RFID Based Automatic Multi-Storied Car Parking System

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Abstract: This paper presents a design and implementation of automated car parking system by using RFID and passcode technologies. In this system, a parking tower with three floors and two slots per floor on either sides of the central lift was implemented. The control of entry-point and exit-point from the parking-lots is one of the applications of Radio Frequency Identification (RFID) technology which leads to the high reliability and security issues. RFID is a wireless technology to identify and track tags attached to objects via radio waves. The parking lots have an elevator to carry vehicles to different floors according to the vacancies that are collected by using an RFID system and are updated periodically into the database. This project is designed with RFID system, stepper motor for elevator, servo motor for turning the pallet to desired position, and DC motor for moving and placing the vehicles toward the specified slot of parking. This project will help to minimize the car parking area companies and apartments. And also it will help to reduce the manual work and save time.

Keywords: *Automatic Car Parking, Radio Frequency Identification (RFID), Arduino*

1. INTRODUCTION

In the modern world, technological advancement penetrating in every aspect has been undeniable. So, the variety of vehicles is increasing and vehicle parking is becoming a major problem. Automatic car parking system will play an important role to reduce the manual work and save time. That is the most effective solution for big city that are facing problem in placing the vehicles at available parking space. The mechanized lift will transport the vehicles to the different levels at a certain position.
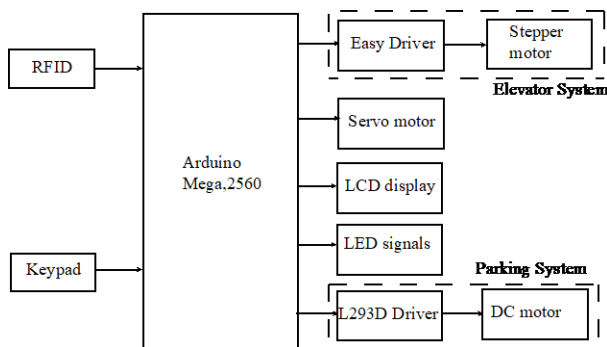

Figure 1. Overall Block Diagram of the Proposed System

Multi-storied car parking system will help in parking large number of vehicles in a smaller area. For this purpose, parking slots are assigned inside the multi storied structure depending on the size of the car.

2. RELATED WORK

In the literature, many methods, for example, Crane Parking system, have been proposed for automatic car parking system. It consists of a central lifting and positioning mechanism that is built into the center isle of a parking structure. However, to increase the redundancy of the system, another crane can be added to the rails and the two are coordinated by software [2].

In some paper, some researchers have been proposed this system by using PLC (Programmable Logic Controller). A kit has been designed for automation of a car parking system. The PLC has been pre-programmed and it reads the inputs from the various sensors and makes logical decisions. In case of occurrence of a failure, the protective measure is also taken [4]

Some other researchers have been discussed this system by using GSM technology. The system is integrated with GSM module so that when a user requests for the details related to the available slots, the system will send a SMS text message to the user with the details related to the parking slots and the same will send the message stating "No Slots Available for Parking". Thus, with the mentioned information the user can take a wise decision whether to park vehicle or not. Then the GSM modem will send a password and the parking lot number to access the reserved parking lot [3].

After doing the study on various system that used various technologies, the proposed title has been tried to describe as a proper system by using RFID and Arduino Mega with AT-mega 2560 microcontroller for car parking system.

3. PROPOSED METHODOLOGY

This section consists of overall description of hardware for automated car parking system and details of the circuit components that used in the project. This project is constructed by stepper motor, servo motor, DC motor , RFID module, 4x4 keypad and 16x2 LCD display Arduino Mega,. Arduino Mega is used as a main controller for this system. Stepper motor is used for elevator control system. Servo motor is used to control the pallet to get the desired position. DC motor will work for moving and placing the vehicle towards the specified slot of parking.

Keypad system is often needed as a backup plan to provide the security for RFID based parking system when the user loses the RFID card. When a password is entered from the keypad, it will be matched with the data stored in the controller. If the password is correct, the parking or retrieving of the vehicle can be taken. If not, LCD will show an error message and any action cannot be taken.

Radio Frequency Identification (RFID) technology is widely used in various applications such as attendance system, tracking systems, monitoring system or parking system, inventory control, identification (ID) badges and access control, equipment or personnel tracking in hospitals and others [1]. RFID use the electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. In RFID module, there are two main components: the interrogator (RFID Reader) which transmits and receives the signal and the transponder (Tag) which is attached to the object [2].

There are two portions in the automated multi-storied car parking system. They are RFID system and car lift control system. For authorization process, the system starts the matching with the user information already stored in database system .SD card adaptor is used as database and data storage device. For identification and classification, radio frequency produced by RFID reader and RFID tag are used to identify whether register person or not. Once the system finds out the corresponding parking slot, the lift will move to the parking slot and then activates the conveyor belt at that location and thus the car is moved to the lift. The 16x2 line LCD display is used to alert notification message depend on the process.

The car is placed on the rotating platform, after that, the program sends the signals to the controller to move the lift to the designated space. This will be accomplished by sending continuous movement instructions to make smooth movement [1]. The movement of the pallet will be achieved by using DC motors.
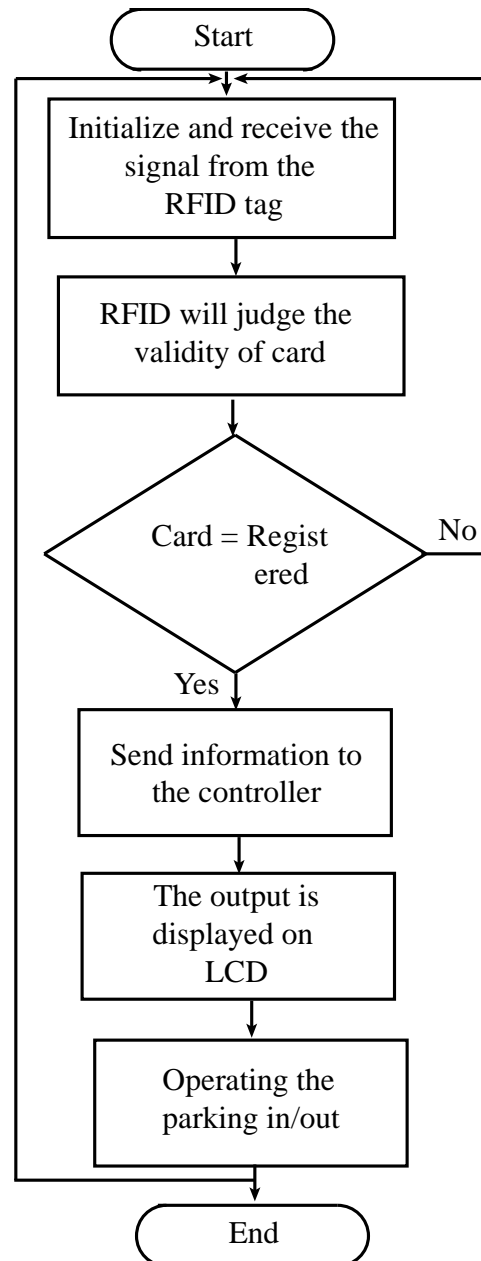

Figure 2: System Flow Chart.

The System flow chart is shown in figure 2. RFID card reader reads the ID number from the RFID tag. Then, the reader sends the ID number to the controller for checking with the database. If the ID number is valid, the user can select the room number. LCD displays the information about the number of cars that can be parked and the vacant place for parking. If the ID number is invalid, an error message will be displayed on the LCD screen and any parking or retrieving of the vehicle cannot be taken.

3.1 SETUP DIAGRAMS OF CAR PARKING SYSTEM

The following pin layout is shown as recommended by the documentation of the MFRC522 library that is used in the programming section [7]. Figure 3 shows the pin connection of RFID, keypad and LCD Display with Arduino Mega. The best thing about servo motor is that it can be connected directly to Arduino. Figure 4 shows the pin connection of motors with Arduino Mega.

The easy driver is used for stepper motor and this driver is able to drive the stepper motor up to 30V. And it has an on board voltage regulator to get precision motor control
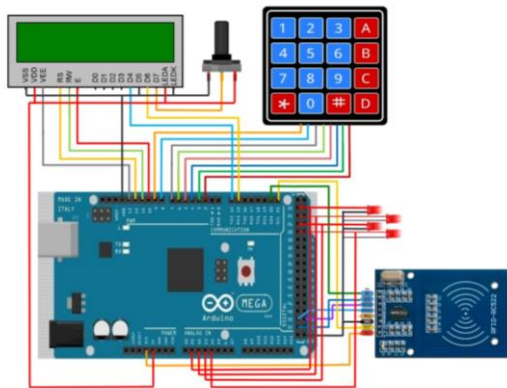

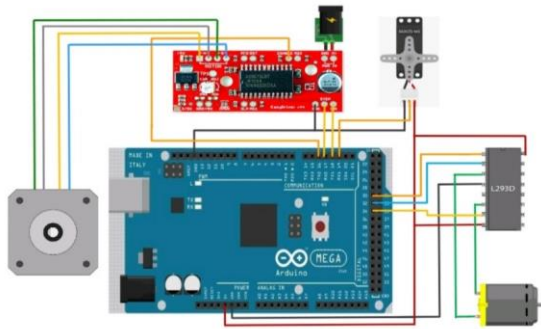Figure 3: Pin Connection Diagram of RFID, Keypad and LCD Display.

Figure 4: Pin Connection Diagram with Motors

3.2 IMPLEMENTATION AND RESULT

The testing results are presented in this section. Arduino IDE (Integrated Development Environment) software was used to simulate and implement the car parking system. The testing results show that the proposed architecture can achieve an effectively performance.
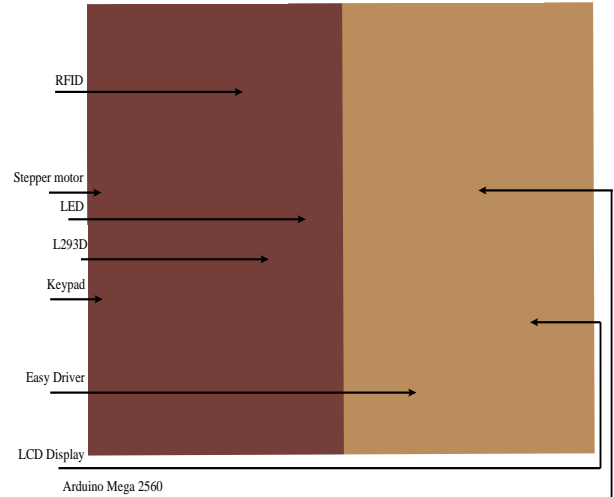

Figure 5: Experimental Setup

Figure 5 describes the experimental setup diagram with Arduino Mega, RFID module, easy driver, stepper motor, L293D motor driver motor, DC motor, servo motor, 4x4 matrix keypad and LCD display... Figure 6 shows the experimental testing result of DC gear motor with the pallet for position control. Complete model of proposed system is described in figure 7 and that shows a parking tower with three floors and two slots per floor on either sides of the central lift. The operation of vehicle retrievable system is shown in figure 8.
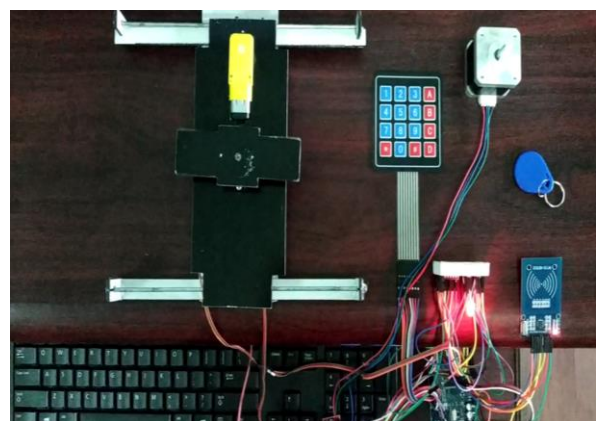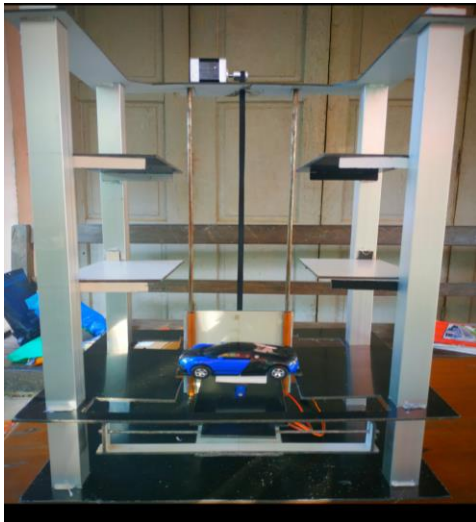

· Figure 6: DC Gear Motor Testing

Figure 7: Complete Model of Multi-Storied
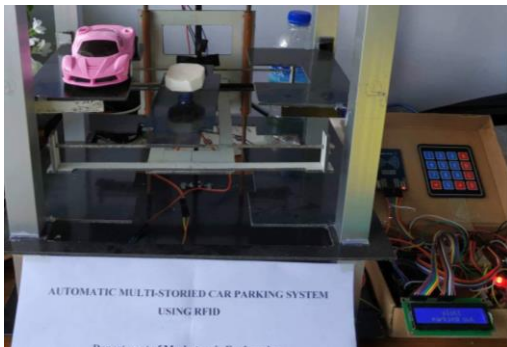Car Parking System

Figure 8: Experimental Result of Multi-Storied
Car Parking System

3.3 CONCLUSION

In this paper, RFID based automatic multi-storied car parking system has been implemented for desired objectives. This system is implemented by using RFID technology and AT-mega 2560 microcontroller of Arduino Mega. This result is expected as a very useful solution for the users and developed countries. In further works, this system can be enhanced with additional features and security elements.

4. ACKNOWLEDGMENTS

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System with using Keypad.

[9] https://www.arduino.cc/en/Main/ArduinoBoardMega

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Design and Development of an Automatic Color Sorting Machine on Belt Conveyor

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Abstract: Automatic color sorting is very much convenient in industry. Color and size are the most important features for accurate classification and sorting of product which can be done by using some optical sensors or analyzing their pictures. Color sorting machines are machines that are used on the production lines in bulk food processing and other industries. They separate items by their colors, detecting the colors if things that pass before them and using mechanical or pneumatic ejection devices to divert items whose colors do not fall within the acceptable range. The Color sorting machine using Arduino is a fascinating and renowned project for techies, who would like to combine electronics, machine building and programming. The Color Sorting Machine is used for sorting mainly RGB colors. A simple robot arm is used to apply a color sorting to a physical system. The objects are placed to the conveyor belt using robot arm with servo motors. One conveyor belt is used, which is controlled by DC motors.

Keywords: color sorting; Arduino; robot arm; conveyor; servo motors; DC motor

1. INTRODUCTION

Nowadays, in the present state of intense competition, production efficiency is generally regarded as the key of success. Production efficiency includes the speed at which production equipment and production line can be lowering material and labor cost of the product, improving quality and lowering rejects, minimizing downtime of production equipment and low cost production equipment. Taking this matter under consideration the project is developed which is very useful for industries.

Machines can perform highly repetitive tasks better than humans. Worker fatigue on assembly lines can result in reduced performance, and cause challenges in maintaining product quality. An employee who has been performing an inspection task over and over again may eventually fail to recognize the color of product. Automating many of the tasks in the industries may help to improve the efficiency of manufacturing system. Automation is the technology by which a process or assistance. Automation or automatic control is the use of various control system for operating equipment such as machinery, processes in factories, boilers, and heat treating ovens, switching on telephone networks, steering and stabilization of ships, aircraft and other applications and vehicles with minimal or reduced human intervention. Some processes have been completely automated.

This machine consists of mainly four parts: conveyor belt, color sensor, mini robotic manipulator by driving the servo motor, linear actuator by using the DC motor and L293D motor driver. The output and input of these parts was interfaced using Arduino. The Color Sorting Machines is used for sorting mainly RGB colors. This Color sorting machine separates different colored objects and classifies them into respective containers/cups. The Color Sorting machine is made up of Arduino UNO, RGB Color Sensor, three Servo Motors and some composite funnels and tube parts.

In today's industrial environment, a robot or rather a robotic arm to be precise is not something hard to find. These robots and robotic arms provide mechanical assistance for human workers in many factories.

Mainly the color sorters are used in agricultural machineries like rice sorter, beans sorter, peanut sorter etc. Color sorters are used in other, industrial applications also like quartz sand sorter, plastic granule sorting of colored nuts and bolts etc. It reduces the human effort, labor and cost.

The sensor handling systems which will drive the pick and place robot to pick up the object and place it into its designated place can.

There are three main steps in sensing part, objects detection and recognition. The system may successfully perform handling station task, namely pick and place mechanism with help of sensor.

The Arduino microcontroller sends signal to circuit which drives the various motors of the robotic arm to grip the object and place it in the specified location. Based upon the detection, the robotic arm moves to the specified location, releases the object and comes back to the original position.

The main advantages of the system are less time required to sort the product, as the whole system is performed by machine there is less possibility of mistake, less man power required. If the industry can produce the product within the required range then the demand of the product will be increased.

2. DESIGN AND CONSTRUCTION

As this project is color sorting machine project, color sensor is used to identify colors.TCS230 color sensor module is used in this project. The TCS230 color sensor is embedded in a flat rectangular shape aluminum plate. This aluminum plate is joined with the conveyor using rivets. A rivet is a permanent mechanical fastener. Before being installed, a rivet consists of a smooth cylindrical shaft with a head on one end. The end opposite to the head is called the tail. On installation, the rivet is placed in a punched or drilled hole, and the tail is upset, or bucked. Fix the color sensor in the conveyor with rivets firmly.
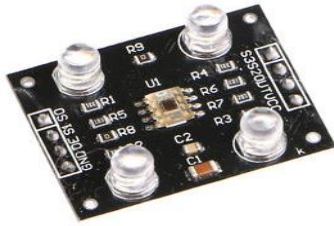
Figure. 1 TCS230 Color Sensor

The TCS230 color detector can measure three primary colors Red, Green and Blue and it also has a separate white light detector. Since any color can be created from different levels of these primary colors, the unit can tell you the color composition of a light source. So the authors will separate the Red, Green, Blue and other colors with this device. Color blocks are used to test the project. The authors have to consider separating and placing the blocks according to their colors. So the authors use four containers. Three containers are placed on one side of the conveyor.
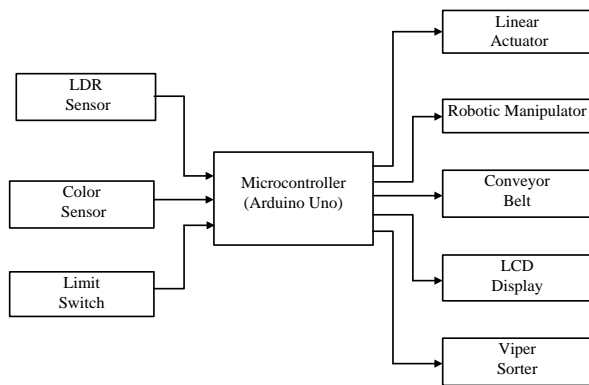

Figure. 2 Block Diagram of Color Sorting Machine

This side of the conveyor is linked with three inclined paths for three containers. Blue block will drop into the first container, Red block will drop into the second container and the Green block will drop into the third container. To drop the block, three arms are needed. These arms are placed on the other side of the conveyor and driven by the servo motors. First arm is for Blue block, second arm is for Red block and third arm is for Green block. The other color blocks will drop into the last container. The last container is placed at the end of the conveyor. These colors which are not customized by the color sensor will go straight to the last container without any obstacles. The whole system is controlled by the microcontroller and whole body is made sure to fix firmly by using screws and rivets.

2.1 Development of the Mechanical Structure

A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the Transportation of heavy or bulky materials.

In this project, horizontal belt conveyor system, made up of aluminum frame, is used. A belt conveyor system is the carrying medium of a belt conveyor system. A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of three pulleys with an endless loop of carrying medium – the conveyor belt – that rotates

about them. One of the pulleys is powered moving the belt and material on the belt forward. The powered pulley is called the drive pulley while the upper pulley is called the idler pulley. The drive pulley is driven by the motor. The motor direction is controlled by the microcontroller. And then the authors use linear actuator to move the color block which are placed in the slot stand. Simple robot arm, constructed with small servo motor, is used to pick up the block and placed the block to the conveyor.

2.2 Development of the Electrical System

Electrical system is the heart of the sensing and sorting process. The authors use the TCS230 color sensor for sensing the different color objects. The authors use the L293D motor driver IC to control the linear actuator by microcontroller. A servo controlling circuit was made on a PCB using mainly Arduino UNO. A laser diode and LDR sensor are used for detecting the presence of the blocks in the slot. A transistor is used to control the conveyor motor. When the block is presence in the slot, the whole is working continuously. If the blocks are gone in the slot, the whole system will be stop.
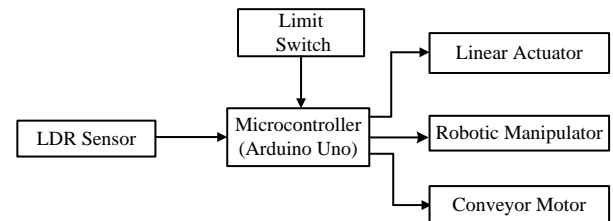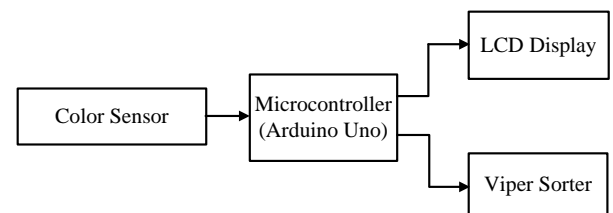

Figure. 3 Block Diagram of LDR Sensing System

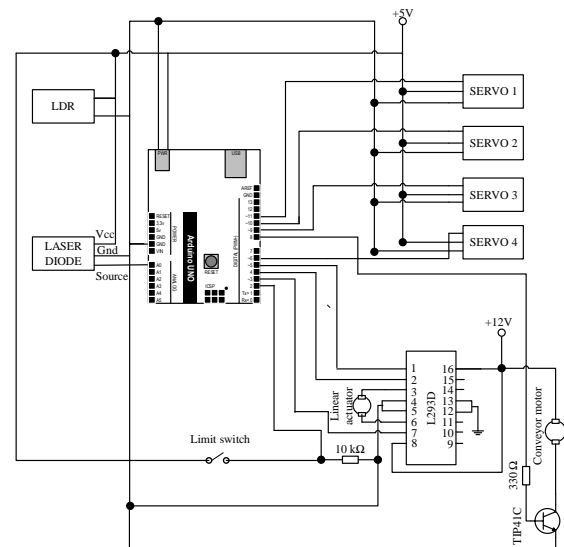Figure. 4 Block Diagram of Color Sensing System

Figure. 5 Circuit Diagrams for the System (board 2)
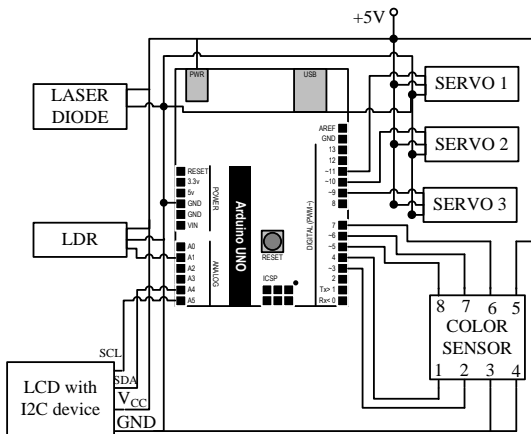
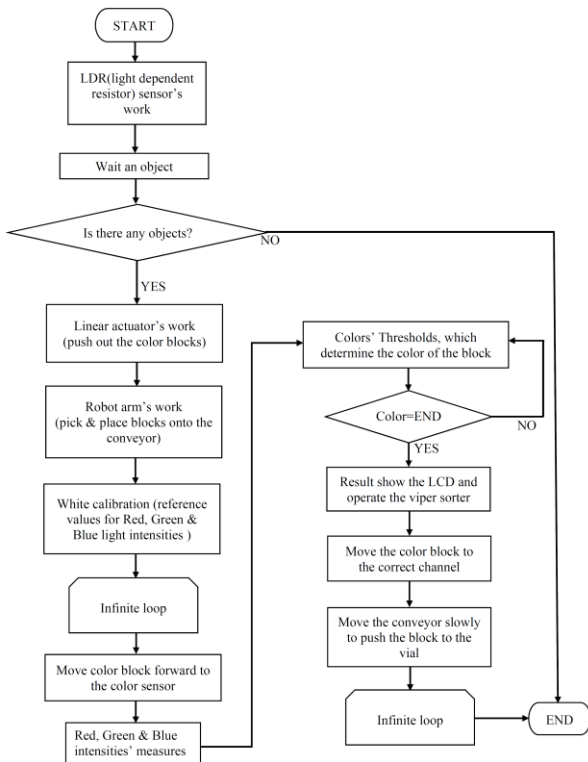Figure. 6 Circuit Diagrams for the System (board 1)

Figure. 7 Flow Chart for the System

2.3 Application

It has application in material handling systems and manufacturing industries like

1. Food industry.

2. Agricultural products scaling and grading.

3. Pharmaceutical industries.

4. Handling biomedical waste.

5. Assemble all color products in one packing box.

Actual application of this project can be done in various industries where distribution of product of different color in one single box is required; these can be done by our mechanism.

3. EXPERIMENTAL RESULTS

All the components are in connected with each other. The main appliances are placed next to each other. The Arduino board is about to be mounted and connected to the external power supply for the flow of current. All the appliances are going to be connected to the Arduino board. All the wirings with the breadboard are installed.
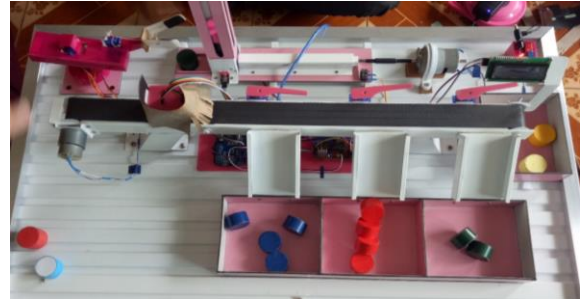
Figure. 8 Color Sorting Machine
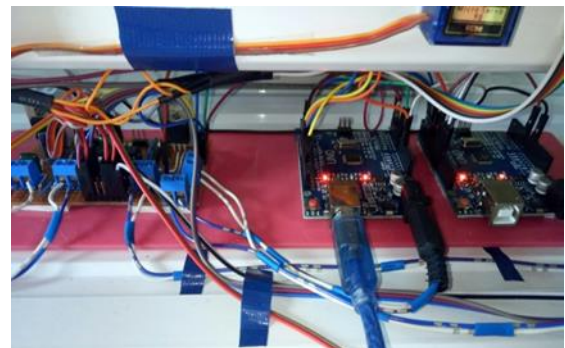
Figure. 9 Circuitry Arrangements for Sensing the Object and Controlling the Motor

The Figure 10 depicts the initial operation when power is supplied to the Arduino at the laser blocking condition. Thus, LDR circuit detects laser light from laser diode and LDR works as an insulator, does not allow the current to pass through the circuit. If there is no object, the laser beam is directly through the LDR. So, that signals sends to the controller and stops the operation.
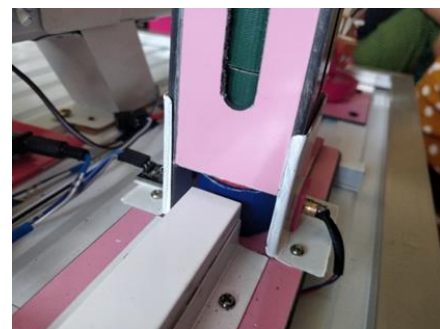
Figure. 10 Actuator with Limit Switch

The gripper arm is made up of four servo motors. Each servo motor is connected with Arduino and it drive with different degrees. The combination of this servo motor is called gripper.

The authors use 12 V DC motor as an actuator and it driven by an7805 voltage regulator IC. The cylinder is made up of composite and the color blocks are put it in. The basement of the cylinder is setup with LDR sensor. This sensor detect if there an object or not. If there is an object, the actuator will

start to work. The actuator moves forward and pushes the color block to the allocating position. In this condition, the gripper arm will pick up that block from allocating position to the conveyor belt and then the conveyor belt will send to their identify container.

In Linear Actuator, 12V DC motor, driven by L293D motor driver IC, is used. Arduino is used to control the motor forward and reverse directions. These motor directions make the actuator in forward and backward directions. The color block is placed in the color slot stand. The color stand is located in front of the actuator. The actuator performs to move the color block in the stand. A time is set the actuator to move the block in order to reach the pick-up point of the robot arm. The distance is not reached the way the authors want after several working time. So, Limit Switch is used to reduce the distance error.

Color sensor is used to separate color blocks. The authors will separate Red, Green, Blue and other color blocks. Color sensor is very sensitive according to the light intensity. So the authors cover the sensor with black curtain. The authors try their best to stable the color reading.

4. CONCLUSION

This project of automatic color sorting is excellent one because of its working principle and wide implementation. By applying the idea of this project an industry can easily sort the required product according to its color. Through it has some limitation, but by having done some modification this concept can be implemented in wide range of application.

The authors can conclude that time and human effort can be reduced by implementing such project in industries like chemical, food, chip manufacturing and so on.

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Performance Analysis of Automatic Voltage Regulator in Power Generation System

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Abstract: The system voltage is one of the most important parameters, which determines the power quality. The stability of the system voltage is critical for the power system. This paper investigates the analysis of the automatic voltage regulator (AVR) system controlled by stabilizer and PID controller. As the work of the AVR is to maintain the synchronous generator terminal voltage. AVR controller simulation model created in power system based on real data from Baluchaung No.2 Hydro Power Plant (Myanmar) to show that the proposed method is effective. The system modeled consists of the amplifier, exciter, sensor and stabilizer or proportional-integral-derivative (PID) controller. Their characteristics and behavior are also briefly discussed. The transfer function controller blocks use linear block model and control techniques in MATLAB/ Simulink environment. By examining the parameters of the stabilizer and PID controller, the generator terminal voltage variations are predicted. Simulation results demonstrate that the proposed controllers provide better performance characteristics with respect to settling time, oscillations and overshoot.

Keywords: Automatic Voltage Regulator (AVR), electric power system, voltage response, Stabilizer, PID controller

1. INTRODUCTION

The system that provides electrical energy flow from electricity generation centers to consumption centers is called an interconnected system. This energy flow should be continuously provided on demand for system stability. The active and/or reactive power change occurring in demand shows itself in two different ways in the electricity generation center. The first one is the case resulted in the change of frequency of the system, that is, rotation speed of the generator. Load frequency control systems are used to hold at the desired frequency. The second one is the change occurring in the terminal voltage of the generator due to the change especially in reactive power. AVR is the control mechanism that detects variations in the output voltage of the generator and provides a controlling excitation current. However, AVR system without any controller will provide slow responses and may cause instability. Thus, need to provide proper control of generator by AVR system to ensure generators operated at safe and stable conditions for normal operations.

Control of AVR system has been proposed in BaluchaungNo.2 Hydro Power Plant (Myanmar).The author designed an AVR system using MATLAB/Simulink and the performance of the system was evaluated using PID controller and stabilizer. In those studies, systems using stabilizer with and without time-delay has been investigated. We also analyzed the mentioned system after introducing the automatic voltage regulators (AVR) and PID controller into the system. In this work, the combined action of the two controllers will be tested as a single controller to determine their resultant effect instead of using them separately in the AVR system. It was deduced that the proportional controller (K_P) have the effect of reducing rise time, the integral controller (K_I) have the effect of eliminating steady - state error, and the derivative controller (K_D) have the effect of increasing stability of the system.

2. AUTOMATIC VOLTAGE REGULATOR (AVR)

The rules of AVR are to maintain the generator terminal voltage magnitudes at the specified level. AVR system consists of four main components there are amplifier, exciter, generator and sensors. The mathematical model and transfer functions can be to linear taking into account the time constant and ignoring saturation or other nonlinear. In Figure (1), the schematic diagram of an AVR system is presented.
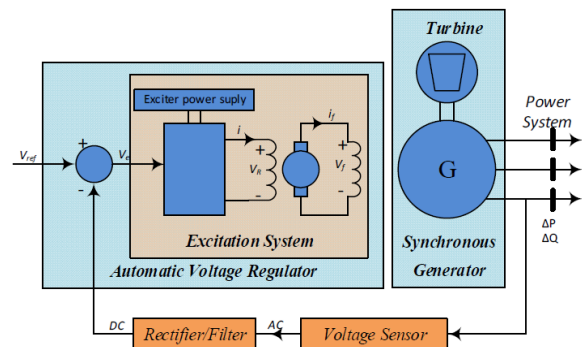
Figure 1. Schematic diagram of an AVR system

3. MATHEMATICAL MODELLING OF AVR SYSTEM

For control system performance, mathematical model of each component is needed. There are two methods to mathematically model an element one is transfer function method and other is state variable method. State variable approach is preferable for both non-linear as well as linear systems. The transfer function approach is simpler and applicable for linear system only.

For transfer function approach, some assumptions and approximations are taken to linearize the non-linear model. Variation in the magnitude of system voltage depends on transient reactance of the synchronous machine while the

duration of variation is decided by the generator time constant. Being a static device, AVR offers minimum time delay and brings the system voltage to its nominal value quickly. The terminal voltage is sensed by AVR and is maintained at its rated value by regulating the excitation.

3.1 Amplifier Model

Transfer function of an amplifier is modelled by a gain and a time constant given by:

$$TF_A = \frac{K_a}{1+s\tau_a}$$

Eq: 1

where, K_a and τ_a represent the gain and time constant of the amplifier. The values of K_a are in the range of 10 to 40 and τ_a are in the range of 0.02 to 0.1 sec.

3.2 Exciter Model

Transfer function of an exciter is modelled by a gain and a time constant given by:

$$TF_E = \frac{K_e}{1+s\tau_e}$$

Eq: 2

where, K_e and τ_e represent the gain and time constant of the exciter. The values of K_e are in the range of 1 to 2 and τ_e are in the range of 0.4 to 1.0 sec.

3.3 Generator Model

Transfer function of a generator is modelled by a gain and a time constant given by:

$$TF_G = \frac{K_g}{1+s\tau_g}$$

Eq: 3

where, K_g and τ_g represent the gain and time constant of the generator and load are dependent. The values of K_g are in the range of 0.7 to 1.0 and τ_g are in the range of 1.0 to 2.0 sec from full load to no load.

3.4 Sensor Model

Transfer function of a sensor is modelled by a gain and a time constant given by:

$$TF_S = \frac{K_s}{1+s\tau_s}$$

Eq: 4

where, K_s and τ_s represent the gain and time constant of the sensor. The value of K_s is 0.02 to 1.0 and τ_s are 0.01 to 2.2 sec.

3.5 Stabilizer Model

Transfer function of a stabilizer is modelled by a gain and a time constant given by:

$$TF_f = \frac{K_f}{1+s\tau_f}$$

Eq: 5

where, K_f and τ_f represent the gain and time constant of the sensor. The value of K_f is 1.0 and τ_f is 0.01 to 0.06 sec.

3.6 PID Controller Model

There are several methods for tuning a PID loop. The most effective methods generally involve the development of some form of process model, choosing P, I, and D based on the dynamic model parameters. Manual tuning methods can be relatively inefficient, particularly if the loops have response times on the order of minutes or longer.

The choice of method will depend largely on whether or not the loop can be taken "offline" for tuning, and on the response time of the system. If the system can be taken offline, the best tuning method often involves subjecting the system to a step change in input, measuring the output as a function of time, and using this response to determine the control parameters.

Transfer function of a PID controller is modelled by a gain and a time constant given by:

$$TF_{PID} = K_P + \frac{K_I}{s} + K_D s$$

Eq: 6

where, K_P, K_I and K_D represent the gain constants of PID controller.

Table 1. Typical values for parameters

Model	Gain Constant	Typical Value	Time Constant	Typical Value
Amplifier	K_a	10 ~ 40	τ_a	0.02 ~ 0.1
Exciter	K_e	1 ~ 2	τ_e	0.4 ~ 1.0
Generator	K_g	0.7 ~ 1.0	τ_g	1.0 ~ 2.0
Sensor	K_s	0.02 ~ 1.0	τ_s	0.01 ~ 2.2

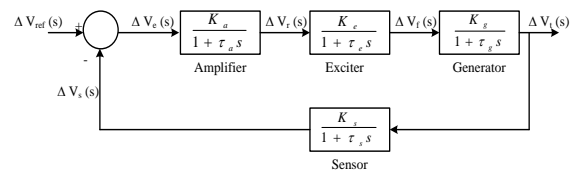The excitation system model of AVR system is shown in Figure (2).
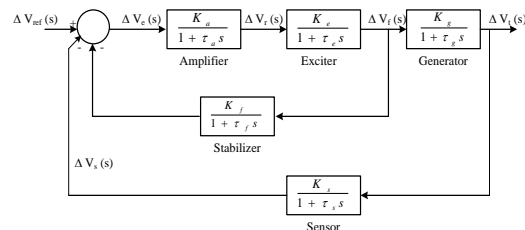

Figure 2. Block Diagram of AVR System

Figure 3. Transfer Function Model of AVR System with Stabilizer
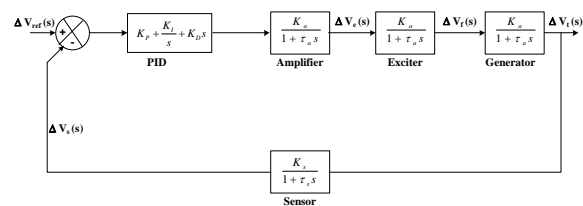

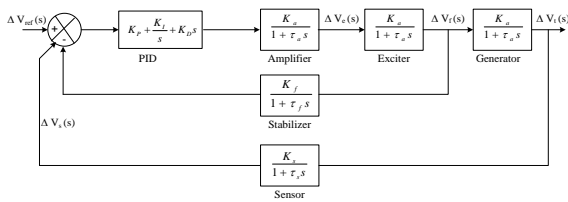Figure 4. Transfer Function Model of AVR System with PID Controller

Figure 5. Transfer Function Model of AVR System with
Stabilizer and PID Controller

4. Location of Research

This research was conducted at the Baluchaung No.2 Hydropower Plant. The Baluchaung No. 2 Power Stations have a generation capacity of (28x6) MW, respectively. Electric power generated at this plant is sent to the Yangon and the Mandalay region; thus Baluchang No. 2 Power Station plays a significant role in the supply of electric energy in Myanmar.

Figure 6. Site Map

Figure 7. Location of Baluchaung No.2 Hydropower Plant
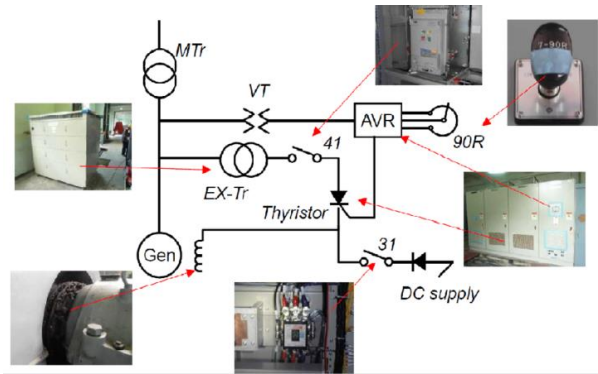
Figure 8. AVR Structure of Baluchaung No.2 Hydropower Plant

5. RESEARCH INSTRUMENT

The instrument used in this study is the hardware and software. Hardware includes a set of computers that are compatible with the software used, while the software includes Matlab Sim link.

6. PARAMETERS FOR AVR MODEL

For control system stability, the Routh-Hurwitz array was constructed and chooses the amplifier gain constant K_a. Assume AVR parameters as follow:

Amplifier gain constant, K_a	-
Amplifier time constant, τ_a	0.05
Exciter gain constant, K_e	1
Exciter time constant, τ_e	0.4
Generator gain constant, K_g	1
Generator time constant, τ_g	0.5
Sensor gain constant, K_s	1
Sensor time constant, τ_s	0.01
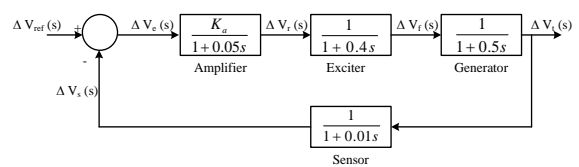
Figure.9 AVR Block Diagram

Open-loop transfer function of AVR is

$$G(s)H(s) = \frac{K_a(1)(0.1)}{(1+0.05s)(1+0.4s)(1+0.5s)(1+0.01s)}$$

$$= \frac{10000K_a}{s^4 + 124.5s^3 + 2545s^2 + 9600s + 10000}$$

The characteristic equation is

$$1 + G(s)H(s) = 1 + \frac{10000K_a}{s^4 + 124.5s^3 + 2545s^2 + 9600s + 10000} = 0$$

$$\therefore s^4 + 1245s^3 + 2545s^2 + 9600s + 10000 + 10000K_a = 0$$

The Routh-Hurwitz array for this polynomial is

$$
\begin{array}{c|ccc}
s^4 & 1 & 2545 & 10000+10000K_a \\
s^3 & 124.5 & 9600 & 0 \\
s^2 & 2467.89 & 10000+10000K_a & 0 \\
s^1 & 504.48K_a - 9095.52 & 0 & \\
s^0 & 10000+10000K_a & &
\end{array}
$$

From the s^1 row, to find K_a for control system stability,

$504.48Ka - 9095.52 < 0$

$$K_a < 18.03$$

For $K_a = 18.03$, the auxiliary equation from the s^2 row,

$2467.89s2 + 10000 + 10000 (18.03) = 0$

$$s = \pm j8.78$$

Since, for $K_a = 18.03$, a pair of conjugate poles on the $j\omega$ axis, and the control system is marginally stable.

Closed-loop transfer function of AVR is

$$\frac{G(s)}{1+G(s)H(s)} = \frac{V_t(s)}{V_{ref}(s)} \qquad \text{Eq: 7}$$

$$= \frac{0.01K_a(s+100)}{s^4 + 124.5s^3 + 2545s^2 + 9600s + 10000 + 10000K_a}$$

For the system to be stability, the amplifier gain of K_a should be chosen less than 18.03.

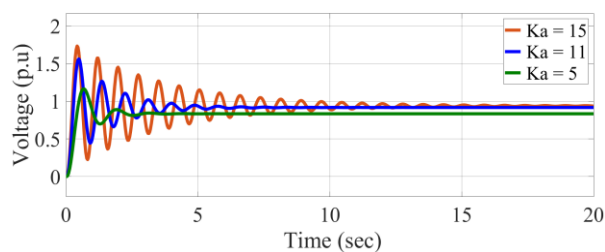Figure 10 shows the comparison of effects of K_a for AVR system.

Figure.10 Effects of K_a for AVR System

From above Figure, choose K_a= 11, the steady-state response is

$$V_{t,ss} = \lim_{s \to 0} sV_t(s) = \frac{K_a}{1+K_a} \qquad \text{Eq: 8}$$

$$V_{t,ss} = \frac{11}{1+11} = 0.9167$$

The steady-state error is

$V_{e,ss} = 1.0 - 0.9167 = 0.0833$

In order to reduce the steady-state error, the amplifier gain must be increased, which results in an unstable control system. Therefore, choose K_a= 11.

6.1 AVR with Stabilizer

Assume stabilizer parameters as follow:

Stabilizer gain constant, K_s	0.4
Stabilizer time constant, τ_s	0.04
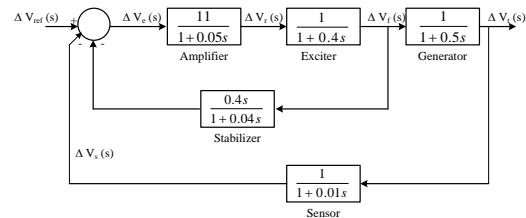
Figure.11 AVR with Stabilizer Block Diagram

6.2 AVR with PID Controller

PID controller transfer function is

$$G_C(s) = K_P + \frac{K_I}{s} + K_D s \qquad \text{Eq: 9}$$

For control stability, the constants K_P, K_I and K_D should choose by tuning, on the response time of the system. The best tuning method involves subjecting the system to a step change in input, measuring the output as a function of time, and using this response to determine the control parameters.

Assume PID controller parameters as follow

Proportional gain constant, K_P	1.0
Integral gain constant, K_I	0.25
Derivative gain constant, K_D	0.28
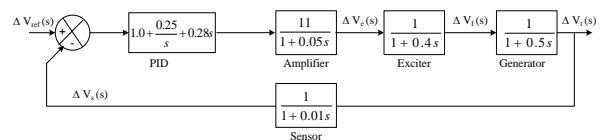
Figure 12. AVR with PID Controller Block Diagram

6.3 AVR with Stabilizer and PID Controller
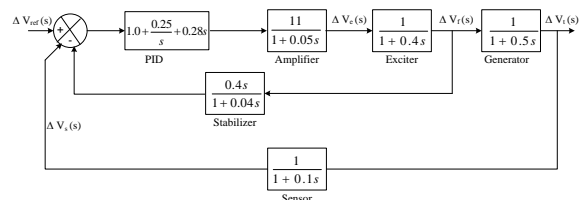
Figure 13. AVR with Stabilizer and PID Controller Block Diagram

7. SIMULINK MODEL AND RESULTS OF AVR SYSTEM

Figure 14(a) shows an AVR system model in MATLAB Simulink, where a combined simulation block model was constructed for the amplifier, exciter, and generator cases in order to obtain their respective step response.

Figure.14 (a) Simulink Model of Simple AVR System
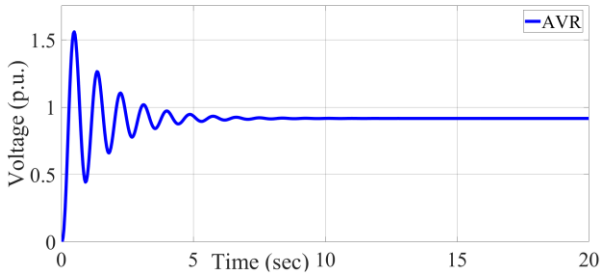
Figure.14 (b) Terminal Voltage Response of AVR System

From Figure 14(b), the result shows that for an amplifier gain $K_a = 11$, the response is highly oscillatory, with a large 71.552% overshoot and a long settling time with 8.177 sec. Since the steady-state error is 8.33%, there is high steady-state error and unsatisfactory transient response.

Figure 15(a) shows an AVR system model with stabilizer in MATLAB Simulink, where a combined simulation block model was constructed for AVR and stabilizer cases in order to obtain their respective step response.

Figure.15 (a) Simulink Model of AVR System with Stabilizer
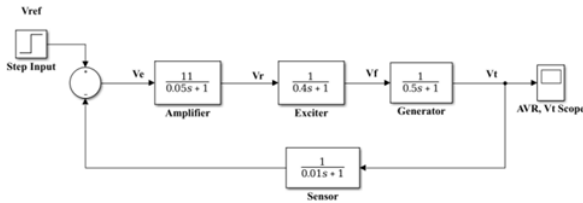

Figure.15 (b) Terminal Voltage Response of AVR System with Stabilizer

From Figure 15(b), the result shows that a very satisfactory transient response with steady state error of 5.4% and a settling time of approximately 2.255 seconds.

Figure 16(a) shows an AVR system model with PID controller without stabilizer in MATLAB Simulink, where a combined simulation block model was constructed for AVR

and PID controller cases in order to obtain their respective step response.

Figure.16 (a) Simulink Model of AVR System with PID Controller

Figure.16(b) Terminal Voltage Response of AVR System with PID Controller

From Figure 16(b), a proportional gain $K_P = 1.0$, an integral gain of $K_I = 0.25$ and a derivative gain of $K_D = 0.28$ is tuned and it is found to be satisfactory. PID controller produced about 0.385 % overshoot and settling time of 4.744 sec. The PID controller reduces the steady-state error to zero. It was observed that the AVR shows 1 p.u. output voltage with PID controller. It also shows that low frequency and less oscillation.

Figure 17 (a) shows an AVR system model with PID controller and stabilizer in MATLAB Simulink, where a combined simulation block model was constructed for AVR, stabilizer and PID controller cases in order to obtain their respective step response.
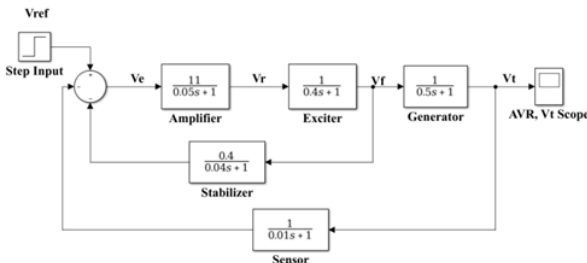

Figure.17 (a) Simulink Model of AVR System with Stabilizer and PID Controller

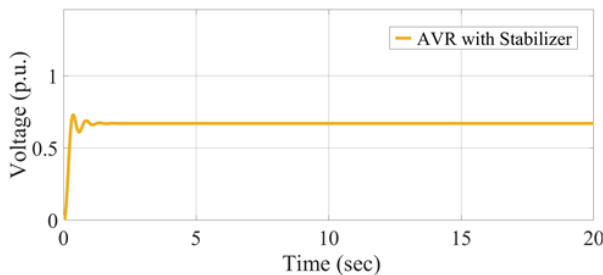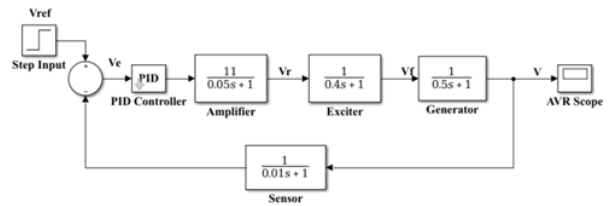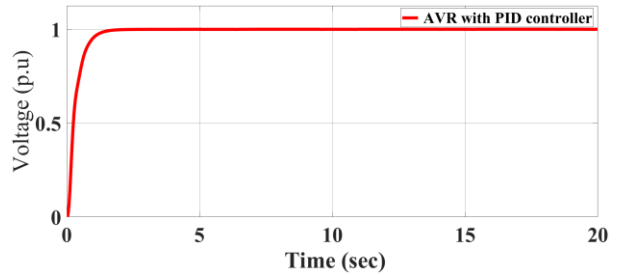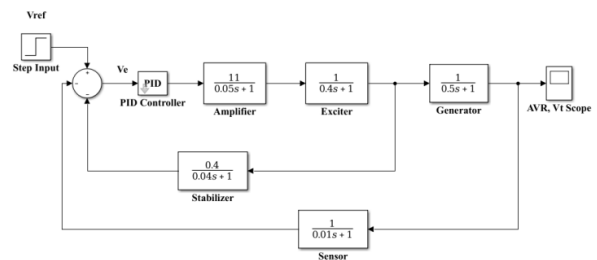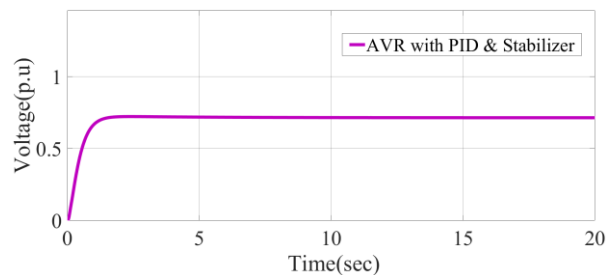

Figure.17 (b) Terminal Voltage Response of AVR System with Stabilizer and PID Controller

From Figure 17(b), a proportional gain $K_P = 1.0$, an integral gain of $K_I = 0.25$ and a derivative gain of $K_D = 0.28$ is tuned and it is found to be satisfactory. The response settles in about 3 seconds with no overshoot. The combined controllers reduce the steady-state error to zero.

Figure 18(a) shows an overall AVR system model with AVR, stabilizer, and PID controller in MATLAB Simulink.
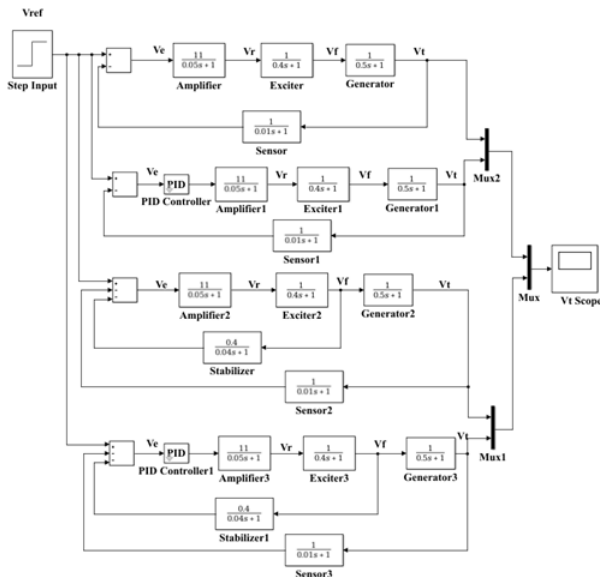
Figure.18 (a) Simulink Model of Overall AVR System with Controllers
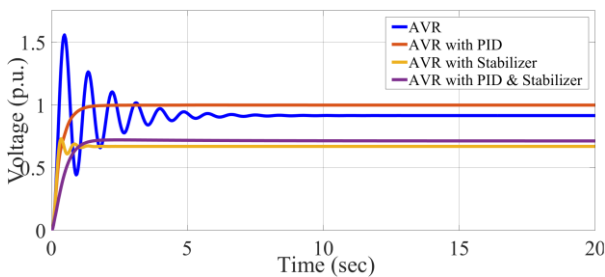
Figure.18 (b) Terminal Voltage Response of Overall AVR System with Controllers

Table 2 shows the comparison results for the AVR system with and without controllers.

Table 2. Comparison results for the AVR system with and without controllers

System	Overshoot (%)	Rise Time (ms)	Peak Time (s)	Settling Time (s)	Steady State (p.u.)
AVR Closed Loop	71.552	161.49	0.484	8.177	0.92
AVR with Stabilizer	9.341	172.428	0.357	2.255	0.67
AVR with PID	0.458	635.164	4.312	4.744	1
AVR with Stabilizer and PID Controller	1.531	775.096	2.492	2.748	0.72

The AVR was simulated with stabilizer and PID controller. It was observed that the AVR shows low frequency and less oscillation. Figure 18(b) shows the comparison results of the system. From these results, AVR with PID controller shows that the reliability of generating system is determined by its ability for maintaining voltage and frequency within permissible limit. It can be concluded that the generating system for AVR with PID controller shows satisfactory performance.

8. CONCLUSION

In this paper, application of PID controller and stabilizer inAVR control system with variation in its time constant andgain was examined. By using PID controller and stabilizer, notonly the system will have an appropriate steady-state error butalso provides good dynamic response with a less overshoot forthe voltage terminal. Finally, the comparison results of AVR system were simulatedand effects of some parameters were investigated.From these results performance response of the AVR system in generator with PID controller gives satisfactory settling time and less oscillation. Thus AVR with PID controller is very suitable for controlling the voltage of power generation system.

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Observational Study of Wastewater Treatment by the Use of Microalgae

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Abstract: Organic and inorganic substances which were released into the environment as a result of domestic, agricultural and industrial water activities lead to organic and inorganic pollution. The normal primary and secondary treatment processes of these wastewaters have been introduced in a growing number of places, in order to eliminate the easily settled materials and to oxidize the organic material present in wastewater. The final result is a clear, apparently clean effluent which is discharged into natural water bodies. Treatments of wastewater with Microalgae based system have the ability to remove nutrients. (Nitrogen, Phosphorus and other nutrients), BOD, COD and other impurities present in the wastewater by using the sunlight, CO2, and impurities like nutrients present in the wastewater. The microalgae also have the ability to fix the excess. Carbon dioxide presents in the environment and release the oxygen and solve the problem of Global warming. According to the various study, the nutrients removal efficiency of microalgae based wastewater treatment system is very high as it removes 78-99% of Nitrogen and Phosphorus. Microalgae culture offers an interesting step for wastewater treatments because they provide a tertiary bio treatment coupled with the production of potentially valuable biomass, which can be used for several purposes. And also, for their capacity to remove heavy metals, as well some toxic organic compounds, therefore, it does not lead to secondary pollution. In the research, we will highlight on the role of micro-algae in the treatment of wastewater.

Keywords: inorganic pollution; treatment; impurities; microalgae; wastewater

I.INTRODUCTION

In developing country, due to the increasing population and rapid industrialization, the amount of wastewater generated every day is very huge. Due to this, water pollution is one of the most critical environmental problems. For wastewater treatment various conventional methods are used in the development country but they are costly and not economical. Nowadays, some new green technical methods of wastewater treatment are being introduced to resolve the problems related to the conventional methods.

Environment laws are given general applicability and their enforcement has been increasingly sticker. So, in terms of health, environment and economy, the fight against pollution has become a major issue. Today, although the strategic importance of fresh water is universally recognized more than ever before, and although issues concerning sustainable water management can be found almost in every scientific, social, or political agenda all over the world, water resources seem to face severe risks to availability and quality of water resources, in many areas worldwide.

Cultivation of Microalgae in wastewater for wastewater treatment, pollution control and production of energy from microbial biomass is nowadays common treatment method. Microalgae have become significant organisms for biological treatment of wastewater. Microalgae based treatment system is one of good solutions to solving the environmental problems such as global warming, the increase of ozone hole and climate changed due to its ability to consume high quantity of carbon dioxide in Photosynthesis process to produce oxygen and glucose.

The problems of water shortage in the Middle East and North Africa (MENA) regions are well documented. Most countries in this region are arid or semi-arid. They have low rainfall, mostly with seasonal and erratic distribution. The MENA region, home up to 5% of the world's people contains less than 1% of the world's annual renewable freshwater. On the other hand, water demand in arid and semi-arid countries is growing fast.

Algae also release a large amount of simpler organic compounds that can be assimilated in aqueous system. The bacteria, in turn constitute an essential source of CO_2 required for algal growth, stimulate the release of vitamins & organic growth factor s and change the pH of the supporting medium for algal growth.

One of the major sources of water pollution is the uncontrolled discharge of human wastes while some countries have made massive investment in water supply projects there has been an overall under-investment in appropriate sanitation systems, which has resulted in harmful contamination of water resources, increased flooding and reduced health benefits from water investments. Finding a solution for the treatment and safe discharge of the wastewater is a difficult challenge because it entails integrated processes in which technical, economic and financial consideration come in play. The uniqueness of each situation makes it difficult to define a universal method for selecting the most adequate type of waste treatment plant. However, it is important to ensure that appropriate treatment standards are selected to meet local conditions, and alternative innovative technologies for treating wastewater are considered. Both conventional and innovative methods should be evaluated.

Determination of Algae Growth Potential is based on the relation of a maximum biomass yield concerning the biologically used nutrients for microalgae growth. In a water body, nutrients could be consumed, partially or totally, depending on the nutritional present in the water. Furthermore, a nutrient-rich discharge like, effluent from the anaerobic digestion process is generally recycled to the head of the wastewater treatment plant and can increase the cost and destabilized the overall treatment process due to the accumulation pf phosphorus.

The microalgae system can treat various types of wastewater like, domestic sewage, industrial waste water etc and reduce the nutrients (Nitrogen, phosphate and other minerals) from the waste water. Removal of Nutrient is an important part of wastewater treatment because rich nutrient effluent discharged into water bodies can result in eutrophication in water bodies. The increased atmospheric CO_2 level is now worldwide accepted to be a major contributor to global warming; its various potential effects are only beginning to be understood. Microalgae use carbon dioxide and sunlight in photosynthesis activity and release the Oxygen in the environment.

Microalgae based treatments have a number of unique benefits. As an aquatic species they do not require arable land for cultivation. It means the cultivation of microalgae does not need to complete with agricultural commodities for growing space. In fact, microalgae cultivation facilities can be built on minimal land that has few other uses.

II.COMPOSITION OF TYPICAL WASTE WATER

Watercourses receive pollution from many different sources, which vary both in strength and volume. The composition of wastewater is a reflection of the life styles and technologies practiced in the producing society. It is a complex mixture of natural organic and inorganic materials as well as man-made compounds. Three quarters of organic carbon in sewage are present as carbohydrates, fats, proteins, amino acids, and volatile acids. The inorganic constituents include large concentrations of sodium, calcium, potassium, magnesium,

chlorine, sulphur, phosphate, bicarbonate, ammonium salts and heavy metals.
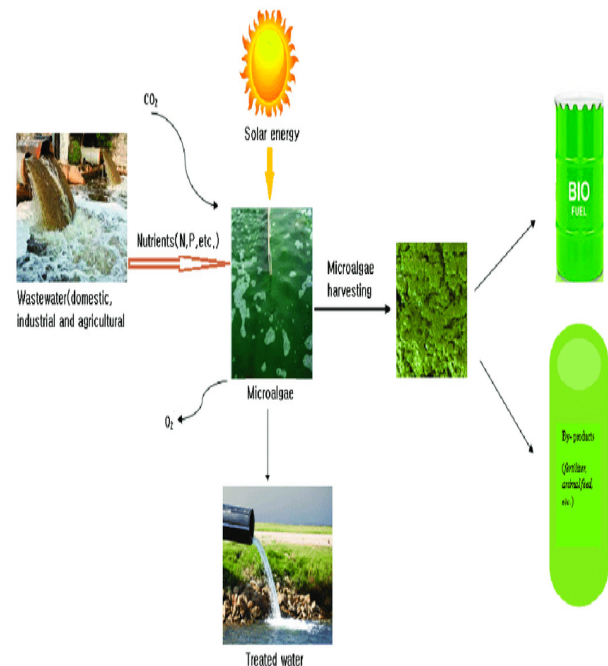
Fig.1.Process of wastewatertreatment with microagale

1. Microbiological Composition of Sewage

Wastewater environment is an ideal media for a wide range of microorganisms specially bacteria, viruses and protozoa. The majority is harmless and can be used in biological sewage treatment, but sewage also contains pathogenic microorganisms, which are excreted in large numbers by sick individuals and a symptomic carrier. Bacteria which cause cholera, typhoid and tuberculosis; viruses which cause infectious hepatitis; protozoa which cause dysentery and the eggs of parasitic worms are all found in sewage. The efficiency of disinfecting sewage is generally estimated by the extent of removal of total coliform organisms.
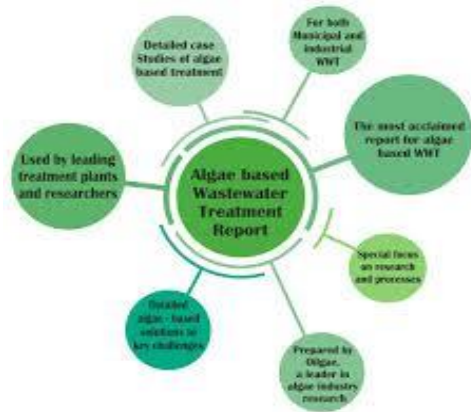
Fig2. Algae for wastewater
treatment

Fig.3.Improving of microagale

2. Factor Affecting for the Growth of Microalgae

(a)   Sunlight

Microalgae are unicellular, photosynthetic microorganisms and they use sunlight in photosynthesis process. Photosynthesis is the process of converting light energy into organic molecules, which are mainly composed of carbohydrates, CH2O. Sunlight is important to the growth of microalgae and without sunlight microalgae growth has been reduces.

(b)   Carbon Dioxide

The increased atmospheric CO_2 level is now worldwide accepted to be a major contributor to global warming; its various potential effects are only beginning to be understood. Microalgae use Carbon dioxide and sunlight in photosynthesis activity and release the Oxygen in the environment. During the photosynthetic process, microalgae utilized CO_2 from the atmosphere as a carbon source to grow and release oxygen. According to the studies microalgae cells contain approximately 50% carbon, in which 1.8 kg CO_2 are fixed by producing 1 kg of micro algal biomass. For the fixing of CO_2 microalgae are considered as more efficient than terrestrial plants.

(c)   Carbon Dioxide

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(d)   PH

Microalgal growth rate and treatment of waste water may also be affected by pH of the waste water. Availability of inorganic carbon also affected by pH, even if pH is high for other reasons than photosynthetic CO_2-exhaustion, the pH regulates what species of inorganic carbon that is available. Increasing dissolved oxygen concentration and pH cause for phosphorus sedimentation and also ammonia and hydrogen sulphur removal. High pH in algal ponds also leads to pathogen disinfection.

(e)   Temperature

Temperature is proportional to the availability of sunlight and has little effect when light is limiting. When light availability is not limiting, increase in temperature can increase the rate of photosynthesis, growth/doubling rates are consequently. However, even though light is most often limiting the growth of microalgae too much light may also cause lowered photosynthetic effectively, which is known as photo inhibition. Increased temperature enhances algal growth until an optimum temperature is reached. Further increase in temperature leads to a rapid reducing in algal growth rate. Temperature ranges generally within 20 to 30'C for the maximum growth of microalgae.

Table I. Summary major nutrient removal
efficiencies by algal cultivation [Wang et al., 2010]

Algae species	Wastewater Characteristics	Carbon	P(%)	N(%)	Retention timrn
Cyanobacteria	Secondarily treated domestic effluent+ settled swine wastewater	NA	60	94	2 Days
Chlorealla pyrenoidosa	Settled domestic sewage	NA	78.8	92.3	15 Days
Chlorella vulgaris	Diluted pig slurry (suspended solids content to 0.2%)	BOD_5 98%	42-89	52-86	3.5Days
Algal –bacterial symbiosis (Chlorella+Nitchia)	Settled domestic sewage	73	91	95%BOD, 80%COD	9hours
Mixed culture of Chlorella and diatom species	Wood-based pulp and paper industry wastewater	40%			45Days
Chlorella pyrenoidosa	Domestic sewage and wastewaters from a pig farm and a palm oil mill	70-78% of BOD, 60-72% COD	40-50	50-60	17 Days

III. REVIEW OF VARIOUS STUDY RELATED TO WASTE WATER TREATMENT WITH THE HELP OF MICROALGAE

The reduction of anthropogenic nutrient inputs (from agricultural practices, urban wastewater and various industries) in the system is required to protect water supplies and to decrease eutrophication process. Their removal efficiencies depend on several factors: (1) microalgae culture, (2) Nutrients initial concentrations, (3) Ration of Nitrogen and Phosphorus (N/P), (4) microalgal strain, (5) microalgae growth conditions, (6) nutrients source, and (7) characteristics.

Microalgae can be used to treat both of municipal and industrial wastewater. However, microalgae can be grown in wastewater to removal all pollutants and chemical toxic substances from wastewater such as nitrogen, phosphorus, nitrite, silica, iron, magnesium and other harmful chemicals. Microalgae have huge capacity to accumulate the heavy metals and heavy toxic compounds to form microalgae

biomass (2). The various study conducted to identify the treatment of wastewater using microalgae discussed below.

The work conducted by Dalrymple et al., (2013) showed that there are important benefits to be derived from integrating algal production systems with nutrient-rich waste streams. The energy resulting from algae will play a significant role in providing energy security while important services such as waste treatment can be significantly achieved by these systems. It also shows that by the end of 14-day batch culture was removed 94% ammonia, 89% TN and 81% TP with the help of algae (5).

Mahapatra et al., (2013) investigate the treatment efficiencies of the Algae based sewage treatment plant located in Mysore. The study showed moderate treatment levels with 60% total COD removal, 50% of filterable COD removal, 82% of total BOD removal, and 70% of filterable BOD removal. The nitrogen removal efficiency was less. However, a rapid reduction in the suspended solids after a high euglenoid growth indicates particulate carbon removal by algal ingestion (13). **Sekaran et al (2013).,** studied on Integrated Bacillus sp. immobilized cell reactor ad Synechocystis sp. algal reactor for the treatment of tannery wastewater with CAACO reactior. **Wang et al (2010)** conducted a study to evaluate the growth of green algae Chlorella sp. on wastewaters sampled from four different points of the treatment process flow of a local municipal wastewater treatment plant and how well the algal growth removed nitrogen, phosphorus, chemical oxygen demand (COD), and metal ions from the wastewaters. The study showed average specific growth rates in the exponential period were 0.412 , 0.429, 0.343, and 0.948 day -1 and removal rates of NH_4 –N were 74-82 % phosphorus 83-90% and 50-78% COD were removed four different types of wastewater. It was also found that metal ions, especially Al, Ca, Fe, Mg, and Mn in centrate, were removed very efficiently. Indeed, the HRAP produced an effluent with a low concentration of dissolved COD (about 60 mg/ml), but the total COD may be high due to algal biomass. The major NHJ-N removal mechanism was the stripping of ammonia in the range between 52%-66%. It was possible to achieve nitrification at all SRTs and corresponding COD/TKN ratios. The COD removal was found to average between 89.5%-97.7% for the organic loadings between 0.5 g/L –day to 0.68 g/L –day.

IV.CONCLUSIONS

Algae can be used in wastewater treatment for a range of purposes, including;

1. Reduction of BOD
2. Removal of N and P,
3. Inhibition of coliforms,
4. Removal of heavy metals

The various studies conducted to treat the wastewater using microalgae shows that the microalgae reactor has a significance reduction in nutrients, BOD and COD and other

toxic chemicals but increase in Total solids due to the growth of microalgae, so it is recommended before discharging the treated wastewater in the stream, it is necessary to remove microalgae from the treated effluent to meet general standards of wastewater discharge. The nutrients removal efficiency of microalgae based wastewater treatment system is very high. The system has a removal efficiency of 78-99% of Nitrogen and Phosphorus. The treatment system also succeeds to remove 40-65% of BOD, COD and other impurities present in wastewater.

ACKNOWLEDGMENTS

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Design, Construction and Performance Testing of 1 kW Pelton Turbine for Pico Hydro Power Plant

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Abstract: The generation of electricity from water is the most effective and the cheapest way to get energy. The pico scale renewable energy is to bring electricity to remote villages that are not near transmission lines. In hydropower plant water turbine is one of the most important parts to generate electricity. The main purpose of this project is to develop the living standard in rural areas and to reduce the use of non-renewable energy. In this research paper, 1 kW pelton turbine design is based on head and flow rate of Department of Research and Innovation. The available head and flow rate are 10 m and 0.02 m^3/sec. The pelton turbine is a tangential flow impulse turbine. There are two main components of this turbine namely, runner and nozzle. A 1 kW medium head hydro concrete turbine is constructed in Taung Da Gone Industrial 3 at Yangon. The pelton turbine project was tested at Department of Research and Innovation.

Keywords: Renewable Energy, Pico Hydro, Pelton turbine, Runner, nozzle

1. INTRODUCTION

Hydropower systems use the energy in flowing water to produce electricity or mechanical energy. In hydro power plants the kinetic energy of falling water is captured to generate electricity. A turbine and a generator convert the energy from the water to mechanical and then electrical energy. There are several classifications related to the dimension of hydropower plants. An actually useful classification is the following.

(i)   Large hydropower   > 100 MW
(ii) Medium hydropower   15 -100 MW
(iii) Small hydropower   1 MW-10 MW
(iv) Mini hydropower   100 kW-1MW
(v)   Micro hydropower   5-100 kW
(vi) Pico hydropower   up to 5kW

Typical hydroelectric plant is shown in Figure 1. Micro hydro systems are particularly suitable as remote area power supplies for rural and isolated communities, as an economic alternative to extending the electricity grid. The systems provide a source of cheap, independent and continuous power, without degrading the environment.
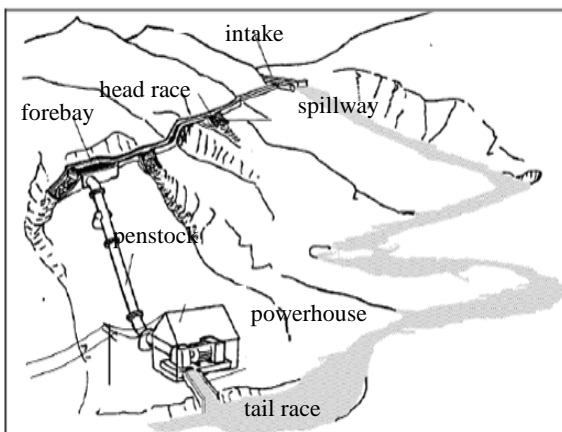
Figure 1. Typical Hydroelectric plant

2. TYPES OF HYDRAULIC TURBINE

A turbine is a rotary mechanical device that extracts energy from a fluid flow and converts it into useful work. The work produced by a turbine can be used for generating electrical power when combined with a generator. Turbines are also divided by their principle of operation and can be divided into impulse and reactions turbine. The impulse turbine generally uses the velocity of the water to move the runner and discharges to atmospheric pressure. Reaction turbines are pressure type turbines that rely on the pressure difference between both sides of the turbine blades. For micro-hydro applications, Pelton turbines can be used effectively at head down to about 20m. Draft tubes are not required for impulse turbine since the runner must be located above the maximum tail water to permit operation at atmospheric pressure. Impulse turbines are usually cheaper than reaction turbines because there is no need for a special pressure casing or for relatively high heads.

2.1. Pelton Turbine

A Pelton turbine is a hydraulic turbine where the runner is rotating from the impulse of water jet on its buckets. The Pelton wheel is a special type of axial flow impulse turbine and is used for very high heads. In large scale hydro installation, Pelton turbines are normally only considered for heads above 100m. A Pelton turbine consists of a set of specially shaped buckets mounted on a periphery of a circular disc as shown in Figure 2. The runner consists of a circular disc with a number of buckets evenly spaced round its periphery. The rim of the runner disc are fastened bucket-shaped blade which are for a better discharge of the water divided by a ridge or splitter into two symmetrical parts. The water jet is deflected by the bucket and thus transfers its energy to the wheel. In order to achieve the most efficient position of the bucket for the impinging water, a notch is made into the edge of the bucket at the largest radius. This notch is carefully sharpened to ensure, as far as possible, a loss-free entrance of the bucket into the

jet. The pelton bucket is designed to deflect the jet through 165 degrees which is the maximum angle possible without the return jet interfering with the following bucket for the oncoming jet.
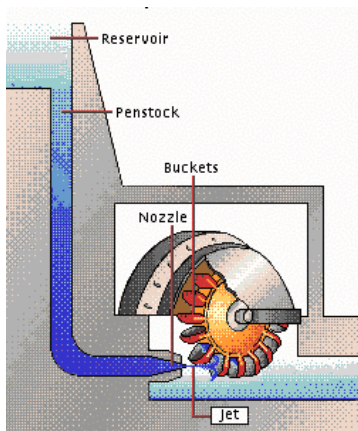

Figure 2. Components of Pelton turbine

3. SELECTION OF TURBINE

The choice of water turbine depends on the site conditions, notably on the head of water H and the flow rate Q. Figure 3 indicates which turbine is most suitable for any particular combination of head and flow rate. Reaction turbines suited for low head and high flow rate. Pelton turbine is suitable for high head and low flow rate.
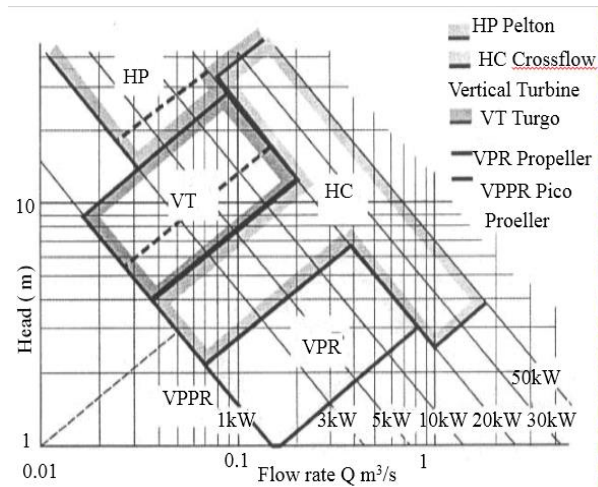
Figure 3. Choice of Turbine in Terms of Head and Flow rate

4. DESIGN CONSIDERATION OF PELTON TURBINE

The effective head and power available of this Pelton turbine is considered at 10 m and 1 kW. The power developed by a turbine is given by the following equation.

$$P = \eta_o \, \rho \, g \, Q \, H \qquad (1)$$

The required shaft power is 1.47 kW.

The specific speed can be calculated from the following equation.

$$N_s = \frac{N\sqrt{P}}{(H)^{5/4}} \qquad (2)$$

The speed of the turbine can be calculated from the following equation.

$$N = 147.7 \sqrt{H} \qquad (3)$$

4.1. Design aspects of Pelton Turbine

The following points should be considered while designing a Pelton turbine. The absolute velocity of water at inlet can be obtained by using this equation

$$V_1 = C_v \sqrt{2gH} \qquad (4)$$

The tangential velocity of wheel is determined the following factors.

$$k_u = \frac{u}{V_1} \qquad (5)$$

The mean diameter or the pitch circle diameter of the Pelton turbine is known from this equation.

$$u = \frac{\pi D N}{60} \qquad (6)$$

Number of nozzle is single jet. Thus the jet diameter of 1000 kW Pelton turbine can be calculated from this equation.

$$d_0 = 0.545 \sqrt{\frac{Q}{z_0 \sqrt{H}}} \qquad (7)$$

Jet ratio is a size parameter for the turbine. This value can be obtained by using this equation.

$$m = \frac{D}{d} \qquad (8)$$

The number of buckets required for the efficient operation of the Pelton turbine is calculated from this equation.

$$z = 15 + 0.5m \qquad (9)$$

Table 1, which presents a variation of number of buckets with jet ratio.

Table 1. Approximate Number of Buckets for a Pelton turbine

Jet ratio	6	8	10	15	20	25
No: of bucket	17-21	18-22	19-24	22-27	24-30	26-33

The blade pitch $p_1 p_2$ on the pitch circle can be obtained by using this equation.

$$p_1 p_2 = \frac{2\pi R}{z} \qquad (10)$$

The relative velocity with the direction of motion of the vane at outlet is 15° Velocity triangle from Figure 4.

$\phi = 15°$
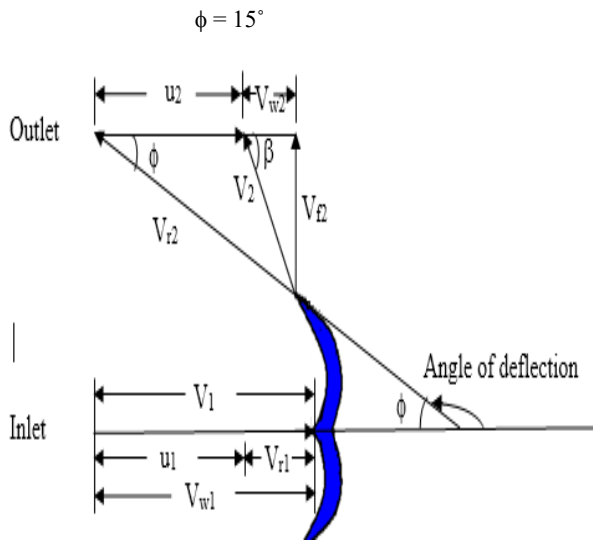
Figure 4. Inlet and outlet velocity diagram of pelton Turbine

(i) Relative velocity of water at inlet

$$V_{r1} = V_1 - u_1 \qquad (11)$$

(ii) Whirl velocity of water at inlet and outlet

$$V_{w1} = V_1$$

$$V_{w2} = V_{r2} \cos\phi - u_2 \qquad (12)$$

(iii)Flow velocity of water at outlet

$$\sin\phi = \frac{V_{f2}}{V_{r2}} \qquad (13)$$

(iv) Angle at exit runner

$$\tan\beta = \frac{V_{f2}}{V_{w2}} \qquad (14)$$

The force exerted by the jet of water to the direction of motion is given as

Jet force on the runner $F = \rho a V_1 (V_{w1}+V_{w2}) \qquad (15)$

4.2 Bucket weight

Jet force on the bucket can be obtained by using this equation

$$P_0 = \rho a V_1 \frac{(V_1 - u)^2}{V_1}(1 - \cos\alpha) \qquad (16)$$

The centrifugal force on the bucket can be calculated.

$$C.F = F - P_0 \qquad (17)$$

Weight of the bucket is

$$C.F = \frac{Gu^2}{gR} \qquad (18)$$

4.3. Bucket Design

In a Pelton turbine design, two parameters are important.
 (i) the ratio of the bucket width to the jet diameter and
 (ii) the ratio of the wheel diameter to the jet diameter
 If the bucket width is too small in relation to jet diameter, the fluid is not smoothly deflected by the buckets and in consequence, much energy is dissipated in turbulence and the efficiency drops considerably.

The main dimensions of the Pelton wheel bucket are shown in Table 2.

Table 2. Dimension of Bucket with Respect to Jet Diameter

Item	Minimum Value	Maximum Value
Bucket length, L	$2.28\,d_o$	$3.3\,d_o$
Bucket width, B	$2.8\,d_o$	$4\,d_o$
Notch depth, S	$0.44\,d_o$	$0.625\,d_o$
Notch width, M	$1.12\,d_o$	$1.6\,d_o$
Bucket depth, E	$0.8\,d_o$	$1.2\,d_o$
Bucket height, A	$1.75\,d_o$	$2.5\,d_o$

The dimension of Pelton turbine bucket is shown in Figure 5.

Figure 5 Dimension of Pelton Turbine Bucket

4.5 Result data of Pelton turbine Bucket

Table 3. Bucket Dimensions

Item	Minimum Value	Maximum Value
Bucket length, L	52.4mm	75.9mm
Bucket width, B	64.4mm	92mm
Notch depth, S	10.12mm	14.375mm
Notch width, M	25.76mm	36.8mm
Bucket depth, E	18.4mm	27.6mm
Bucket height, A	40.15mm	57.5mm

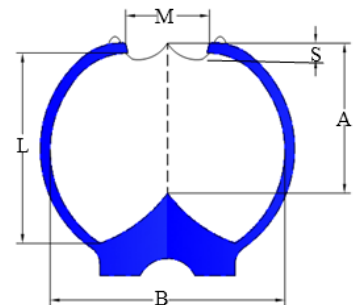## 5. CONSTRUCTION PROCEDURES OF RUNNER

Production process of pelton turbine runner are design and drawing, pattern making, casting and assembling. Mechanical drawing can be drawn by using design data. The next step is patter making for casting. Figure 6 show that pattern is made by CNC milling machine.
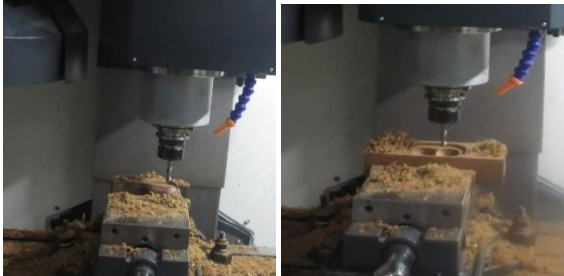
Figure 6. Pattern making

After pattern making, the next step is mould making. The proper mould for this pattern is clay mould as shown in Figure 7.
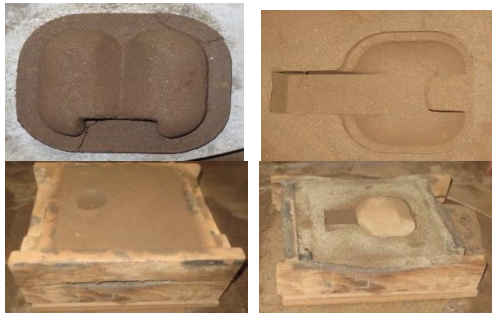
Figure 7. Mould making

. And then, casting for pelton turbine bucket is chosen by available local aluminum. Figure 8 shows the casting process and Figure 9 shows the pelton turbine bucket.

Figure 8. Casting   Figure 9. Bucket

Final step is assembly of runner as shown in Figure 10 and assembly of Pelton turbine as shown in Figure 11. To construct the turbine runner, these materials are required. They are resin, colouring, pigment, talc powder, fiber mat and hardener.

Figure 10. Runner

Figure 11. Assembly of Pelton Turbine

6.PERORMANCE TESTING OF PELTON TURBINE

Before being tested the turbine and generator assembly must be set firstly.

The effective head H is measured by the pressure gauge. Discharge is measured with the volume of the low head tank and how long it takes to fill the water The speed of turbine is measured by using tachometer. The speed of the turbine is 500 rpm. And then the load is gradually increased and result are records.

During the test, the speed was found to decrease depending on the increasing load. . The turbine is started at no load condition. At that time, the speed of turbine was 500 rpm. And then the load is gradually increased and results are recorded.

The generator output can easily be measured by using various load. The turbine is tested at five different loads on head and flow rate are constant.

The water passed through nozzle and is guided to the runner. For that turbine permanent magnet type generator is used with belt drive which speed increase three times. During the test, the voltage of the turbine drop when the load is increased.

Table 4. Test Result Table

No	Head (m)	Speed (rpm)	Volt (V)	Load (watt)	Quantity	Power (watt)
1	10	600	270	100	1	100
2	10	550	230	100	2	300
3	10	500	200	100	2	500
4	10	450	150	100	1	600
5	10	450	130	100	1	700
			Total Power			700 watt

Figure 12. Performance Testing of Pelton turbine

7. CONCLUSIONS

This turbine can be used for household in remote areas to produce 1 kW power for 1 household are easily and inexpensively. This turbine can be used to demonstrate for hydropower training at DRI. The required head is 10m to generate 1kW output power. The flow rate of this turbine is 0.02 m^3/sec and the pitch circle diameter is 0.248m. Number of poles of generator is 4 pole and the speed of turbine is 500rpm. The diameter of jet is 23mm and jet ratio is 10. The performance testing is made at DRI which is located in Yankin Township. This test result are the correct design of the runner. The turbine can be manufactured by any simple workshop. It can also be quickly and easily removed temporarily during flooding of other adverse condition.

The micro and pico hydro power plant are easily established at low cost. So, the micro and pico hydro power generation is the best method for rural electrification.

8. ACKNOWLEDGEMENTS

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Preparation of Hydrogen Dry Cell

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Abstract: The objective of this research is to prepare an electrolyser, hydrogen dry cell to reduce green- house gas effect and air pollution. This research presents the results obtained from the experiments concerning electrolyser producing efficiency. These test emphasized the possibility of reducing fuel consumptions and pollutants from exhaust gases offered by the gaseous fuel.

Keywords: pollution; hydrogen; electrolyser; fuel; HHO

1. INTRODUCTION

Pollution is the most dangerous case in the world. Pollution is caused because of the factories and transportations. The combustion of carbon releases the harmful gas such as carbon monoxide, carbon dioxide etc. Almost all of the uses of fossil fuel in factories and transportation is for combustion. There has another problem for fossil fuels.. That is why, we need to find renewable energy for the world. Nowadays, there has plenty of renewable energy such as solar energy, wind turbine energy, biomass, biogas, hydrogen, etc. Among them, the hydrogen dry cell preparation is one of the most hydrogen technology for renewable energy hydrogen fuel cell is an electrolyser that is completely enclosed base on electrolysis of split water into oxygen and hydrogen. The resulting gas is called 'hydroxy' gas, as it is a mixture of hydrogen and oxygen. In today's power savvy world, dry cell is one of many types of electrochemical cells available for consumer use, but it was a great innovation when it was invented.

2. MATERIAL AND METHOD

2.1 Material

The materials for the construction of hydrogen dry cell are stainless steel plates, gaskets, PVC end plates, PVC pipe, bolt and nuts.

2.2 Sample of Electrolyser Construction
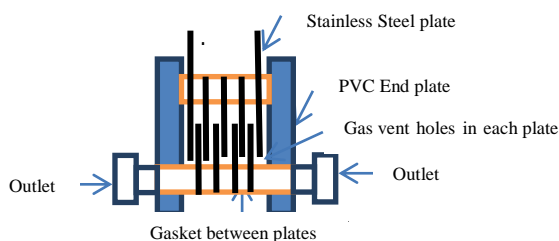
Figure 2.1 Series-Cell Electrolyser Cross-Section

2.3 Method

The thirteen electrolyser plates (Figure 2.2a) are about 0.5 mm thick 127 mm x 127 mm stainless steel (SS) (304 grade). A 6 mm gas vent hole is drilled in each plate. The electrolyte level is always about 25 mm below the gas vent hole. There is

3 mm diameter liquid level equalization holes drilled in the bottom corner of each plate (not shown) in such a way that adjacent plates have holes in opposite corners. Staggering and using small holes minimizes any efficiency loss due to current leakage between cells, but makes electrolyte refilling and level equalization significantly easier. The two end plates have a small SS piece welded for electrical contact.

Fourteen spacers (Figure 2.2b) were cut out of 3 mm thick soft gasket sheet with a knife. The wall thickness is 3 mm. The gasket sheet is originally designed for door material for large room-size refrigerators. The small square gasket blocks were meant to keep proper distance between SS plate centers, but they turned out to be unnecessary and were not used.

The end plates (Figure 2.2c) were cut out of 13 mm thick PVC plate. The size of the plates was 203 mm x 203 mm. Sixteen 3 mm holes were drilled for stainless steel through-bolts. A 1/2" pipe thread was tapped in 6 mm gas vent hole. A valve and gas hose connector was epoxy glued to the 1/2" tapped hole in both plates. Other thread sealants may not be compatible with the electrolyte so it is best to use epoxy or teflon tape. The valve was lined up with gas vent hole in SS plates. When the electrolyser stack is tightened up the PVC end plates tend to bend and bulge. Some form of metallic bracing should be used to prevent bending or the end plates made out of thick stainless steel plate.
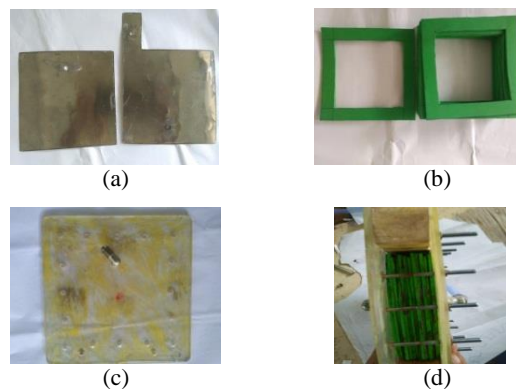
Figure 2.2 (a) Stainless Steel Electrolyser Plates (13 total)
(b) Soft Gasket Spacers Rings (14 total)
(c) PVC End Plate with Gas Valve Attached
(d) Assembled Stack

The finished electrolyser is shown in Figure 2.1d. The two PVC end plates are clamped together with 76 mm long stainless steel bolts and nuts. This softened the gaskets and allowed the stack to be tightened up even further to provide an excellent seal.

3. RESULT AND DISCUSSION
3.1 Hydroge Dry Cell Electrolyser Test
The finished electrolyser equipped was joined with the battery and filter (bubbler) is shown in Figure 3.1a. The bubbler is absolutely essential to prevent backfires from blowing up the electrolyser. The electrolyser may be filled with slightly acidic water (use vinegar) to neutralize any residual NaOH or KOH vapors in the output gas.

This test work done on stainless steel dry cell as shown below:

(a)   (b)

Figure 3.1 (a) Finished Electrolyser with Bubbler
(b) Hydrogen Dry Cell

The hydrogen dry cell of actual flow rates were measured at various ammeter readings. The Ammeter readings and the actual flow rates are tabulated below:

Table 3.1 The Ammeter readings and the actual flow rates for hydrogen dry cell

Test	Amp	Q_{act} (ml/min)
1	10	130
2	15	220
3	20	300
4	25	433
5	30	586
6	35	670
7	40	886
8	45	1040
9	50	1230

3.2 Sample of Calculations
The calculation for the efficiency is as follows:

For theoretical maximum production of hydrogen hydrogen oxygen (HHO) gas for hydrogen dry cell,

The temperature in Kelvin's is 35+273 = 308 K

Q_{theo} = 0.627*308/273 LPH/A*15A*7 = 74.275 Liters/hour.

For actual gas production of HHO gas for hydrogen dry cell,

Q_{act} = 220*60/1000 = 13.2 Liters/hour.

Production efficiency for hydrogen dry cell: The efficiency is calculated by comparing the actual production to the theoretical maximum production.

η production = Q_{act}/Q_{theo} = 13.2/74.28 = 0.1778 = 17.78 %

3.3 Hydrogen Dry Cell Results
The efficiency of the hydrogen dry cell were calculated and shown in Table 3.2.

Table 3.2 Hydrogen Dry Cell Results

Test	Amp	Q_{act} (L/h)	Q_{theo} (L/h)	η
1	15	7.8	49.52	15.75
2	20	13.2	74.28	17.70
3	25	18	99.034	18.18
4	30	25.98	123.792	20.99
5	35	35.16	148.55	23.67
6	40	40.2	173.31	23.195
7	45	53.16	198.07	26.84
8	50	62.4	222.83	28.00
9	55	73.8	247.58	29.8

The production efficiency for hydrogen dry cell is shown in Figure 3.2.
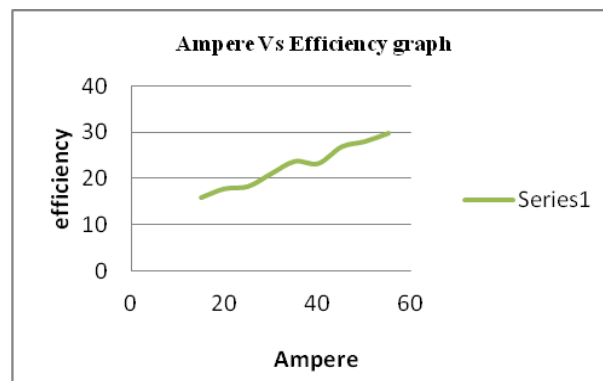
Figure 3.2 Production Efficiency for Hydrogen Dry Cell

4. CONCLUSION
We need to find an easy affordable way to reduce the fuel consumption, green- house gases effect and air pollution. On the dry cell test, the electrolyser production efficiency is not too high because most of the energy is transferred to heat due to the electrical resistance and the large size of the electrolyser and the loss happened due to the circulation of the electrolyte to generate hydrogen hydrogen oxygen (HHO) gas.

5. RECOMMENDATIONS

Recommendations for further research works are outlined as follow.

- Experiment with rapid study in change the number of stainless steel electrolyser plates.

- Experimental words on hydrogen dry cell preparation with efficiency need to be studied.

6. ACKNOWLEDGEMENTS

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Network Analysis Using Drone Based GIS Map for Emergency Services in Incident Location at Meiktila Region, Myanmar

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Abstract: Network Analysis aims at finding solutions to routing problems related to rate of flow, and network connectivity. It helps in identifying optimum locations for services to be provided. The special analysis of transportation network is performed for Meiktila region. Data based GIS Maps are produced with Drone aerial survey method. This method provided geo-location accuracy (x-y-z) and ground sampling distance (GSD) more accuracy and high resolution than Satellite map. Total Road length and total area is calculated using the Arc Map software, using these data and road density is calculated Network Dataset is created in Arc Catalog which provides the number of Transport lines and number of junctions. It is used to calculate the Network Connectivity Indices. The purpose system is intended to verify the incident location in short time, to find the nearest emergency services and calculate the optimal route to go to the incident site. The purpose work also considers the traffic congestion based on A* algorithm.

Keywords: Shortest Routing Problem, A* algorithm, Drone System, Public facilities, Technology Innovation, GIS

1. INTRODUCTION

The Transportation System is a critical component of urban infrastructure growth of that region. It also displays region's economic condition as well as planner dedication for their region. An efficient route planning and accessibility facilitate sustainable development. This part of the paper introduces the reader to current status of the transportation system in Meiktila region.

GIS has been used in several areas such as retail site analysis, transportation [3], emergency services, fire petrol station mapping, and health care planning for the measurement of physical accessibility etc. The shortest path problem is a problem of finding the shortest path or route from a starting point to a final destination.[3] We use graphs which are mathematical abstract objects to represent the shortest path problems. They contain sets of vertices and edges. Edges connect pairs of vertices. It is possible to walk by moving from one vertex to other vertices along the edges of a graph. The graph can be a directed graph or an undirected graph. [4]The lengths of edges are often called weights. Weights are normally used for calculating the shortest path from one point to another point. We can also use a graph to represent a map where vertices represent fire stations and edges represent routes that connect the fire stations. are more efficient. Dijkstra's algorithm determines the shortest route between the source node and any other nodes and A* algorithm is much like Dijkstra's but it relies on heuristics strategy. The remainder of the present paper is organized by sections 2 , 3 , 4 , 5 and 6 . Section 2 describes the basic representative network structure. Section 3 describes the applied

A*algorithm method and related function for this method. Section 4 briefly explains about road density and study area. Section 5 discusses about how to do experiment the proposed system on Meiktila regions. Finally, section 6 presents conclusion of the proposed system.

2. PROBLEM STATEMENT

A graph is a pair, $G = (V,E)$,of sets satisfying $E \in [V]$; thus, the elements of E are 2-element subsets of V. The elements of V are the nodes of the graph G, the elements of E are its links (or edges). In this case, E is a subset of the cross product $V \times V$ which is denoted by $E \in [V]$. A connected graph is a non-empty graph G with paths from all nodes to all other nodes in the graph. An optimal path from node u to node v is the path with minimum cost, denoted by (u,v). The cost can take many forms including travel time, travel distance, or total toll.

2.1. A* algorithm

Optimum A * algorithm is used to search for the nearest public transportation route. A* algorithm is an algorithm that has been enriched with a heuristic function. The heuristic function is used as an optimization algorithm that makes this algorithm is superior when compare with other algorithm.

A* algorithm is similar to the BFS, as it will visit in depth for the selected node is considered the best. If the node was visited not lead to a solution, it will return to the previous node to destination node find other, more promising. Process back to the previous node will recur if not find the destination node that leads to the solution.

2.2. Heuristic Function

An admissible heuristic is used to estimate the cost of reaching the goal state in an informed search algorithm. In order for a heuristic to be admissible to the search problem, the estimated cost must always be lower than or equal to the actual cost of reaching the goal state. The search algorithm uses the admissible heuristic to find an estimated optimal

path to the goal state from the current node. For example, A* search the evaluation function is

$$f(n) = g(n) + h(n) \qquad (1)$$

where
f(n) = the evaluation function at node n
g(n) = the cost from the start node to the current node
h(n) = heuristic estimated cost from current node to goal

h(n) is calculated using as a heuristic function. h(n) is admissible if h(n) ≤ h*(n). h* (n) is the optimal cost to reach a goal from n.

With a non-admissible heuristic, the A* algorithm can still overlook the optimal solution of search problem due to an over estimation in f (n).

3. SYSETEM DESIGN AND PROPOSED WORK

The system design for optimal route is as shown in Figure 1. In this system, it is needed to enter the emergency location and system uses this location to search nearest fire station by applying Haversin function. After that the optimal route is searched using A* algorithm which is the best search algorithm.

In order to calculate the distance between the emergency place location and rescues station, two geographic coordinates are needed. Both locations have their geolocation coordinates.
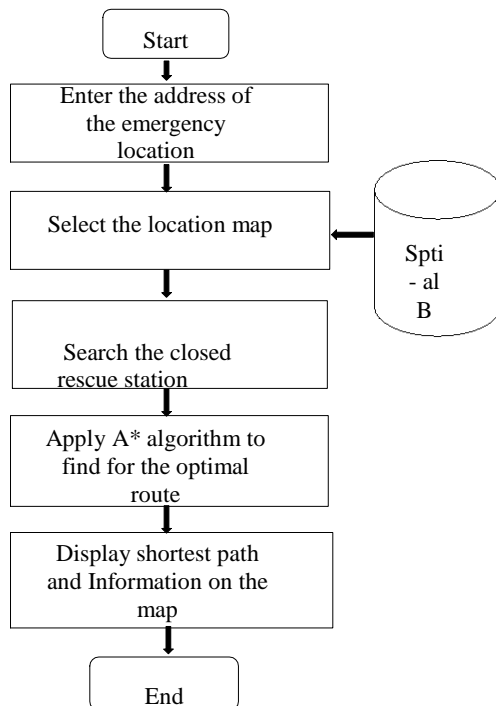

Figure 1: Flow diagram of the proposed system
The earth curvature, Haversine formula is as follow.

$$haversin\left(\frac{d}{r}\right) = haversin(\emptyset_2 - \emptyset_1) + (\emptyset_1)(\emptyset_2)haversin(\varphi_2 - \varphi_1) \qquad (2)$$

where
    d is the distance between two points

r is the radius of the sphere

φ_1, φ_2 are latitude of point 1 and point 2

ψ_1, ψ_2 are longitude of point 1 and point 2

haversin is the haversine function

haversin function works as follows:

$$h(\theta) = sin(\theta/2)^2 = \frac{1 - cos(\theta)}{2} \qquad (3)$$

On the left side of Eqation (2), the argument to the haversine function is in radians. In degrees, haversin (d/R) in the formula would become haversine(180° d/πR).One can then solve for either by simply applying the inverse haversine (if available) or by using the arcsine (inverse sine) function:

$$d = r\ haversin^{-1}(h) = 2r arcsin(\sqrt{h}) \qquad (4)$$
and $d = 2r\ arcsin$

where h is haversine(d/R)

3.1. The Path Finding Algorithm

A* algorithm is the simplest path finding algorithm, event through these days a lot of other algorithms have been developed.

A* algorithm reduces the amount of computational time and power needed to find the optimal path. The algorithm strikes a balance by calculating a path which is close to the optimal path that is computationally manageable. The algorithm breaks the network into nodes (where lines join, start or end) and the paths between such nodes are represented by lines. In addition, each line has an associated cost representing the cost (length) of each line in order to reach a node. There are many possible paths between the origin and destination, but the path calculated depends on which nodes are visited and in which order. The ideas is that, each time the node, to be visited next, is selected after a sequence of comparative iterations, during which, each candidate-node is compare with others in terms of cost.

The following is an application of the algorithm on a case of 6 nodes connected by directed lines with assigned costs, explains the number of steps between each of the iteration of the algorithm(Figure : 2). The shortest path from node 1 to the other nodes can be found by tracking back predecessors (bold arrows), while the path's cost is noted above the node.
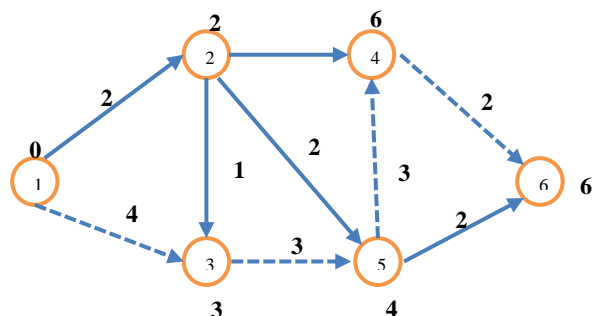

Figure 2 : An A* algorithm

3.2. Network Analysis

A network is a system of interconnected elements such as lines (edge) and connecting junction (better or points(which represent ever possible route from one junction to another junction from a feature class network dataset is create but it is restricted that form only one feature class can create only one Network Dataset. The ArcGIS network analyst extension allows to build a network dataset and perform analysis on a network dataset. GIS database building and data linking with non-spatial data were done after digitization and geo referencing. Using the database, network analysis was carried out to find out.

- Shortest path between any two destination
- Closest facility and
- Service area

3.3. Drone Based GIS Method

Drone aerial survey method is used widely all over the world. There are three process of this method included with ground survey, drone aerial survey and data processing. In ground survey section , the surveyors need to use the Real-time Kinematic (RTK) ,leveling equipment. Depend on the ground condition, the surveyors have to measure five points of the RTK GPS per one square kilometer for (X-Y geo-location accuracy).For Z geo-location accuracy, it is necessary to measure level points .After that, the target board must be placed to find clearly when the drone flying survey. Drone will capture the photo included with target board according to preflight plan automatically. After flying, the data will be collected and processing with data processing software to get output such as Orhomoasic, Digital Surface Model (DSM),Digital Terrain Model(DTM),Digital Elevation Model and Contours. This Method ,had been used in Meiktila Region to get high geo-location accuracy about 8cm (X-Y-Z) and ground sampling distance 10 cm/pixel.

3.4 The Structural Analysis of Road Network

A digital transport network with complex mathematical model is the basis for transport analysis and urban growth. The network is a representation of major routes within the routes within the area. This digital network is the input to the transport analysis and to identify urban growth, which contains vertex (Node / point / junction) and Edge (Arc / Line /Link). This is use identify the start and end point of any routes.

Every vertex(v) and Edge (E) is a record that is used to represent the characteristic of a road. In traditional GIS a Toposheet was the only medium which was available to visualize the Transport Network. Generally Transportation planning consistes of a various individual modules. These modules can be road type (width of road), pavement, traffic management and accident related data. As per the population with that area the transport network structure should be redesigned. This may be to increase road width, make one way and identify the parking area. The use of GIS technology in development of Urbanization, the transportation information system and management can provide a very strong solution. Information Desiging, Construction, Maintainance and Management of the transport system. Meiktila region transportation network consist the major road (primary road), main road (secondary road) and other road.

3.5. Emergency Service Stations' Information

The emergency services stations' information can be obtained by visiting the desired fire stations and taking the important information about the provided facilities and the specialty of fire stations etc.,. The attribute data like name of fire stations, contact number specialty etc., are need to be stored in the separate database. The data required is in the form of spatial and attribute data. Spatial data required is road network and the fire stations. Attributes taken for Fire Station such as Name, Contact number are collected by surveying of each emergency services station.

In this paper, the emergency stations information (latitude, longitude position of fire stations and hospital) for Meiktila downtown regions stored in spatial database as shown in Table 1.

Table 1: Some Emergency Services Location in Spatial – Database

| No	Longitude	Latitude	Rescue Stations sName
1	95º20´52.39"E	20º52´09.04" N	North of PyiTharyar Quarter Fire Station
2	95º18´53.44"E	20º51´06.25" N	East of Market Fire Station
3	95º23´16.56"E	20º52´20.55" N	AungZeyar Fire Station
4	95º20´52.24"E	20º52´34.92" N	AungSan Fire Station
5	95º21´15.06"E	20º52´38.15" N	Thee Gyone highway road Fire Station
6	95º20´50.65"E	20º52´53.10" N	Big Marke Fire Station
7	95º20´41.02"E	20º52´40.8"N	Meiktila Industrial Zone Fire Station
8	95º51´34.16"E	20º53´11.25"N	Zaw Hospital
9	95º50´44.66"E	20º52´33.13"N	Shin Than Chin Hospital
10	95º51´37.96"E	20º52´42.87"N	Soe Moe Hospital
11	95º51´37.96"E	20º52´41.71"N	ThuKaHtila Hospital
12	95º50´36.57"E	20º52´32.68"N	Public Hospital
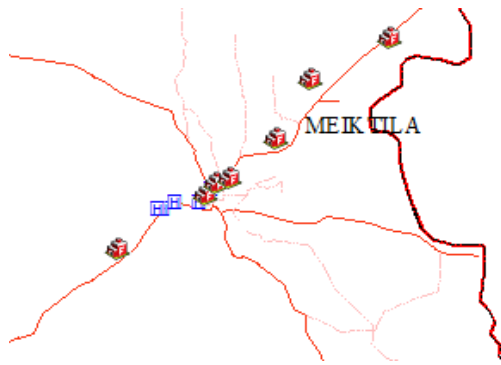
Figure 3 : Location of Emergency Services

3.6. Network Dataset

Spatial data from Geographic Information System database is used more and more in transportation due to the convenient structure they provide for entering, viewing and manipulating spatially-oriented data. Application of GIS in the traffic safety area has been limited mostly to visual representation of accident locations.

Network dataset is built mainly from two GIS data layers. They are major road networks which are captured as line features, and junctions and important landmarks that as point features. These two are playing prominent role in keeping network alive at all time. Road network is properly connected in GIS with junctions and important landmarks. Necessary attribute data such as name of roads, length of roads, name of the junctions and important landmarks have been given as input in network dataset. Exclusive module available in ArcGIS software is used to build network data from the above line and point features. While building the network dataset, proper connections between road and junctions are checked and any violations are flagged for rectification of errors. After achieving error free data, the dataset is used to find out shortest path , closest facility and service area within the Meiktila limits.

Table 2: Some Emergency Services Location in Spatial – Database

Sr.No	Major Roads
1	Meiktila -Myingyan
2	Meiktila-Thazi
3	Meiktila -Yangon
4	Meiktila -Kyaukpadaung
5	Meiktila -Mandalay

3.7. Shortest Path Analysis

A shortest path problem is finding a path with minimum travel distance from one or more origins to one or more destinations through a connected network. It is an important issue because of its wide range of applications in transportation networks. In some applications, it is also beneficial to know the second or third shortest paths

between two nodes. For instance, in order to improve the effectiveness of travel information provision, there is a need to provide some rational alternative paths for road users driving in real road network. Having built the network GIS data layers, shortest path between any two destinations can be efficiently found. The shortest path takes into account road distance and not radial distance. It is also possible to find out a route which has the least travel time. In the case of travel time based shortest path, the impedance is to be given based on the road condition, vehicle type and other influencing parameters. In the present case, the best way to get from one location to another was worked out based on road distance where the destinations can be chosen by the user interactively. It has also been built in such a way that due to any reason if the road is closed, the user can introduce a barrier interactively. In such situations, the best possible alternative route is identified and made available to the user along with the distance he has to travel.

3.8. Closest Facility Analysis

Closest Facility workers on two different entities such as facility and incident. Incident is considered as place of interest from where system searches facilities within the user –specified road distance. For one incident, there may be many facilities from which, closest facility may be picked up for the purpose. At the same time, it continues to search for the next closest facility and this process is repeated and all the facilities are identified within the user-specified maximum road distance.

3.9. Service Area Analysis

One can find service area coverage around any particular location. If a hospital has certain norm of servicing only up to 1.00 km road distance the service area around selected hospital can be demarcated at all directions through road network model. The same concept can also be applied to find out the service area of schools, fair price shops, police stations, etc. based on selected norms.

3.10. The solution of Traffic Jams

To solve the problem of overloading of traffics, detour can be used. If so, it can solve traffic jam in junctions which already have been in the critical stage. The following are the suggestion for the easing of traffic jams.
(a) To eliminate and remove tea shops, venders, slow vehicles parking, temporary market, all buildings within the limit of road boundaries.
(b) To extend the limit of road boundaries for free movement, traffic pavement nets should be constructed on both sides of the road.
(c) If over bridges with a single lane can be constructed, the problem of traffic jam at junction can be solved.

4. ROAD DENSITY AND POPULATION DENSITY OF THE STUDY AREA

The road density of the study area is calculated by relating the total density to the total area. This is represented mathematically as

$$RD = L / A \qquad (5)$$

where (L=total length a network, A=total area of network), 169.9 km/ 27.52 km= 6.1736 km. This analysis showed that the road density was high comparing it with the standard as highlighted in Meiktila region. This can be

seemed in the road network of the study area where by the roads were even by distributed.

4.1. Connectivity

Connectivity is based on topologic distance. The relative degree of connection between all vertices is defined as the connectivity of the network. There are three types of measure that can be used. They are the Beta Index, the Alpha index and the Gamma index.

The Beta index- The simplest description of increasing complexity is to relate the number of edges and vertices in a ratio of E/V. This Beta index differentiates simple topological structures (with low beta values)from complicates structures (with high beta values.) The lower portion of the Beta scale (from zero to one) differentiates between different types of branching networks and disconnected network. Values of one and above differentiate as circuit network.

The Beta index = E/V, where E=Edges, V= Vertices
There are 279 edges and 280 vertices in this network.
Therefore the Beta index for road of wards network of Meiktila region is, E/V=279/280=0.996=99.6%

In Meiktila region , there are total 10 wards and these are named an ward 1 to 10. Among these ward 5 has a largest area. Ward 10 is second largest area, ward 9 is third largest area. Ward 7 is four largest area and Ward 1,2,3,4,6 and 8is medium and small areas. Ward 5 are very high connectivity and ward 8 has low connectivity. So ward 8 is identified as an un-development. The study reversals that the Meiktila City is medium transportation facilities.

4.2. Population Density

Meiktila, situated in Mandalay Division has 475.34 m^2. It is about 30 miles from East to West and 22 miles South to North. The city is about 11.08 m^2. There are four main roads. Not only citizens but other travelers use these roads everydays. Then, it is a simply crossing point between Yangon, Mandalay, Bagan and Inle lake. Moreover, it is also a significant trade centre. So, there are so much traffic especially at junctions.

Need to find the shortest path for emergency case at downtown. Need to choose type of road to pass through depending on cases. E.g Fire case or accidence

Because of population density and road density, the user needs to use this system to overcome the bad result. If there are schools, universities, banks, markets on the main road, traffic jam occurs more and need to use other paths to reach destination. Traffic lights on the roads are also needed to be considered especially the length of time. The equation of population density is:

Population Density=
Total number of people / Total land area (km^2)
$$(6)$$

Table 3: Population density of 3 Quarter in Meiktila region

SrNo	Quarter	Population	Width (km^2)	Population Density
1	MyoMa	3305	0.259	331
2	Yadamaanaung	6603	0.337	508
3	Aungzayyar	10979	0.984	289

5. EXPERIMENTAL RESULTS

In this paper, the proposed system is tested on Meiktila downtown regions, road network. After the data collection it is important to locate in the map. After Fire Station location is marked it is important to draw a road map. The Figure(3) shows the Toposheet of the Meiktila region.

Figure (4) shows Quarters that may take place incident. When creating a network routing system, specific spatial data were collected for the accurate completion of the network. For a complete road network, where all the roads within the network are connected, network routing is significant because it allows connection throughout the system. The program successfully finds the optimal path from the start point AungZayar fire station to the destination point YanMyoAung quarter in Figure (6). The solution has been tested with simulated road conditions and has performed exceptionally well, i.e. the A* Search algorithm worked every time and was able to find the optimal path.

A menu driven interface has been designed and implemented to simulate the road blockage condition which can be due to heavy traffic, road construction, or bad weather condition. The calculated optimal path is then displayed on the console, giving step by step directions from the start to the destination. Only if all roads are active, the program successfully finds the optimal and shortest path.
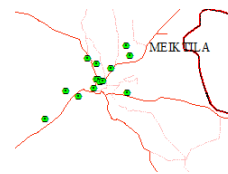
Figure 4 : Location of 14 Quarters
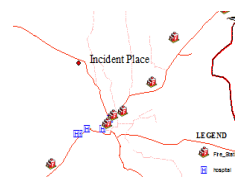
Figure 5 : The closest emergency services

Figure 6 : Optimal route between Incident Location and AungZayar Fire Station

6. CONCLUSION

The developed system is tested on the Road Map of Meiktila region. The propose system will provide the location of incident place or the user location, the appropriate service location based on the user requested and the closest emergency service within the shortest time. It also provides to compute the optimal ways to go to the incident place with the

route direction information. Thus the user should use this system to find the shortest path in many emergency cases. Because it is very useful and can give advantages for the user.

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Algorithmic Design Analysis of Voice Recognition System

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Abstract: This paper is on Algorithmic design analysis of voice recognition systems, it involves the design and analysis of voice recognition system using algorithms. A modular design approach was adopted, the designed submodules are incorporated together to form a complete unit, the designed system is general and can be adopted to fit into various voice recognition systems. It can also be programmed using any suitable programming language like C++, PHP etc. The algorithm accepts voice as input analyzes the voice of interest, retrieves the parameters from the voice, performs a database input matching/search for a user who has similar records and then displays an output of the result.

Keywords: Voice Recognition, Speech Recognition, Algorithm, Machine, Artificial Intelligence

1. INTRODUCTION

An Algorithm is an unambiguous specification of how to solve a problem or class of problems. Algorithms can perform calculation, data processing, automated reasoning, and other tasks. Starting from an initial state and initial input which could be empty, the instructions describe a computation that, when executed, proceeds through a finite number of well-defined successive states, eventually producing an "output" and terminating at a final ending state. Design analysis is the study of the characteristics (form, structure, construction, features, etc.) of the design of a system using a systematic process to find out certain other characteristics of the thing, in simple terms it is using the known to find the unknown, it focuses on studying and reviewing the details of the design in order to answer questions about the system such as will it break, when will it break, how long will it last etc. Voice Recognition is the identification of a person from the characteristics of the voice.The term voice recognition can refer to speaker recognition, recognizing the speaker can simplify the task of translating speech in systems that have been trained on specific voices or it can be used to authenticate or verify the identity of a speaker as part of a security process. Speaker recognition has a history dating back some four decades and uses the acoustic features of speech that have been found to differ between individuals. A system which performs voice recognition is referred to as a Voice Recognition System.

This paper will cover the step by step process involved in the identification of a person from the characteristics(frequency, Amplitude) of the voice in a voice recognition system.

2. METHODOLOGY

The modules involved in the design are the input module which is the voice or text, the database search or input matching module, parameter retrieval module,voice analysis module based on frequency and amplitude parameters and the display of the result.

Based on the above the system is split into workable smaller units:

- Input Module
- Analysis Module
- Parameters Modules
- Database Module
- Output Module
- General Modules

All the functionalities of the modules will be setup as submodules that are either public or private to other modules so as to enable interconnectivity among modules or resource sharing.

Input Module:

The system's input will be a microphone placed at a position where the user can speak directly to it and the microphone has to be able to cancel noise in case the user is in a noisy area and a keypad for a user to type meaning the system input might need to be text or voice and either the keypad or microphone is used depending on the needed input.

This module simply accepts input from either the microphone or the keypad and should be able to access all public sub modules from other modules. Its submodules are

- Mic Input sub module
- Text Input sub module

the Mic Input Sub module which can retrieve the voice from the mic and it is a private submodule meaning only the Input module has access to it while the Text input sub module accepts text input from the user and it is also a private sub module.

Analysis Module:

This module handles filtering and recording of voice and the various methods of analysis of the recorded voice which are sampling and frequency domain analysis hence its sub modules are

- Filter Sub module
- Record Sub module
- Sampling analysis Sub module
- Frequency domain analysis Sub module

The ecological importance of human voice processing for listeners is obvious and it is important to note that voice does not only convey speech, it also provides information on user's gender, identity, and emotional state [1]. The Recording submodule has to be a public sub module because it will be used at some point by the Input Module while the Filter, Sampling and Frequency domain analysis sub modules are private sub modules.

The Filter sub module is for removing of unwanted sounds/noise in the voice data gotten form the Input module and neuroimaging studies confirm that there is neural circuitry just for vocal sounds [2]. Also, the system should automatically separate voice sound and non-voice sounds which would be useful for further filtering of noise from the voice and speech-recognition or keyword-spotting could ignore the sections of a noisy part that are dominated by non-vocal sounds, these are all the features that the Filter sub module has.
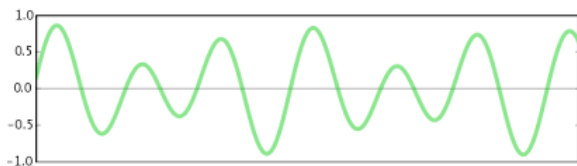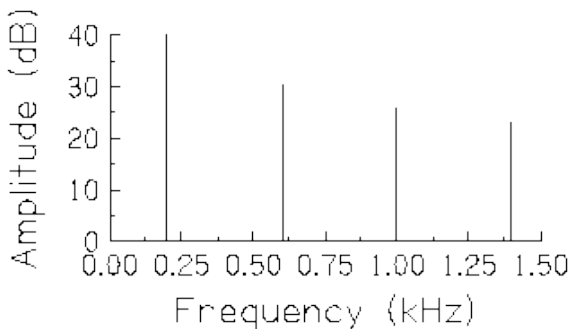

Fig 1. Example of a Sampled Voice signal

Fig 2. Example of a Frequency Domain signal

Parameters Module:

This module handles the retrieving of needed parameters from the Analysis Module and each parameter to be retrieved is done by a dedicated submodule and they are

Frequency Sub module

Amplitude Sub module

Note that all the submodules here are private because they are only needed by the Parameters Module and based on their name it is easy to know which parameter the sub module will be retrieving, the Frequency sub module will be retrieving the frequency of the Voice from the Frequency Domain data, Amplitude sub module will be retrieving the amplitude from the Sampled data.

Database Module:

This modules handles database related processes and such as saving of data and retrieving of data and the system will need just 2 sub modules:

Save Submodule

Get Sub module

The Save submodules INSERT's records in to the database while the Get submodule performs the GET FROM command on the database for getting similar records which is useful for our search and it is important to note that both submodules are private.

Table - users

Fields - id,full_name,sex,created_at,updated_at

Table - users_voice

Fields - id, user_id, voice_file, tone, frequency, amplitude, created_at, updated_at

Above is a visual illustration of the tables and fields of our basic database, the full_name and sex of the users table is entered during enrollment/training while created_at and updated_at are date-time stamps of when the record was inserted and last updated respectively. The user_id of the users_voice table is the key that relates the user record to his voice record on the users_voice table meaning the system has to use a relational database with each table having a primary key and id field being an integer and auto-increment. The voice_file is a blob field that holds the audio voice record, the frequency field holds the frequency of the voice, the amplitude field holds the amplitude of the voice and created_at and updated_at are also date-time stamps of when the record was inserted and last updated respectively.

Output Module

This module handles communicating results back to the user and it has 2 sub modules namely

Buzzer Sub module

Display Sub module

Where the buzzer sub module makes a buzzing sound to get the users attention the Display sub module displays the response/result on a screen and they are both private sub modules.

General Module

This modules is for handling operations that could not be part of the Above Modules and they are equally as important as the above modules as they perform operations that makes things easy for the user, the sub modules are

Sentence generator

Error handling

The sentence generator submodule handles generating of sentences used during the training process for the user to read out and it is limited to 3 sentences while the error handling sub module is to handle any unforeseen errors in the system by generating a system log that can be accessed by the administrator and it gives details of the what was going on during which the error occurred such as

The current module

The current sub module

The time

The process eg training/identification

The details of the last input or output data it has

with the above details it give the administrator all the information to aid in the debugging and helps make the identification of the error faster. All submodules in the General module are public hence they are available to all modules.

With this breakdown of the entire process into modules and submodules the system can be easily understood and the functionality of the system gets clearer. It is important to note that there are some functionalities which more than one module might need at a particular time and an example is voice recording hence the Recording submodule is be accessed by more than one module which is the reason why it is a public sub module and for clarity sake all actions of each module are setup as sub modules.

It is important to note also that the system needs to have a way of collecting users data and keeping it so users can be identified later on, this means the system will require "training" also called "enrollment" by each user where an individual speaker reads text or isolated vocabulary into the system. The system analyzes the reader's specific voice and uses it to fine-tune the recognition of that user's speech, which will result in increased accuracy. This is compulsory because the system being developed is a "speaker dependent" system and during the process the reader has to read the text in 3 different tones namely

Low Tone

Mid Tone

High Tone

This is to ensure the system can detect a user when the user speaks on a different tone because a users mood can affect the tone of the users voice and with this the system can easily detect the user even when his tone changes either due to mood swings, emotional troubles or vocal problems.Tone will vary from user to user depending on how a user reacts to an emotion, some studies show an increase in intensity,increase in fundamental frequency [3].

The flow of the system during training or enrollment is different form the flow during user identification due to the fact that during a training the database module should run the Save submodule while during identification it should run a Get Sub module, below are the system flow for the various process.
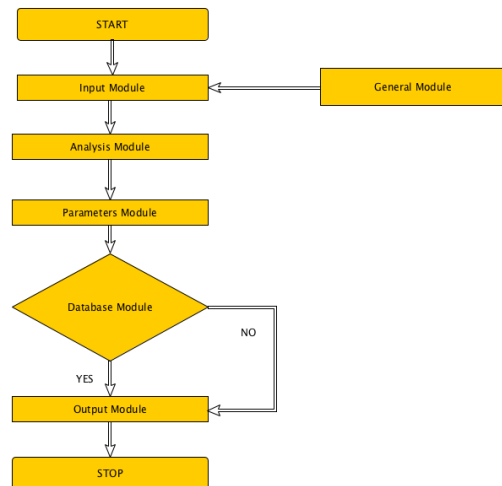

Fig 3. Flow chart representation of each module

IDENTIFICATION PROCESS:

The Input Module

The system receives the voice of the user from the microphone using the MIC Input sub module and sends the voice data to the Analysis Module

Analysis Module

The system at this point filters and analyzes the voice from the input module in order to make certain parameters or variables available and the voice is first recorded as an audio file using the RECORD sub module and then passed to our submodules to analyse the audio in different categories so the system can extract required variables in the next stage.

Parameters Module

The system retrieve the important parameters from the analysis conducted in the Analysis module and the following variables will be retrieved

Frequency

Amplitude

The frequency of the human voice ranges from 85-180 Hz for males and 165 - 255 for females, frequency and pitch are directly connected to the low or high nature of the sound but come from different angles and they are retrieved from the frequency domain analysis while amplitude is gotten from the sampling of the voice.

Database Module

The system at this point takes the audio file and the parameters retrieved from the voice and prepares a search query to the database using the SEARCH Sub Module to find a user whose voice details match the details retrieved from the parameters gotten as a result of the analysis. This database could be any kind from SQL to MS ACCESS and the schema should be structured in such a way that there is a users tables different from the users_voice table where a users can have multiple records on the users_voice table, this allows the system to work better especially due to the fact that a users voice could change because of this mood or emotions can actually affect the loudness of a voice which results in either a high pitch or low pitch.

Output Module

The system returns the result of the search back to the user and the result contains the details of the user whose records match those of the voice which the system just received and if no result is found, the system does something obvious to alert the user that the records did not match any in its database by using the Buzzing sub module or displays the message on the screen using the Display sub module and the user is then given the opportunity to train the system to recognize his/her voice.
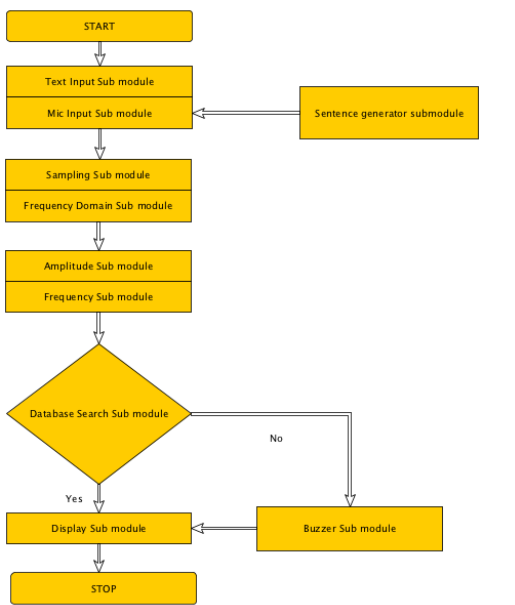

Fig 4. Flow chart representation of the Identification process

TRAINING PROCESS

The system allows users to enroll their voice into the system so that they can be recognized when next they use the system and the training follows the same protocol for finding a users voice however instead of searching for the records it inserts the

records into the database so it makes use of the Save sub module when it gets to the Database module.

The system first ask the user to enter some of his/her details such as

Full Name

and Sex

and these details are collected by the Text sub module of the Input Module

After that some words are displayed from the Sentence generator of the General Module which is a public sub module for the user on the screen and the system prompts the user to speak those words, first in a low tone which is recorded then in a high tone which is recorded and then in a mid/moderate tone which is also recorded, the system

then sends the data to the next stage which is the Analysis Module for filtering of noise and analysis of each voice recorded and they are sampled and moved to the frequency domain using the respective Sub modules after which they are sent to the Parameter module where the needed parameters are retrieved from the result of each analysis using the different submodules also.

The system then sends them to the next section which is the Database module and the records are saved to the database, the users name and sex are saved to the users table which has a unique ID then the parameters and the voice file are saved to the users_voice table, each voice file is a database record of its own with a table field called user_id where the unique id of the user in the users table is saved so there has a relationship between the users and the user's voice table which is the id and then a success message is displayed to the user via the Display Sub module of the Output Module.
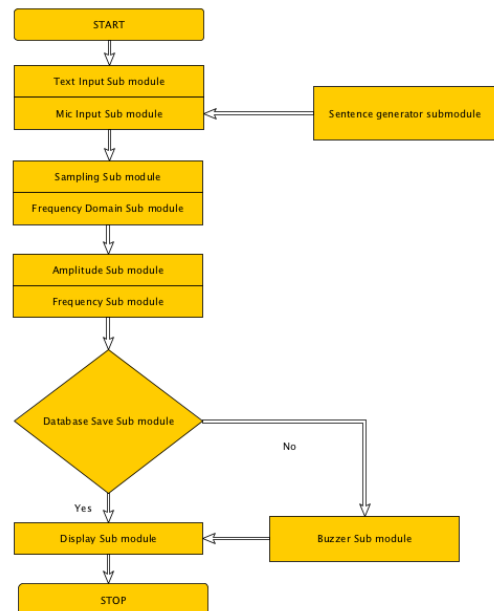

Fig 5. Flow chart representation of the training process

3.   RESULTS

Results

The Algorithm developed will require certain additional hardware for the system to work such as a microphone, keypad, screen and buzzer, it also needs to have a database such as SQL or MS ACCESS etc for data to be stored, that is data storage for the users data. The system's Speed, Performance will be dependant on the RAM and Processor of the main hardware and accuracy will be depend on the flawlessness of our algorithm.

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4.   CONCLUSIONS

This study has developed a voice recognition algorithm and broken down the system into modules and submodules from input to output and error handling for unforeseen circumstances and it is ok to say the system is efficient, robust and uncomplicated for the recognition of its users voice after training.

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Secure Information Hiding System in Image Steganography

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Abstract: Today's real transmission environment, the two ways for securing messages and data are cryptography and steganography. Steganography is used for hiding messages in innocuous media (carriers) such as text, image, audio, video and protocol. Amongst these different carriers, digital images are the most popular because of their frequency on the internet. To be more robust in security, steganography can be combined with cryptographic techniques. In this paper, we propose LSB based image steganography combining with AES (Advanced Encryption Standard) cryptographic encryption algorithm in order to obtain a secure system that could be used in a real data communication environment. The system will be implemented by Java programming language.

Keywords: Cryptography, Advanced Encryption Standard, Hiding Information, Image Carriers, Steganography

1. INTRODUCTION

Since the rise of the Internet one of the most important factors of communication and information technology has been the security of information. It is necessary to protect this information while communicated over insecure channels. Thus, a need exists for developing technology that will help protect the integrity of digital content and secure the intellectual property rights of owners. This has resulted in an explosive growth of the field of information hiding. In addition, the rapid growth of publishing and broadcasting technology also requires an alternative solution in hiding information. To overcome this problem, some invisible information can be embedded in the digital media in such a way that it could not be easily extracted without a specialized technique [1]. One and most widely used for securing data is Steganography. The word steganography is derived from the Greek words "*stegos*" meaning "cover" and "*grafia*" meaning "writing" defining it as "covered writing" [2]. Today, steganography is mostly used on computers with digital data being the carriers and networks being the high speed delivery channels. It is a performance that inserts secret messages into a cover file, so that the existence of the messages is not apparent. Research in information hiding has tremendous increased during the past decade with commercial interests driving the field [3].

For security enhancement, this system can be made by combining with another method for securing data, called Cryptography. Cryptography was created as a technique for securing the secrecy of communication and many different methods have been developed to encrypt and decrypt data in order to keep the message secret.

2. RELATED WORKS

Recently, there is a growing interest in the information security to the problems in the current data communication domain. Steganography is the idea of hiding private or sensitive data or information within something that appears to be nothing out of the ordinary.

The paper [4] pointed out that "some specific image based steganography techniques and show that an observer can indeed distinguish between images carrying a hidden message and images which do not carry a message." And the paper [5] also figures out that "given an image is believed to contain a secret message, identify where the message is hidden. We treat this problem as outlier detection". Moreover, the paper [6] pointed out that "The strength of steganography can be thus amplified by combining it with cryptography".

On the other hand, applying encryption algorithm on the message can enhance the security. And it is an important tool to protect information from attackers. To overcome this problem, the need is to add security mechanism in our system. To improve the performance of this proposed system, steganographic and cryptographic techniques are combined to implement the system.

3. STEGANOGRAPHY

3.1 Different Kinds of Steganography

Almost all digital file formats can be used for steganography, but the formats that are more suitable are those with a high degree of redundancy. Figure 1 shows the categories of steganography.

Hiding information in text is historically the most important method of steganography. Text steganography using digital files is not used very often since text files have a very small amount of redundant data. The large amount of redundant bits presents in the digital representation of an image, so images are the most popular cover objects for steganography.

To hide information in audio files similar techniques are used as for image files. One different technique unique to audio steganography is masking, which exploits the properties of the human ear to hide information unnoticeably. A faint, but audible, sound becomes inaudible in the presence of another louder audible sound [3]. Although nearly equal to images in steganographic potential, the larger size of meaningful audio files makes them less popular to use than images [7].

The protocol steganography refers to the technique of embedding information within messages and network control protocols used in network transmission [8]. In the layers of the OSI network model, there exist covert channels where steganography can be used [9].
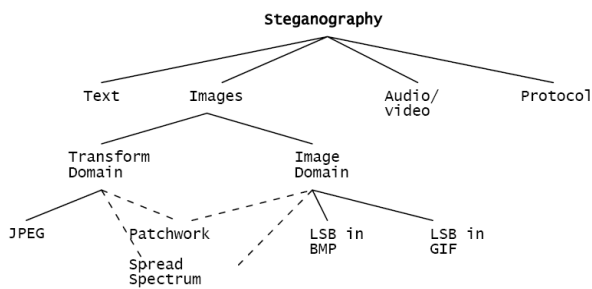

Figure 1 Categories of Steganography

3.2 Image Steganography

Images are the most popular cover objects used for steganography. For the different image file formats, different steganographic algorithms exist. For these different image file formats different steganography algorithm exist.

Image steganography techniques can be divided into two groups: those in the Image Domain and those in the Transform Domain [10]. Image – also known as spatial – domain techniques embed messages in the intensity of the pixels directly, while for transform – also known as frequency – domain, images are first transformed and then the message is embedded in the image [11]. Image domain techniques encompass bit-wise methods that apply bit insertion and noise manipulation and are sometimes characterized as "simple systems". The image formats that are most suitable for image domain steganography are lossless and the techniques are typically dependent on the image format.

Steganography in the transform domain involves the manipulation of the algorithms and image transforms. These methods hide messages in more significant areas of the cover image, making it more robust. Many transform domain methods are independent of the image format and the embedded message may survive conversion between lossy and lossless compression.

3.3 Embedding data into an image

To a computer, an image is an array of numbers that represent light intensities at various points, or pixels. In digital, images are represented with the numerical values of each pixel where the value represents the color and intensity of the pixel. These pixels make up the image's raster data. Digital images are typically stored in either 24-bit or 8-bit per pixel files. 24-bit images are known as true colour images. Obviously, a 24-bit image provides more space for hiding information as compared to 8 bit image [12].

3.4 Least significant bit insertion

The least significant bit insertion method is probably the most well-known image steganography technique. It is a common, simple approach to embed information in a graphical image file. This is the most common method used in this the data to be hidden is inserted into the least significant bits of the pixel information In digital, images are represented with the numerical values of each pixel where the value represents the color and intensity of the pixel. In 24 bit image we can embed 3 bits in each pixel while in 8-bit we can

embed only 1 bit in each pixel. To hide an image in the LSBs of each byte of the 24- bit image, one can store 3 bits in each pixel. A 1024 x 768 image has the potential to hide a total of 2,359,296 bits of information. For e.g., the letter A can be hidden in three pixels. The binary value of A is 10000011.
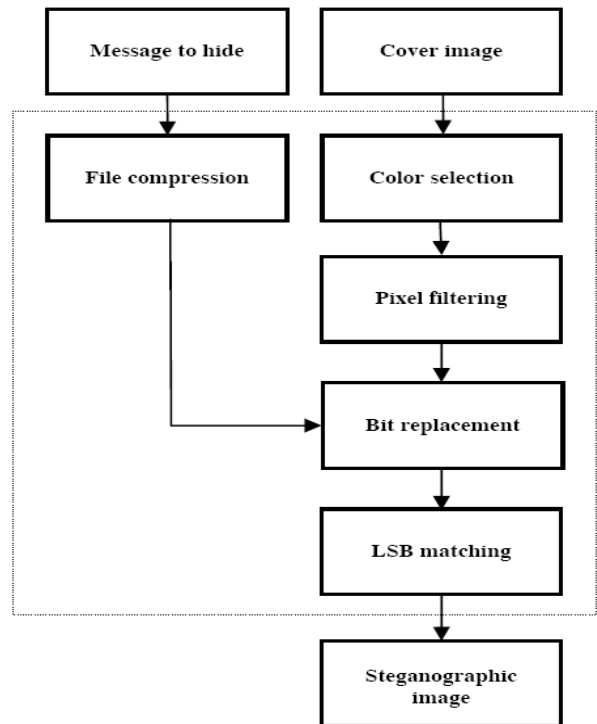

Figure 2 Structure of the algorithm SLSB

The original raster data of 3 pixels may be:

(00100111 11101001 11001000)

(00100111 11001000 11101001)

(11001000 00100111 11101001).

After inserting the binary value for A.

(00100111 11101000 11001000)

(00100110 11001000 11101000)

(11001000 00100111 11101001)

The highlighted bits are the only three actually changed in the 9 bytes of data. One can hide data in the least and second least significant bits and still the human eye would not be able to discern it. In this proposed algorithm we generate random number initialized with a stego-key and its output is combined with the input data, and this is embedded to a cover image. The usage of a stego-key is important, because the security of a protection system should not be based on the secrecy of the algorithm itself, instead of the choice of a secret key.

4. CRYPTOGRAPHY

Cryptography is an important element of any strategy to address message transmission security requirements. Cryptography is the study of methods of sending messages in disguised form so that only the intended recipients can remove the disguise and read the message. It is the practical art of converting messages or data into a different form, such that no-one can read them without having access to the 'key'. The message may be converted using a 'code' (in which case each character or group of characters is substituted by an

alternative one), or a 'cypher' or 'cipher' (in which case the message as a whole is converted, rather than individual characters).Cryptology is the science underlying cryptography. Cryptanalysis is the science of 'breaking' or 'cracking' encryption schemes, i.e. discovering the decryption key. Cryptographic systems are generically classified along three independent dimensions [13]. If both sender and receiver use the same key, the system is referred to as symmetric, single-key, secret-key, or conventional encryption. If the sender and receiver each use a different key, the system is referred to as asymmetric, two keys, or public-key encryption.

4.1 Advanced Encryption Standard (AES) Algorithm

This standard specifies the Rijndael algorithm and it is a symmetric block cipher that can process data blocks of 128 bits, using cipher keys with lengths of 128, 192 and 256 bits. Rihndael was designed to handle additional block sizes and key lengths; however they are not adopted in this standard. Throughout the remainder of this standard, the algorithm specified herein will be referred to as "the AES algorithm." The algorithm may be used with the three different key lengths indicated above, and therefore these different "flavors" may be referred to as "AES-128","AES-192", and "AES-256".

4.2 Algorithm Specification

For the AES algorithm, the length of the input block, the output block and the State is 128 bits. This is represented by $Nb = 4$, which reflects the number of 32-bit words (number of columns) in the State.

For the AES algorithm, the length of the Cipher key, K, is 128, 192 or 256 bits . The key length is represented by $Nk = 4$, 6, or 8, which reflects the number of 32-bit words (number of columns) in the Cipher Key.
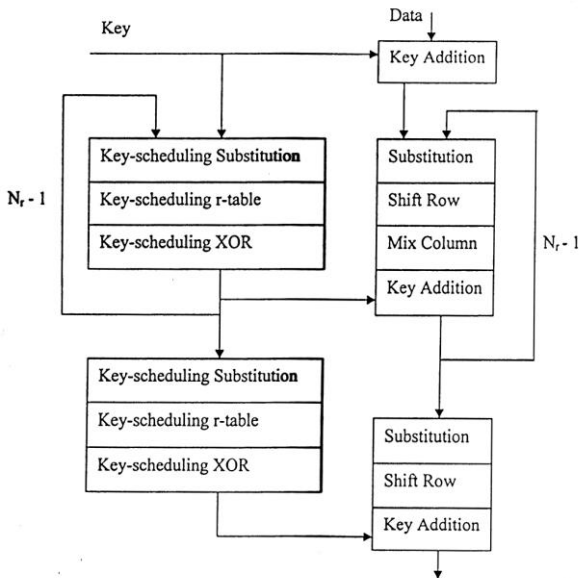

Figure 3 Advanced Encryption Standard

For the AES algorithm, the number of rounds to be performed during the execution of the algorithm is dependent on the key size. The number of rounds is represented by Nr, where $Nr = 10$ when $Nk = 4$, $Nr = 12$ when $Nk = 6$, and $Nr = 14$ when $Nk = 8$.

5. PROPOSED SYSTEM

As shown in Figure 4, two ways of securing method are used in this proposed system: Steganography and Cryptography.
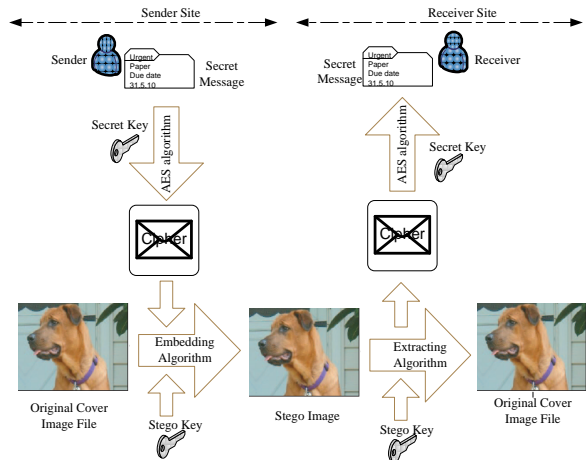

Figure 4 Proposed System Design

In the first step, at the sender site, the plaintext (secret message) is encrypted with the help of Advanced Encryption Standard (AES), popular and easy, algorithm and then the cipher text is produced as in Figure 5. Because it is a symmetric key algorithm, the same Secret Key is applied both for encryption and decryption.
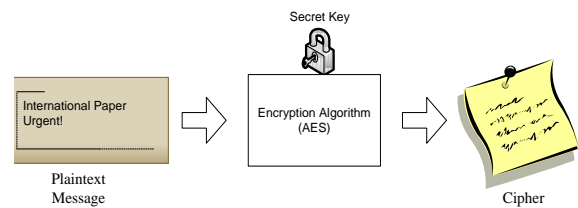
Figure 5 Encrypting the Message

Here we embed the message (Cipher) into the carrier image by using Least Significant Bit (LSB) insertion method. After embedding a secret message into the cover-image, a so-called stego image is obtained. The size of information to be hidden relatively depends on the size of the cover-image. Any image file can hide the message of size of one – eight the size of original cover file, e.g if cover image is 128 bytes then it hide 16 bytes of message without any distortion.

After this process, at the receiver site, the embedded message is extracted from the stego image file and obtained the cipher text again as depicted in Figure 6.

Figure 6 Embedding and Extracting the Message (Cipher)

The resulting cipher text is decrypted by using AES algorithm with the same Key as in encryption. Finally, the receiver obtains the sent message (plaintext) as shown in Figure 7.
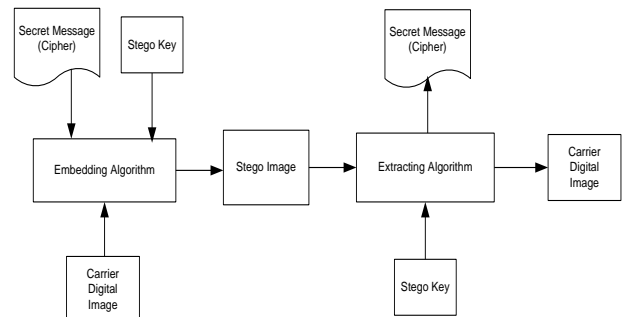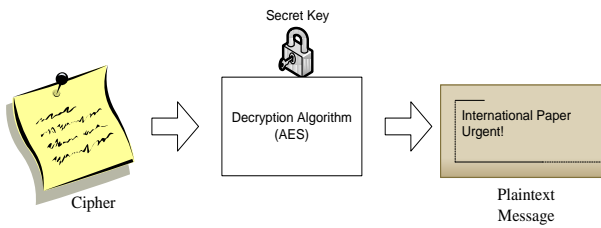

Figure 7 Decrypting the Message

6. PROS AND CONS

Table 1 Steganography Vs Cryptography

Steganography	Cryptography
Unknown message passing	Known message passing
Steganography prevents discovery of the very existence of communication	Encryption prevents an unauthorized party from discovering the contents of a communication
Little known technology	Common technology
Technology still being developed for certain formats	Most of algorithm known by all
Once detected message is known	Strong current algorithms are currently resistant to attack, larger expensive computing power is required for cracking
Steganography does not alter the structure of the secret message	Cryptography alter the structure of the secret message

7. TEST AND RESULT

Firstly, the system is implemented by using StegoJava. Figure 8 shows the encryption process.
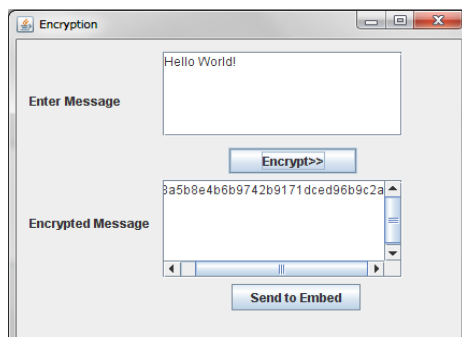

Figure 8 Encrypting the Message with AES Algorithm

The resulting cipher message is fetched to the embedding mode and is embedded the GIF image which is used as a cover image by the help of LSB. Then the resulting stego-image is obtained as shown in Figure 10.
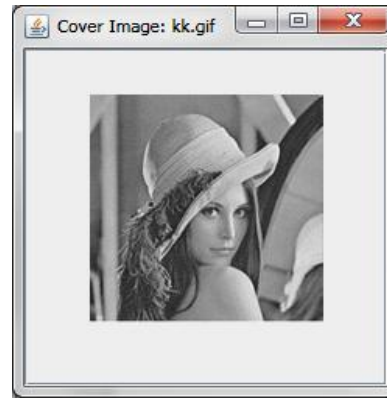
Figure 9 The Cover Image
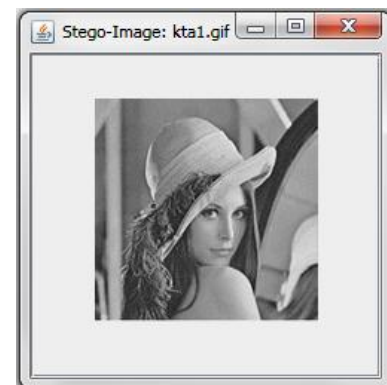
Figure 10 The Stego-image

Finally, the resulting cipher message extracting from the stego-image is decrypted to get the original message as shown in Figure 11.
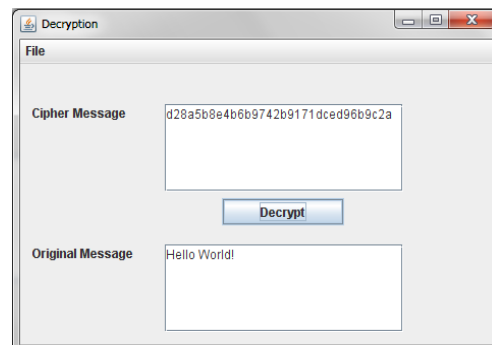
Figure 11 Decrypting the Cipher Message

8. CONCLUSION

Until recently, information hiding techniques received very much less attention from the research community and from industry than cryptography. Steganography has its place in security. It is not intended to replace cryptography but supplement it. In this paper we give an idea to enhance the security of system by combining the two techniques. It can enhance confidentiality of information and provides a means of communicating privately. Here message is first encrypted and then embed in image file with help of steganographic system. There are infinite number of steganography applications for digital image including copyright protection, feature tagging, and secret communication. This paper explores a tiny fraction of the art of steganography. It goes well beyond simply embedding text in an image.

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Making the Appointment at OPD by Using Clustering Algorithm

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Abstract: Life is becoming too busy to get medical check and treatment in person. The main idea is to provide ease and comfort to patients while taking appointment from doctors and it also resolves the problems that the patients has to face while making an appointment. Enhancing patient care management is one of the aims of healthcare industry to improve the healthcare system worldwide. Making Appointment at OPD System is an important component of scheduling and managing appointments. This paper advances with the facilities that eliminate the chaos of traditional appointment service and offers the appointment booking, to view doctors list, to cancel and update appointments with a user form to manage all the sections. It provides advanced functionality the process that easy to access personal hospital services that help organizations to stay connected with their customers, the most importantly patients, the result in significant time and time savings. In this paper, K-Means clustering algorithm is implemented to analyze the OPD system.

Keywords: data mining, clustering, k-means clustering, initial centroid, Euclidean distance

1. INTRODUCTION

Data mining is an active research area and research is ongoing to bring statistical analysis and artificial intelligence (AI) techniques together to address the issues. Data mining tools are then used to uncover useful patterns and relationships from the data capture. Currently, data mining techniques, tools, and researches are being expanded to the various field [1]. Clustering is one among the oldest techniques used in Data mining [2]. Clustering is a standard procedure in multivariate data analysis. It is designed to explore an inherent natural structure of the data objects, where objects in the same cluster are as similar as possible objects in different clusters are as dissimilar as possible. Clustering is unsupervised learning and do not rely on predefined classes. In clustering we measure the dissimilarity between objects by measuring the distance between each pair of objects. These measure include the Euclidean, Manhattan and Minkowski distance [3]. Scheduling appointments is one of the most important administrative responsibilities performed in the medical check. The most important criteria the medical assistant must take into consideration when scheduling appointments are exhibiting good interpersonal skills and reducing the amount of time a patient has to wait to see the physician .People went to a medical office expecting to wait as long as an hour or more. People have little tolerance for waiting in a medical check. Lifestyles have changed and people have busy lives. Many have to take personal time away from work to go to the medical check, and they feel that their time is as valuable as the physician's time. Scheduling appointments correctly and efficiently is crucial to the smooth operation of the medical check. Many factors must be taken into consideration when scheduling appointments. The patient who has made an appointment weeks or even months in advance wants to be seen within 15 to 20 minutes after arriving at the medical check. The physician wants a smooth flow of patients during the time scheduled for seeing patients. Patients who are ill or have accidents want to be able to see their physician on the day of the illness or injury. They prefer to be given a specific time, even if it is later in the day, rather than come into the medical check and wait for an open moment. A patient appointment system or appointment schedule for health care center started long time ago .Management of patients' appointments has earlier works and has developed simplified queuing models and fairly static scheduling conditions. Another attempt was made to calculate the waiting time between patient and doctor using the mathematical queuing models to minimize waiting time .However; traditionally the appointment system has considered that the doctor time is more important than patient time .So an appointment system was designed to minimize the doctor idle time but current designing of an appointment system is based on decisive factors with respect to both the patient and doctor [4]. The patient appointment system has complex structures because it represents the patient appointment time in the healthcare center and controls the patient waiting time based on the type and the period of patient appointment. Moreover, a patient appointment system is meant for: managing doctor's time, reducing patient's waiting time, reducing doctor's idle time, reducing nurse's idle time, and improving the quality of service in the health care.

2. AIMS AND OBJECTIVES

This paper is to provide patients full access to manage their hospital appointments which, facilitates with a service for appointment reservation, updating and canceling management minimizing customer inconvenience and assuring a better healthcare. The appointments system is a means for health care center and hospital that allows for quick booking and managing of patient's appointments while eliminating the possibility of reiteration of the same time slot for different patients. Specific objectives include:

- To understand how to use data mining techniques and methods

- To know the importance of the basics methods

- To establish of a paperless environment

- To advance utilization of medical resources at the medical center

- To increase efficiency of medical care outcome between hospital and customer time saving

3. METHODOLOGY

3.1 Data Mining

Data mining is the process of applying these methods to data with the intention of uncovering hidden patterns. Data mining or data mining technology has been used for many years by many fields such as businesses, scientists and governments. It is used to sift through volumes of data such as airline passenger trip information, population data and marketing data to generate market research reports, although that reporting is sometimes not considered to be data mining [5].

One of the most important tasks in Data mining is to select the correct data mining techniques. Data mining technique has to be chosen based on the type of business and the type of problem. A generalized approach has to be used to improve the accuracy and cost effectiveness of using data mining techniques. There are basically seven main Data Mining techniques. There are a lot of other Data Mining techniques but these seven are considered more frequently used by business people.

- Statistics
- Clustering
- Visualization
- Decision Tree
- Association Rule
- Neural Networks
- Classifications [6]

3.2 Clustering

Clustering is a process in which a group of unlabeled patterns are partitioned into a number of sets so that similar patterns are assigned to the same cluster, and dissimilar patterns are assigned to different clusters. This will help to understand the differences and similarities between the data. There are two goals of clustering algorithms: determining good clusters and doing so efficiently. Clustering has become a widely studied problem in a variety of application domains, such as in data mining and knowledge discovery, statistical data analysis, data classification and compression, medical image processing and bioinformatics [7].

Clustering techniques are classified into supervised and unsupervised methods. The unsupervised clustering method is used to detect the underlying structure in the data set for classification. Supervised clustering method involved with the human interaction. The unsupervised clustering techniques are most popular due to the minimal knowledge about the dataset. Similarity is fundamental to the definition of a cluster, and various clustering techniques use different similarity definitions and techniques. The very famous distance measure may be the Euclidean distance. But, it has taken much time to cluster the data's compare to other distance metrics like Minkowski. In this paper, a new Minkowski distance based K-means clustering algorithm for clustering the data is proposed. In addition, the performance analysis is compared with our proposed algorithm.

3.3 K-Means Clustering Algorithm

K-Means clustering is one of the methods of cluster analysis which partitions or divides the number of observations into k clusters. Every observation belongs to the cluster with the nearest mean. The grouping is done by minimizing the sum of squares of distances between data and the corresponding cluster centroid. The main purpose of K-means clustering is to classify the data [8].

The K-means clustering algorithm is a data mining and machine learning tool used to cluster observations into groups of related observations without any prior knowledge of those relationships. By sampling, the algorithms attempts to show in which category, or cluster, the data belong to, with the number of clusters being defined by the value k [9].

The K-means algorithm is one of the simplest clustering techniques and it is commonly used in medical imaging, biometrics, and related fields [19]. K-means is used in various topics, ranging from market segmentation, computer vision, statistics and astronomy to agriculture. It is also used as a preprocessing step for other algorithms. There are a lot of applications of the K-means clustering like Pattern recognitions, Classification analysis, Artificial intelligent, image processing, machine vision, etc. [8]

K-means clustering intends to partition n objects into k clusters in which each objects belongs to the cluster with the nearest mean. This method produces exactly k different clusters of greatest possible distinction. The best number of clusters k leading to the greatest separation (distance) is not known as a priori and must be computed from the data.

K-means Algorithms

- Clusters the data into k groups where k is predefined.
- Select k points at random as cluster centers.
- Assign objects to their closet cluster center according to the Euclidean distance function.
- Calculate the centroid or mean of all objects in each cluster.
- Repeat steps 2, 3 and 4 until the same points are assigned to each cluster in consecutive rounds [10].

4. EXPERIMENTAL RESULTS

Table 1. Assign Value for Department Timetable (Heart)

Department Timetable(Heart)	Values
09:00 AM-12:00 PM	2
10:00 AM-12:00 PM	2
08:00 AM-10:00 AM	8
02:00 PM-04:00 PM	5
07:00 AM-10:00 AM	7
03:00 PM-05:00 PM	6
08:00 AM-11:00 AM	1
07:00 AM-11:00 AM	4
08:00 AM-12:00 PM	8
09:00 AM-11:00 AM	3

Table 2. Assign Value for Patient Diseases Timetable (Heart)

Patient Diseases Timetable (Heart)	Values
08:00 AM	10
11:00 AM	5
09:00 AM	4
06:00 PM	8
08:30 AM	5
03:00 PM	4
10:00 AM	2
12:00 PM	9
07:00 AM	11
09:00 AM	6

Table 3. Assign Value to Department and Patient Diseases for Dataset

No	Department Timetable (Heart)	Patient Diseases Timetable (Heart)
1	2	10
2	2	5
3	8	4
4	5	8
5	7	5
6	6	4
7	1	2
8	4	9
9	8	11
10	3	6

Euclidean distance equation:

$$d(x, y)(a, b) = \sqrt{(x - a)^2 + (y - b)^2}$$

K = 2, Initial cluster centers are (2, 10), (1, 2).

$$\text{Cluster1 } (2, 10) = \sqrt{(2 - 2)^2 + (10 - 10)^2} = 0$$

$$\text{Cluster2 } (1, 2) = \sqrt{(1 - 2)^2 + (2 - 10)^2} = 9$$

Table 4. Calculation Result of an Iteration 1

Point	(2, 10) Distance Mean 1	(1, 2) Distance Mean 2	Cluster
(2,10)	0	9	1
(2, 5)	5	4	2
(8, 4)	12	9	2
(5, 8)	5	10	1

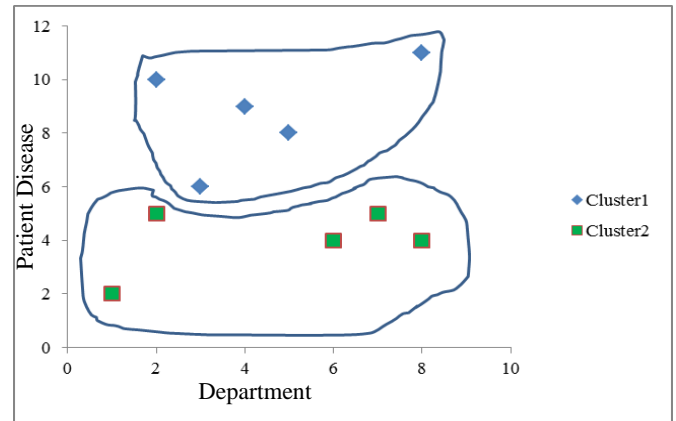| (7, 5)	10	9	2
(6, 4)	10	7	2
(1, 2)	9	0	2
(4, 9)	3	10	1
(8,11)	7	16	1
(3, 6)	5	6	1

Figure 1. Graph of Iteration 1

Cluster1   (2,10),(5,8),(4,9),(8,11),(3,6)

Cluster2   (2,5),(8,4),(7,5),(6,4),(1,2)

For Cluster1,

((2+5+4+8+3)/5, (10+8+9+11+6)/5) = (4.4, 8.8)

$$\text{Cluster1 } (4.4,8.8) = \sqrt{(4.4 - 2)^2 + (8.8 - 10)^2} = 3.6$$

$$\text{Distance from Cluster2 } (4.8,4) = \sqrt{(4.8 - 2)^2 + (4 - 10)^2}$$
$$= 8.8$$

Table 5. Calculation Result of an Iteration 2

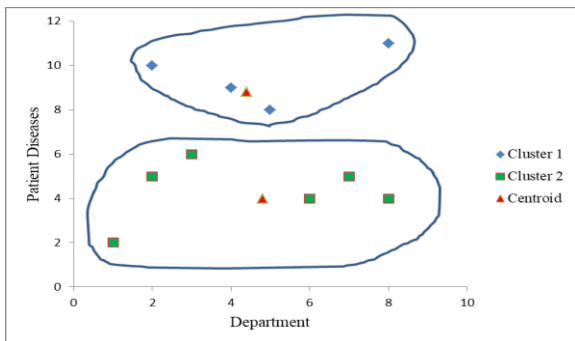| Point	(4.4,8.8) Distance mean1	(4.8,4) (3.1) Distance mean2	Cluster
(2,10)	3.6	8.8	1
(2, 5)	6.2	3.8	2
(8, 4)	8.4	3.2	2
(5, 8)	1.4	4.2	1
(7, 5)	6.4	3.2	2
(6, 4)	6.4	1.2	2
(1, 2)	10.2	5.8	2
(4, 9)	0.6	5.8	1
(8,11)	5.8	10.2	1
(3, 6)	4.2	3.8	2

Figure 2. Graph of Iteration 2

Cluster1   (2, 10),(5,8),(4,9),(8,11)

Cluster2   (2,5),(8,4),(7,5),(6,4),(1,2),(3,6)

For Cluster1,

((2+5+4+8)/4, (10+8+9+11)/4) = (4.75, 9.5)

For Cluster2,

((2+8+7+6+1+3)/6, (5+4+5+4+2+6)/6) = (5.4, 5.2)

Cluster1 (4.75, 9.5) = $\sqrt{\left(4.75 - 2\right)^2 + \left(9.5 - 10\right)^2}$ = 3.25

Distance from Cluster2 (5.4, 5.2)

$$= \sqrt{\left(5.4 - 2\right)^2 + \left(5.2 - 10\right)^2} = 8.2$$

Table 6. Calculation Result of an Iteration 3

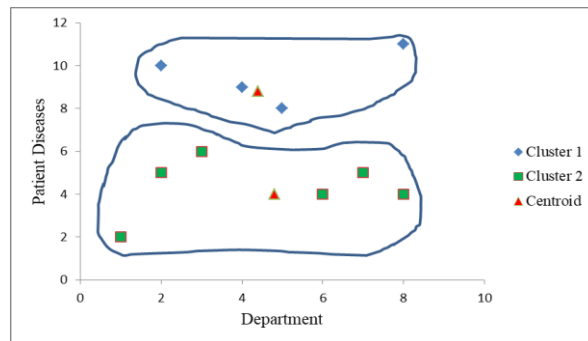| Point	(4.75,9.5) Distance mean1	(5.4,5.2) Distance mean2	Cluster
(2,10)	3.25	8.2	1
(2, 5)	7.25	3.6	2
(8, 4)	8.75	3.8	2
(5, 8)	1.75	3.2	1
(7, 5)	6.75	1.8	2
(6, 4)	6.75	1.8	2
(1, 2)	11.25	7.6	2
(4, 9)	1.25	5.2	1
(8,11)	4.75	8.4	1
(3, 6)	5.25	3.2	2

Figure 3. Graph of Iteration 3 (Final Result)

The calculated mid-points for each group as the initial 2 centroids, apply the K-means algorithm on the input data. After two iteration of the K-means algorithm, stability was achieved. The resulting clusters are showed as above.

5. CONCLUSION

The Scheduling appointment at OPD system using data mining. The whole system activities are divided into two major parts like patients and doctors. Each one has their own role to perform and system respond accordingly. Several patient have been created using department. The scheduling appointment at OPD has been collecting the medical data of patients. The volume of patient medical data at the various hospitals has been increasing. As a result, majority of outpatient do not have full medical record. With this situation, the specialist time is wasted since they have collect this information again and in addition, it becomes very difficult for them to keep track of the patients. This reduces the ability to carry out high quality clinical research in the hospitals and compromises the continuity as well as the quality of healthcare delivery in the hospital.

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Investigation on Wine Fermentation with Three kinds of Honey

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Abstract: In this research, preparation of starter culture, fermentation of four ratios Honey to Water (1:1, 1:2, 1:3, 1:4) with the fixed starter culture, analysis of product wine, the parameters such as alcohol content, total soluble solid (Brix˚), total (titrable) acidity, pH, ester and aldehyde contents were analyzed. For the microbial safety, the samples were pasteurized at 120 ˚C for ten minutes. The sample containing Honey to Water ratio 1:4 (B Honey) (Pan-Hnun.. Honey) (15% Honey) (Alcohol 9.4%) is the optimum preparation for making wine with Honey.

Keywords: wine; honey; preparation; parameter; microbial safety

I. INTRODUCTION

An ancient use for honey was in medicine as a dressing for wounds and inflammations. Today, medicinal uses of honey are largely confined to folk medicine. Honey has different types of color which depend on the source of nectar. Since Myanmar is a tropical country, Honey is found abundantly. It is the substance that is derived from the tree of the nectar which the bees suck it. Honey is the most complex that contain many biological active compounds. Honey, as explained elsewhere , is readily assimilated, giving athletes a quick source of energy and enabling them to recuperate rapidly from severe exertion with less evidence of fatigue. There are various kinds of honey. Commercial preparations of honey for medicinal and cosmetic used are available in Myanmar.

In nearly all areas of the world, some type of alcoholic beverage native to its region is prepared and consumed. In Africa, fermented alcoholic beverage are consumed in different occasions such as marriage, naming, and rain making ceremonies(Zvauya et al., 1997),at festivals and social gatherings, at burial ceremonies and settling disputes (Steinkraus, 1983). They are also used as medicines for fever and other aliments by adding banks or stems of certain plants (Okafor, 1972). For these reason, these are consumed around the world.

Indigenous fermented alcoholic beverages from different parts of the world are described by Steinkraus (1983) and some of the indigenous African fermented alcoholic beverages include Egyptian bouza, Tanzanian Wanzuki, gon go, tembo- mnazi and gara, Nigerian palm- wines, Kenyan muratinga and uragua, South African kaffir beer.

Fermented beverages produced from cereals are usually referred to as beer while those produced from fruits are classified as wine (Pederson, 1979). Fermentation of a variety of foods or blends of fruit, cereals, milk sap, honey molasses and other foods are also wines that are not crystal clear products. Instead, they are cloudy, effervescent containing residues of substrates and fermenting yeast and other microorganisms (Steinkraus, 1983).

Alcohol in traditional beverages serves as source of calories valuable to the calorie-deficient villager. The primitive beverages provide not only calories but also B vitamin due to residues of the substrate, the fermenting yeasts and other microorganisms. (Steinkraus, 1983).

This study tends to decide the optimum ratio of Honey (*Apis mellifera)* to water, to analyze the wine products and to know the presence of medicinal useful compounds in honey.

The objectives of this study are:

(1) To determine the composition of honey used in the research.

(2) To know how to make honey wine in lab scale.

(3) To search the optimum conditions of honey wine-making based on the ways either yeast starter or only natural present in honey.

(4) To report, if possible, honey wine with statistical point of view.

II.   MATERIAL AND METHODS

2.1 Materials

2.1.1.   Raw Materials

Honey, yeast, and boiled water were used as raw materials for this research work. Honey is a very versatile tool with which to make wine. Honey is purchased from "Ministry of finishing & livestock, Department of beeking" which is situated southern part of Mandalay Division. "Levuer instance" instant yeast (France) is used for fermentation. They are purchased from local market.

2.1.2Glass wares

Glass wares used for this research are sterilized before using .Sterilization is carried out by autoclaving at 121 ˚C for 30 minutes under 15 psi pressures. After that, they were washed and dried in a hot air oven.

2.1.3.   Chemicals

Chemicals and media used for this work are from "British Drug House (BDH) Chemical Ltd, Poole, England," "Australia Medical Diagonostics (AMD) Co.Ltd" and analytical grade chemicals available from local markets.

2.2.   Methods

2.2.1.   Analytical Methods for Determination of Composition of Honey (*Apis mellifera*)

Before it was used for fermentation process, Honey was sent to Analysis Department of Ministry of Science and Technology to determine the composition of Honey.

The samples were analyzed to know the composition of Honey.

2.2.2.   Procedure for making wine with Honey
2.2.2.1.   Preparation of Starter Culture

Firstly, the amounts of water were boiled and let it cool down to room temperature and then add the yeast and citric acid. And stir thoroughly and then incubate for 3 hrs or 4 hrs. After that the liquid yeast starter is poured into all 12 samples.

2.2.2.2.   Fermentation of Wine with Honey

For this purpose, Honey was mixed the water. In this case, to determine the optimum ratio of Honey to Water , four different ratios of Honey to Water (1:1,1:2,1:3,1:4) were used and the total amount was fixed at 600 ml . So, each of the required amounts of Honey was weighed. The level of starter culture (200 ml) was used to mix with these four ratios. Then, when this starter levels was mixed into four ratios of Honey to Water, 12 samples was obtained. Then, these were fermented for one month and half. Then, they were filtered and transferred into different containers and racked. During racking, total soluble solid (ºBrix) was recorded weekly. When it was constant, the alcohol content, pH, total (titrable) acidity, ester, and aldehyde contents were determined. Then, the samples were stored and aged.

2.2.3.   Chemical Analysis of Wine
2.2.3.1. Alcohol Content Determination

Alcohol content was determined by distillation.

2.2.3.2. Total   Soluble   Solid   Content Determination

This content was determined by refractometer.

2.2.3.3. Determination of pH

The pH of the samples was determined by pH meter

2.2.4.   Methods For Microbial Safety
2.2.4.1.   Pasteurization

The bottles of all wine samples were placed in an oven. The thermometer is used to know the temperature. The temperature is gradually high and when the temperature in the bottle was reached at 120 ºC, they were kept for 10 minutes at this temperature.

2.2.4.2.   Gram Staining Method

The method described by Collin (1964) was employed in Gram's stain reaction of the isolated bacteria. After a bacterial smear had been prepared on grease-free slide, it was subjected to gram staining first by staining with ammonium oxalate crystal violet for 1 minute. Next, it is was washed with water, 95 % ethanol was used as decolorizing agent. It was added drop wise for 30 seconds to remove uncontainable stains. Then, it was counterstained with staff run for 1 minute. Finally, the stained bacterial smear washed with water, dried with blotting paper and observed under a microscope using an oil immersion lens.

2.2.4.2.   Plate Count Method

In plate count method, 1 ml of sample was diluted in all test tubes having 9 ml of sterile normal saline. 20 μl from diluted test tube were inoculated by dropping on nutrient agar medium. After absorbing the culture suspension inside the medium, the inverted plates were incubated at 37 ℃ overnight. The formula for calculating dilution of bacterial count was described as follows.

$$X = m \times d/v$$

Where,   X   = number of bacterial per 1 ml of sample

m = number of colonies count

d = number of dilution used in series

v = volume of sample

III.   RESULT AND DISCUSSION

RESULTS

Honey was used as a "Health Care Product in the fermentation process of wine-making. Before it was used, it was analyzed in Analysis Department of Ministry of Science and Technology. The result of the composition of Honey was shown in Table .

The 12 samples with each of the fixed level of starter culture combined with 4 ratios of Honey to Water (1:1,1:2,1:3,1:4) were prepared and fermented for one month and half . Photographic appearance of the 12 samples preparation was shown in plate .   After fermentation, wine products obtained from fermentation process were analyzed. The parameters measured were alcohol content (%), total soluble solid (°Brix) , pH ,total (titrable) acidity, ester and aldehyde content . The results of 12 samples were shown in Appendix .

The graphical presentations of alcohol content (%) and total soluble solid (°Brix) of four ratios of Honey to Water for the three types of Honey were shown in figure respectively.

The graphical presentation of pH, and total (titrable) acidity of four ratios of Honey to Water for three types of Honey were shown in fig. respectively.

Table (1) Analytical Composition of the Determination of Honey

Composition	Honey A	Honey B	Honey C
Moisture (%)	19.87	19.13	19.47
Ash (%)	0.45	0.34	0.47
Glucose (%)	30.2	33.6	33.2
Sucorose (%)	9.78	1.14	9.97
Fructose (%)	33.9	38.2	30.5
Chloride (%)	0.02	0.025	0.03
Nitrogen (%)	N.D	N.D	N.D
Protein (%)	N.D	N.D	N.D
Acid(Total Acid)(mg Na OH/g of sample	2.5	8.9	3.7

Table (2). Analytical Determination of Composition of Mineral Contents in Honey

Mneral	Honey A	Honey B	Honey C
Silica (Si) (%)	N.D	N.D	N.D
Iron (Fe) (%)	N.D	N.D	N.D
Manganese (Mn) (%)	N.D	N.D	N.D
Phosphorus (P)(%)	0.005	0.015	N.D
Magnesium (Mg) (%)	0.008	0.003	0.004
Copper (Cu) (%)	0.001	0.0005	0.0015
Sulphur(S) (%)	N.D	N.D	N.D

Plate1. "The Sources of Honey" Used in the Research

Plate2. Preparation of Wine with Honey
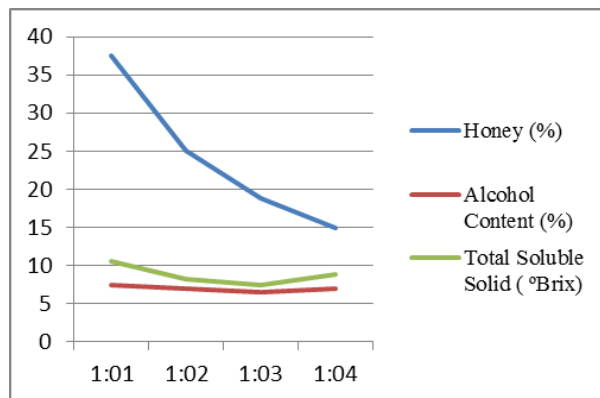
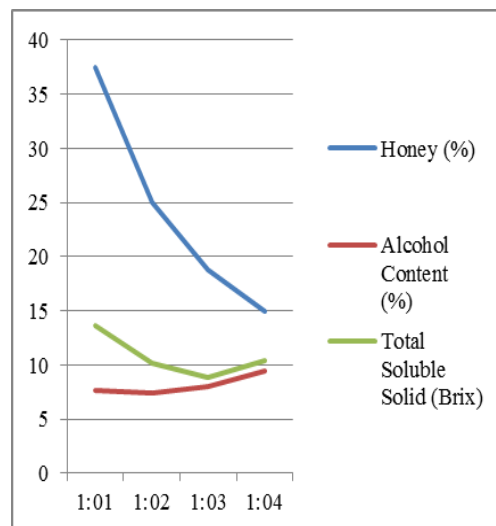Figure 1. Alcohol content and total soluble solid (˚Brix) for four ratios of Honey to Water for Honey A(Zee)

Figure 2. Alcohol content and total soluble soli (˚Brix) for four ratios of Honey to Water for Honey B (Pan-hnun)
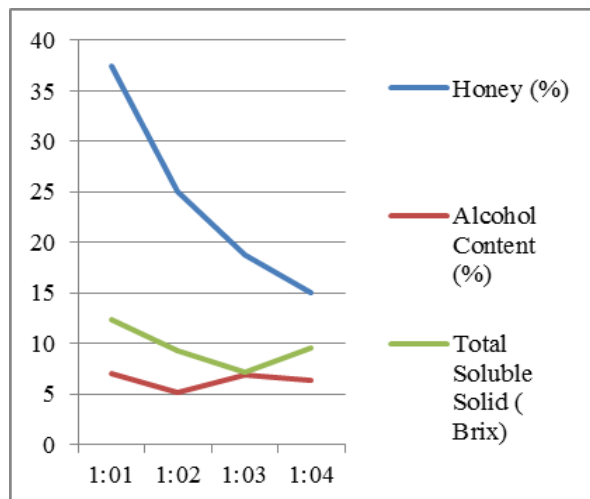
Figure 3. Alcohol content and total soluble solid (˚Brix) for four ratios of Honey to Water for Honey C(Mixture)
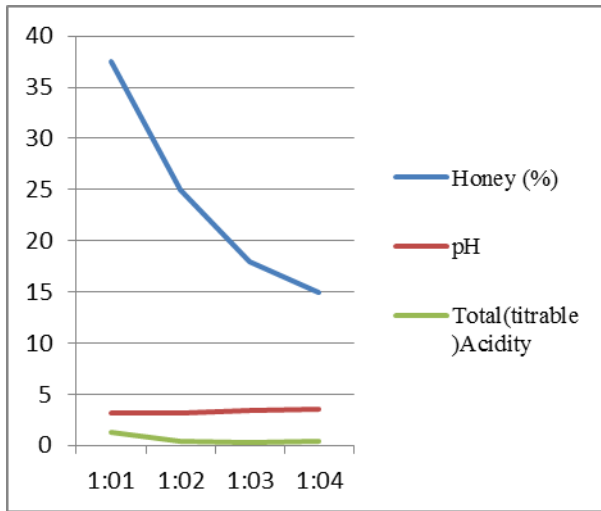

Figure 4. pH and total (titrable) acidity of four ratios of Honey to Water for Honey A(Zee)
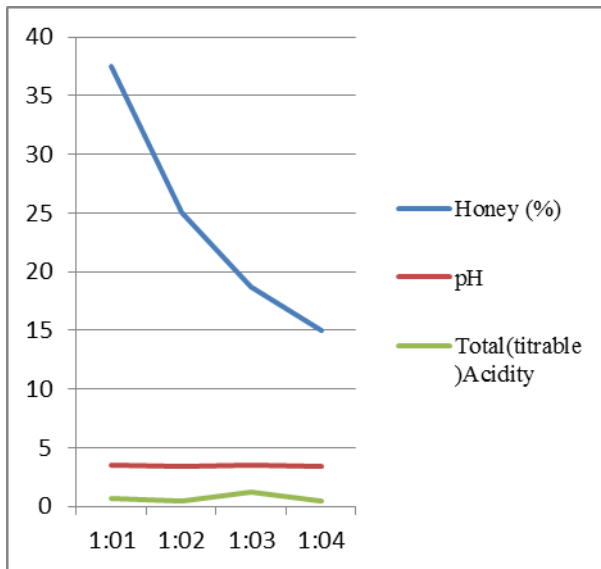

Figure 5. pH. and total (titrable) acidity of four ratios of Honey to Water for Honey B (Pan-hnun)
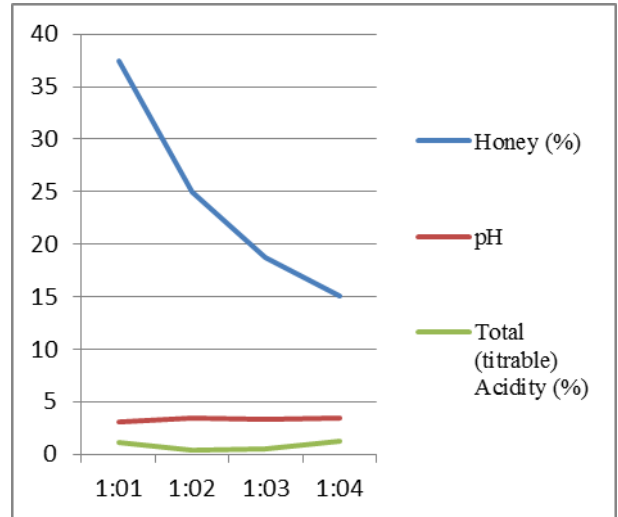

Figure 6. pH and total (tirable) acidity of four ratios of Honey to Water for Honey C (Mixture)

DISCUSSIONS

Wine is a kind of alcoholic beverage made from fermentation of fruit juice. It is becoming increasingly popular and is well accepted in Myanmar. And, Honey is used as folk medicine. Honey is found in every parts of the country around the world. So, Honey is used in wine-making as a fortifying agent. Starter culture preparation was necessary done to ferment the mixtures of Honey to Water.

To determine the composition of Honey, I sent the samples of Honey to Analysis Departments, Ministry of Science and Technology (MOST) and measured the parameters. Due to the results of Table , Honey was suitable to use in experiment because it includes much minerals and proteins.

To get the optimum ratio of Honey to Water in wine-making, 12 samples preparations were made on three sources of Honey. Four different ratios of Honey to Water (1:1,1:2,1:3,1:4) were fermented with fixed levels of starter culture .In this way, 12 samples preparations were obtained .

For wine analysis, pH of all samples was measured in which all pH values existed within the specification range. Wines are diluted acid solutions. Without acid, wine would spoil easily and unpalatably flat in taste.

Total (titrable) acidity was also measured in wine products. Wine producers need to know the titrable acidity of

musts in order to determine the proper amount of sulfur dioxide to add and also to decide on whether correction of the acidity needs to be made.

The titrable acidity is used during processing and finishing operations to standardize the wine and to follow undersirable changes due to bacteria, yeasts, etc. Commercial standards dictate total (titrable) acidity of wine is about 0.4-0.65%. According to figures, titrable acidity values of 1:2 ratio and 1:4 ratio of (A) Honey (zee honey) to water and 1:4 ratio of (B) Honey (pan-hnun honey) to water and 1:2 ratio and 1:4 ratio of (C)Honey (mixture honey) to water were 0.45,0.42,0.45,0.40, and 0.49 respectively . They were within the specification range. This could be due to the lesser formation of citric acid in wine products.

The alcohol content of wine products was determined and that of 1:1 ratio and 1:4 ratio of (A) Honey (zee honey) to water and 1:3 and 1:4 ratio of (B) Honey (pan-hnun honey) to water were highest alcohol content (%) . Other ratios had lower alcohol content. This could be due to incomplete fermentation or unequal presence of yeast cell in starter culture. Alcohol content and total soluble solid (°Brix) for four ratios of Honey to Water could be seen in fig respectively.

The ester and aldehyde content were important to measure the parameters of wine products in the research .Below about 200 mg/L ester content may give a desirable odour while above this content appear to give a spoiled character of wine . At a concentration of which it gives adverse effect. Content for wine specification should be below 750 mg/L. In this research, all 12 samples had ester and aldehyde contents within the specification range. These conditions pointed out all wine products not only have desirable odour but also are safe for drinking.

The essential research work was to detect microbial safety for wine products in which pasteurization at 120 ℃ for 10 minutes was enough to sterilize all contamination microbes. The low pH value in wine products also inhibited the growth of contaminants. These facts pointed out all wine products had microbial safety for consumption.

IV.   CONCLUSION

In the research, 12 samples with starter culture mixed four ratios and three sources of honey to water (1:1, 1:2, 1:3, and 1:4) are prepared. Then these wine samples are analyzed for the parameters such as pH, alcohol percentage, ester, ºBrix, total (titrable) acidity, are determined. Aledhyde content also determined in these samples for chemical safety. For the microbial safety, the samples are pasteurized at 120 ℃ for 10 minutes. It can be concluded that sample preparation containing (B) Honey (pan-hnun honey) of Honey to Water 1:4 is the optimum preparation for making wine with honey. Because this sample had the higher alcohol percent.tage and the parameter of this such as aldehyde, ester, pH, and total (titrable) acidity are within the wine specification range.

ACKNOWLEDGEMENTS

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Artificial Neural Network for Facial Feature Extraction System

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Abstract: This paper aims to develop face detection system using Artificial Neural Network (ANN). Face detection is one of the most important in security system. In this paper, an input image of face is acquired firstly by using a digital camera (model - Canon PowerShotA3100). The image is segmented by using threshold function and is needed to perform image processing techniques such as converting gray scale, noise removal image, edge image and changing to digited image. The important features of the image are needed to be extracted according to morphological features. A complete set of 12 features are used for the classification of final outcomes. Feature vectors obtained from feature extraction are used as input to neural networks. The system trains the Neural Network using Back-propagation algorithm. MATLAB 2009a programming language is used to implement this system.

1. INTRODUCTION

Developing detection and recognition algorithms become a very fascinating study due to its applications within the field of business, security system, person authentication, robotics, advertising, and enforcement. As a result of the development within the effectiveness of information technology distinctive researchers from all over the world have proposed a number of algorithms and techniques which make immense possibilities for outreach into nonstandard areas such as nanotechnology, criminal identification and many more by taking advantages of the growing application of computer vision [1]. Face features, an important means of biometric is a rapidly growing domain in pattern recognition. Usually, face recognition systems accomplish the task through face detection, facial feature extraction and face recognition. Facial features which make a face distinct play a vital role in identifying a person. Face recognition is influenced by many complications such as the differences of facial expression, the light directions of imaging, and the variety of posture, size and angle. Even to the same people, the images taken in different surroundings may be dissimilar. Facial feature extraction has become an important issue in recognition of human faces.

Although it is clear that people are good at face recognition, it is not at all obvious how faces are encoded or decoded by the human brain. Developing a computational model of face recognition is quite difficult, because faces are complex, multi-dimensional visual stimuli. Therefore, facial feacture recognition is a very high level computer vision task, in which many early vision techniques can be involved. The main purpose of this paper is to implement for face recognition system applying MATLAB image processing functions.

The proposed scheme of the present research is to provide a system for feature extraction for face decection for image processing systems. Various methods have been proposed by different researchers. But this thesis described accurate image preprocessing using color conversion methods and median filter method. Many researchers have focused on the extraction of the features. Different morphological features have been used, and some methods have been carried out with color features. Majumdar and Jayas developed classification models by combining two or three feature sets (morphological, color and textural) to classify individual kernels. Mallat developed wavelet technique, is used in textural image analysis to make object classification more precise.[6] Vertical and horizontal centre points are extracted from Paliwal, J., Borhan, M.S. and Jayas developed for an inexpensive machine-vision system (MVS) to identify and classify cereal face, a flatbed scanner was used and its performance was evaluated. Images of bulk samples and individual grain kernels of barley, Canada Western Amber Durum (CWAD) wheat, Canada Western Red Spring (CWRS) wheat, oats, and rye were acquired and classification was done using a four layer back-propagation neural network. Classification accuracies in excess of 99% were obtained using a set of 10 color and textural features for bulk samples. For single kernel images, a set of at least 30 features (morphological, color, and textural) was required to achieve similar classification accuracies. Classification accuracies for single kernel samples varied between 96 and 99%.[5]. Majumdar and Jayas also proposed that texture can be defined as the distribution of color in an image with respect to the spatial coordinates. It can be qualitatively evaluated as having one or more of the properties of fineness, coarseness, smoothness, granulation, randomness, or irregular. Two objects, in their digital image form, can be comprised of same number of pixels and exactly same color histograms but if the distribution of color is dissimilar, they can have totally different appearance. These two objects, if classified using simple color features, would be classified as similar objects. Haralick presented that there have been many statistical and structural approaches to the measurement and characterization of image texture: autocorrelation functions, autoregressive models, optical transforms, digital transforms, structural elements, spatial gray tone co-occurrence probabilities, gray level run lengths, and sum and differences histograms. [7]

systems are still largely in use; major areas of application of offline signature verification systems include: authentication of bank cheques, attendance register monitoring and visa application [8], and [9].

2. PROPOSED SYSTEM

This section describes system design of the proposed system. A typical face recognition system generally consists of the basic characteristics. These are image acquisition, preprocessing, feature extraction and face . The first stage deals with collection of face followed by pre-processing and feature extraction process as the second and third stage respectively. The fourth stage describes the training process. And the final stage describes the face recognition process between the test. The architecture of the proposed system composed of four main steps. This paper is to implement for face detection system applying MATLAB image processing functions.
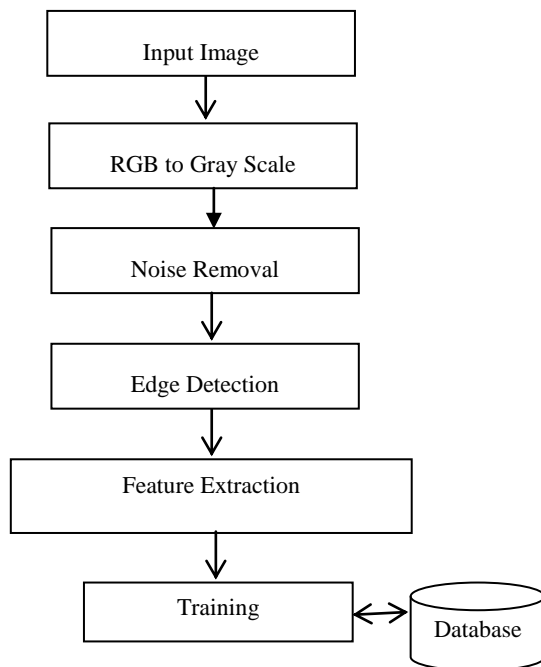
Figure. 1 System Design of the Proposed Process

2.1 Image Acquisition

The input images can be acquired through the scanner or camera. Using a conventional analogue camera and scanner method is clearly not appropriate for verification system. It is due to the procedure to follow need a lot of time or on other words, its time consuming. It is also tedious and impractical. Using a video camera with frame grabber is the one that has been applied in the real life system as everything can be automated through the computer and it suitable for the real time processing. But that method is expensive. Using a digital camera is more convenient, cost effective and reliable. The proposed system uses a high resolution digital camera. Pre-processing is an important and diverse set of image pre-processing for next stage of image processing based application. The input image All the collected input images were scanned and stored in a digital format. There will be some amount of noise in the input. Median filter was used to remove the noises present in the input images.

Fig. 1 Input Image

2.2 Image Pre-processing

2.2.1 Grey Scale Image

A grayscale or grey scale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest. The range of pixel values is from 0 to 255. These images can provide some sorts of noise [3].

Figure. 3 Grey Scale Image

2.2.2 Noise Removal Image

There are many methods to reduce noise. Dirt on camera or scanner lens, imperfections in the scanner lighting, etc introduces noises in the scanned signature images. A filtering function is used to removal the noises in the image. Filtering function works like a majority function that replaces each pixel by its majority function. Median filter is used to reduce salt-pepper noise and Gauss noise respectively. The easiest way to create such a median filter is to copy the 9 pixel values in memory cells and sort them by ascending gray value. They only differ by the position in the list from which the gray value is picked out and written back to the center pixel. The filter operation which selects the medium value is called the median filter [1]. A noise reduction filter is applied to the binary scanned image. The goal is to eliminate single white pixels on black background and single black pixels on white back ground. In order to accomplish this, the image is appled a 3 x 3 mask with a simple decision rule: if the number of the 8-neighbors of a pixel that have the same color with the central pixel is less than two, the color is reversed of the central pixel. Comparing and selecting characterize the class of operations to combine neighboring pixels. Such a filter is called a rank-value filter. The preprocessing task of rank value filters is the removal of disturbances or noise in an image. The median filter sorts the values of the neighboring pixels in an ascending order and returns the value in the center of the value list. The main problem is a fast algorithm to sort the pixel values correctly. The median is usually taken from a template centered on the point of interest. The median has a well-known ability to remove salt and pepper noise [2].

Figure. 3 Filter Image

2.2.3 Edge Image

The Sobel operator is the most popular edge detection operator among edge detection techniques. This is because it gives the better performance than other contemporaneous edge detection operators, such as the Prewitt operator. The Sobel templates can be involved by operating on a matrix of dimension equal to the window size, from which edge magnitude and gradient are calculated. The Sobel operator performs a two dimensional spatial gradient measurement on an image and so emphasizes regions of high spatial gradient that correspond to edges. Typically it is used to find the approximate absolute gradient magnitude at each point in an input grayscale image.

Figure. 3 Edge Image

2.2.4 Dilated Image

Grayscale dilation with a flat disk shaped structuring element will generally brighten the image. Bright regions surrounded by dark regions grow in size, and dark regions surrounded by bright regions shrink in size. Small dark spots in images will disappear as they are `filled in' to the surrounding intensity value. Small bright spots will become larger spots. The effect is most marked at places in the image where the intensity changes rapidly and regions of fairly uniform intensity will be largely unchanged except at their edges. Figure 4 shows a vertical cross-section through a graylevel image and the effect of dilation using a disk shaped structuring element.

Figure. 3 Dilated Image

3. FEATURE EXTRACTION

In feature extraction, a mathematical representation called a biometric template or biometric reference is generated, which is stored in the database and will form the basis of any recognition task. Facial recognition algorithms differ in the way. Feature extraction involves simplifying the amount of

resources required to describe a large set of data accurately. The features can be derived directly from the results of the preprocessing operations. Although there are many types of features, morphological features or shape features are used for this system. Among the shape features, different features from a pre-processed face image are extracted for this system. These proposed features are as follows: Mean Subtraction, Entropy, Variance, Smoothness, Kurtosis, Skweness, Contract, Correlation, Energy and Homageneity. The data is fairly simple and makes the calculation of covariance matrix. This is not the subtraction of the overall mean from each of image values as for covariance, it needs at least two dimensions of data. It is in fact the subtraction of the mean of each row from each element in that row.

Feature Table

	Features
Mean	137.6411
Std. Dev	55.0539
Entropy	7.5633
RMS	15.9031
Variance	1.7508e+03
Smoothness	1.0000
Kurtosis	2.8690
Skweness	-0.3932
Constract	0.0650
Correlation	0.5124
Energy	0.8059
Homogeneity	0.9675

Figure. 4 Feature Extraction

4. TRAINING

The basic elements and structure of Artificial Neural Network (ANN) are insufficient to make a useful learning machine. The key to automated learning is being able to assess the learning algorithm can be eventually guided toward a satisfactory solution. Training and testing data sets for a classification system are usually determined from known process generation mechanisms or by a consensus of expert opinion. Either way there is a known data standard against which to evaluate the system's performance. After training, the test set of known categories is passed through the ANN classification system and it is possible to get the percentage of correct and incorrect classifications. An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data

classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurons. The network is composed of a large number of highly interconnected processing elements (neurons) working in parallel to solve a specific problem. [10]
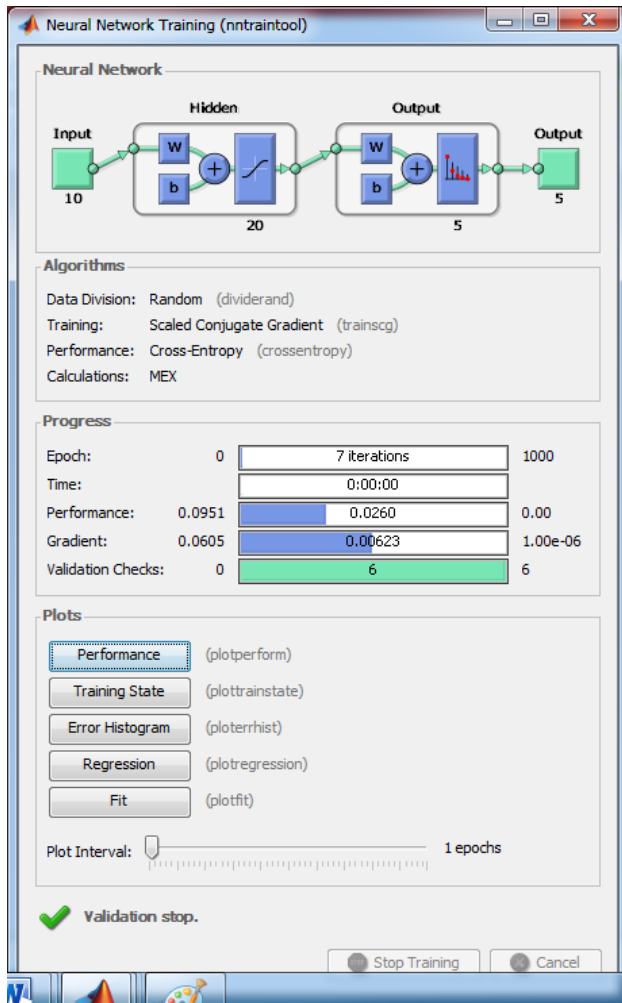

Figure. 5 Training Neural Networks

4.1.1 Edge Image

This is the result of output windows form for facial feature extraction system. The output result shows the .

	Image 1	Image 2	Image 3	Image 4	Image 5
Mean	147.9979	123.7593	82.6312	60.6728	78.9876
Std.Dev	81.4966	92.0016	94.1296	66.7431	76.4326
Entropy	7.6517	6.9345	6.1677	7.0162	8.3076
RMS	15.0234	13.8163	11.7042	13.0495	14.2567
Variance	4.6908e+03	6.1917e+03	1.3338e+03	13.0481e+03	14.0671e+03
Smoothness	1.0000	1.0000	1.2000	1.6500	1.5000
Kurtosis	2.0450	1.5473	1.8844	2.9926	2.8006
Skweness	-0.5163	-0.0429	0.7016	1.0746	1.0067
Constract	0.0946	0.1700	0.1781	0.1127	0.2109
Correlation	0.3112	0.2147	0.2838	0.3657	0.4000
Energy	0.7769	0.6425	0.6049	0.7223	0.8006
Homogeneity	0.9527	0.9150	0.9109	0.9436	0.8967

Figure. 6 Training Results

5. CONCLUSION

This paper described the basic approaches, techniques, and applications of artificial neural networks as a start of the development of comprehensive recognition systems. The system provides other capabilities such as integrated graphics and interpretive environment which MATLAB offers. Face recognition system which used by principal component analysis is to recognize the face which is registered in database. The system can recognize the face which is registered. This system used the eigen value to detect the person face and recognize. The proposed facial feature extraction system is reliable and provides high accuracy.

6. ACKNOWLEDGMENTS

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Computer Aided Teaching and Learning System

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Abstract: With rising number of students, more flexible methods of teaching are required both for traditional higher and further education courses as well as more novel distance learning, hence the need for the improvement of learning system. Fortunately, the recent advancement of computer system has provided a ready-made infrastructure for supporting the attempts to deal with these issues. This system provides the computer aided teaching and learning system. The purpose of this system is to teach and enable a person to learn with self-teaching techniques. Moreover, the users can self-test whether they understand the lessons or not. The administrator in this system can edit the lecture notes, delete the less effective portion, add or update or delete the exam questions and answers and change the time limitation for the exam. This system is developed by using C# Programming Language and Microsoft Access for the database.

1. INTRODUCTION

An interesting finding is that students with learning difficulties sometimes significantly improve their learning using CAL compared to stronger students. The more senses through which the observers receive the information, the easier it is to remember. People remember 20% of what they hear, 40% of what they see and hear, and 75% of what they see, hear and do. The fact that the computer can exercise various the senses and the present information in a variety of media can enhance the learning process. Computers may help the reticent student who is afraid of making mistakes in a classroom situation. Students using computer aided teaching and learning (CAT/L) system have performed moderately better than the controlled group. Computer Aided Learning (CAL) has been a term of increasing significance during the last decade and can also be referred to as Computer Based Instruction (CBI), Computer Assisted Learning (CAL), or Computer Aided Instruction (CAI). For the purpose of this review, CAL can be simply defined as the learning procedures and environments facilitated through computers. However, the keyword for understanding CAL is interaction. Computers can facilitate interaction during the learning process on multiple levels.[1] On one level CALs have interaction of the student/user with the content and the learning material (for example with an interactive patient on a CD-ROM). On another level, computers can host interaction of the student/user with the tutor, peer interaction or interaction between members of whole ''virtual'' learning communities. Computers' facilitation of interaction between humans, however, has only emerged during the last decade, as explosive technological progress and the Internet allowed reliable and inexpensive communication. Computer mediated human-human interaction is a whole new area in CAL, which presents the special methodological considerations and requires the separate study.

CAT/L encompasses a broad range of computer technologies that supplement the classroom learning environment and can dramatically increase a student's access to information. CAT/L programs, which can include directed drills, practice exercises, and communication between students and teachers, can adapt to the abilities and preferences of individual students and increase the amount of personalized instruction a student receives. One advantage of answering questions in a computer system is that feedback can be provided immediately: the student knows if his answer is right or wrong. Therefore, students benefit from the immediate feedback provided by computers and most of them appreciate the self-paced learning environment. At its best, CAT/L engages the students' interest, motivates them to learn, and increases their personal responsibility for learning.

Russell and Haney [7] observed that two of the most prominent movements in education over the last decade or so are the introduction of computers into schools and the increasing use of authentic assessments. A key assumption of the authentic assessment movement is that instead of simply relying on multiple choice tests, assessments should be based on the responses students generate for open-ended real world tasks. At the state level, the most commonly employed kind of non-multiple-choice test has been the writing test in which students write their answers longhand.[3] At the same time, many test developers have explored the use of computer administered tests, but this form of testing has been limited almost exclusively to multiple-choice tests. Relatively little attention has been paid to the use of computers to administer tests which require students to generate responses to open-ended items.

Educators also use standardized tests as a measure as a methodology for human subject psychological assessments testing and skills-based testing. Weisband and Keisler [6] conducted a meta-analysis that gives support to the main hypothesis that computer administration elicits more self-disclosure than traditional forms of administration do. In recent years, the disclosure effect has declined significantly due, perhaps, to increasing public knowledge of computers, increasing public computer literacy, or even people's reduced awe of the computer.[5] Their indirect analysis, however (for example, comparing students to other adults), did not support explanations related to public knowledge of computers. Two major changes came starting in the mid-1990s. [2] One was the dramatic increase in commercial multimedia for language learning as CD-ROMs became standard in home computers. The other was the development of the World Wide Web. Because of the web and increased access to the Internet in general, the past five or six years have seen a major shift toward tool uses, and many newcomers to CAI define the field almost entirely in those terms.

2. PROPOSED SYSTEM

This system is designed to use as learning tool for the students. This learning system is built for the user and the administrator. Each user has specific allowance in using the system. When this system is run by the user, he/she can learn

the lectures or sit for online- examination system. Moreover, the administrator using password can edit the lecture or exam questions. The system flow is as shown in Fig. 1. Administrator can edit lessons and add more lessons and questions not only one topic but also other topics. The guest users answer multiple choice questions to test how they learnt.
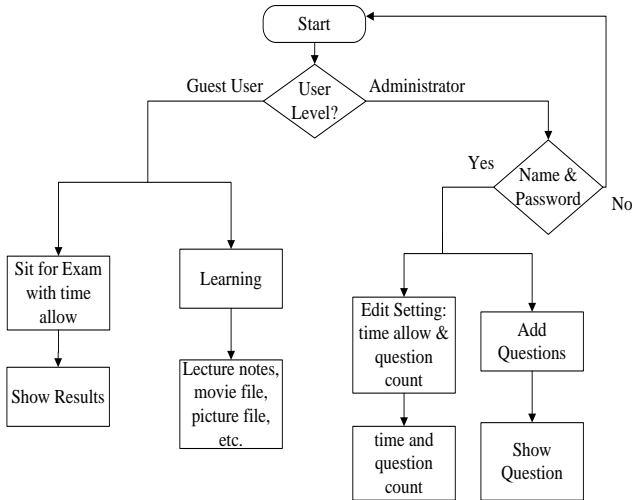

Figure 1. Overflow Diagram for the CAT/L System

3. COMPUTER AIDED TEACHING SYSTEM

The Teaching methods are the ways in which information to be learned is presented and it effects on students evaluated. Methods vary in the medium of delivery (teacher, books, film, television, teaching machines), in the explicitness of the program (structured or open), in how the teacher operates (lecture, discuss, tutors), in the ways in which student progress is monitored (immediate questions, delayed quizzes, appraisal of products), and in the organization of instructional time and space (grouping, structure, amount of choice). Until recently most reviews of teaching methods concluded that as long as the relevant content is covered, one method is as good as another. Between 1973 and 1978, however, a number of studies showed that some. When the student performance of reading and arithmetic on normative tests is used as the criterion, better gains are leader of instructional activities chooses materials, paces the instruction rapidly, requires the frequent student responses, and uses teacher-directed, rather than individual or self-directed, activities [4]. Computers are an integral part of this paradigm shift, as technology, particularly information technology is increasingly integrated into the educational process and looked at as an element in the valorization of knowledge. In education, computers play a fundamental role in both the instruction and the learning process. Information technology plays a significant role as an aid to instruction in the development and presentation of course contents. The use of information technology offers wider and richer sources of content material and easier ways of manipulating, packaging and presenting the material. There are developing criteria-dimensions and criteria inside the dimensions for choosing usable media for science learning and teaching, and to generate from this an interactive and adaptable teacher-training module. Therefore, literature, recent research results, and examples of media have been reviewed and analyzed. The usable media (textbooks, web pages, databases, web encyclopaedias, educational multimedia etc.) should be special for teaching science, as learning depends on the quality of the media. The pedagogical orientation of the teachers also affects the usability of the media. Other factors such as previous in-

service training influence the media usability. "Usable media" is complex as concept, being hard to analyze without considering the users of the media and the educational context. According to "How People learn: Brain, Mind, Experience, and School" meaningful learning engages students in tackling the topic to be learnt in such a way that they create meaningful and understandable knowledge structures on the basis of a goal of learning. It is possible to present an outline of use of "usable media" in learning and based on "Multimedia learning".

Teachers are introduced to action research methods when using CAT in classrooms. Material for teachers who want to evaluate the effective use of CAT in their class will be developed, together with a good practice example for self-evaluation. Teachers usually evaluate the learning outcomes of their students by oral or written tests. In doing that, they fail to learn about the problems students face when learning science, their misconceptions, and the ways they collaborate with each other. The aim is to help teachers to evaluate their own teaching by action research methods. How action research can be used in a teacher-training course is a secondary aim.

4. COMPUTER ASSISTED LEARNING

The purpose of CAL is identical to the purpose of traditional, instructor-led learning: to transfer knowledge and skills. In many ways, delivering instruction via computer technologies is similar to delivering it face-to-face. Good instruction fulfills the desired learning outcomes, whether instructor-led or technology-based. When properly designed, however, CAL provides benefits for both the organization and the participant. They are summarized in the following figure 2.

In general, research shows that when CAL is implemented correctly, the results in the following categories are as good as or better than traditional instructor-led approaches: Participant Achievement: In a comparison of the grades, test scores, retention and job performance of individuals who learn through computer-assisted methods with those of learners taught in instructor-led classes, the most consistent finding is that there is no significant difference between the achievement of participants, regardless of the content, participant educational level or media used.

Learning Time: One of the advantages of CAL is reduced learning time. Studies have shown that learners are able to learn 30 percent faster VIA technology than in traditional classrooms. Other studies show a 20–40 percent decrease in learning times. Reasons for the decrease include the ability of the participant to progress at her/his own pace and the standardization of training content. Research has shown that training retention is also enhanced, due to the multi-sensory nature of the training and the ability to retake instruction or use the materials as reference.

Cost-Effectiveness: CAL can be extremely cost-effective when providing instruction to large, geographically dispersed audiences. Reductions in the cost per participant, which include travel and off-the-job time and expenses; learning times; and overhead expenses of training all factors into the cost-effectiveness formula.

Primary Benefits to the Organization	Primary Benefits to the Learner
Increases instructional effectiveness	Improves access to instruction
Improves access to instruction	Allows learner to choose a convenient time and place for learning
Improves return on investment (ROI)	Meets a wide variety of learning styles
Reduces training time and costs	Provides immediate feedback
Allows consistent, standardized presentation of material	Enables learner to move through training materials at a speed that meets individual learning needs
Simplifies updating of materials	Allows participants with varying degrees of knowledge and skills to access instruction in a comfortable, non-threatening manner

Figure. 2 Benefits of Computer-Assisted Learning

5. CONTROLLING USER LEVELS

In this teaching and learning system, there are two levels of users: the administrator and the guest user.

5.1.1 Administrator

This type of user needs the password to enter the system because he/she controls the time allowed for examination and question counts. Moreover, he/she can add multiple choice question and possible answers for the suitable topic.

5.1.2 Guest User

The user is allowed to take the test by the administrator. They do not need password to enter the system. They can learn the lessons, the lecture movies and picture file for the subject. Moreover, they can answer multiple choice questions whether they understand the lesson or not.

6. IMPLEMENTATION

This teaching and learning system is developed on the PC and compatible. The CAT/L system is implemented with C# programming language. When the user starts the system, the cover form or main dialog will appear as shown in Fig. 4.2.
In this dialog, the user can clearly see the five processes: Setting, Add New Questions, Start Answer, Learning and Exit.
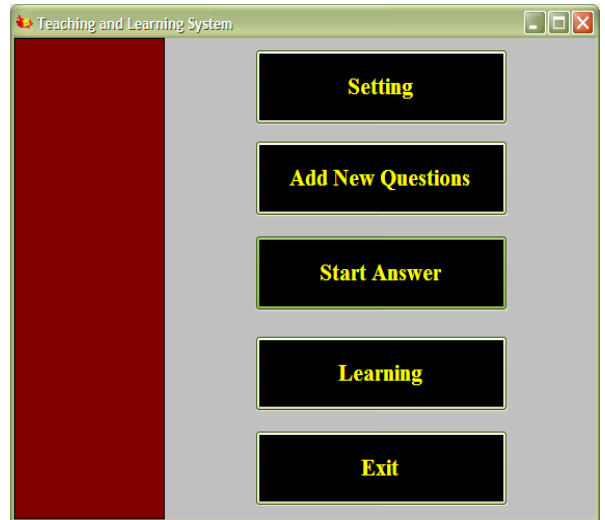

Figure. 3. Main Dialog for Computer-Aided Teaching and Learning System

6.1.1 Setting

This process belongs to the administrator. He/she can edit the time allowed for the examination for the guest users. In addition, he/she can change the question count for the exam. The administrator's password filling dialog is shown in Fig. 4
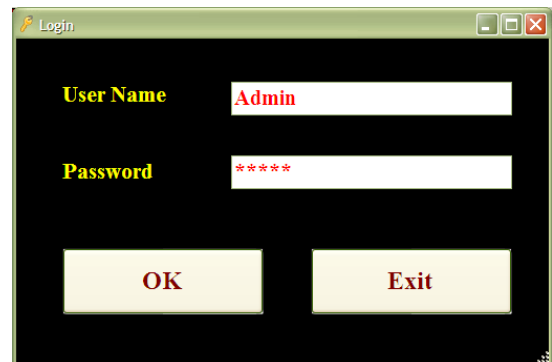

Figure. 4. Admin Dialog

If the username and password are correct, the system will allow to edit the time allowed and the question count for the exam as shown in Fig. 5.
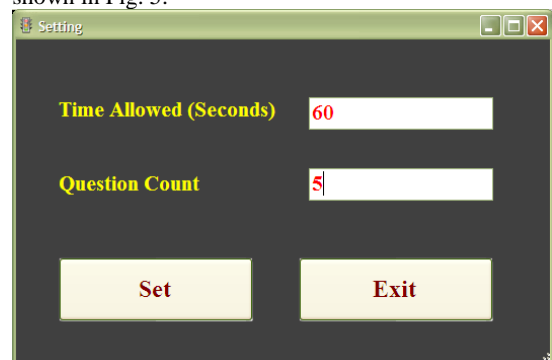

Figure. 5. Setting Dialog

6.1.2 Add New Questions

This system allows the administrator to add the multiple choice questions and their possible answers if the username and password are correct as shown in Fig. 6.
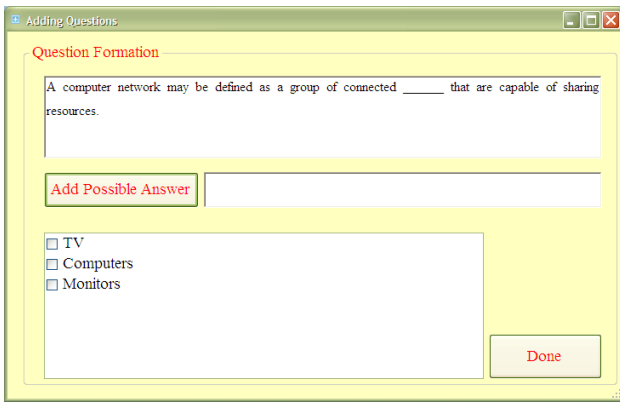
Figure 6. Adding Questions Dialog

6.1.3. Start Questions

When the users click "Start" button, the question will be shown in randomly to answer. The user selects the possible answer on this dialog. When the user finishes answering, this system will show the message box that the user marks and the percentage for the time as shown in fig. 7. Moreover, there is time limitation to answer the questions. The question count is also limited by the administrator. If the question count is five for sixty seconds, the system will allow sixty seconds to answer five questions. The time will be counted when the user presses "Start" button. The system will terminate this process and show the result when the time is sixty seconds. Moreover, this system does not take care whether the user finishes answering all questions or not. When the system is time up, it will count the correct answer of the user. Then, this system will show the available mark, total mark and percentage as shown in Fig. 8.
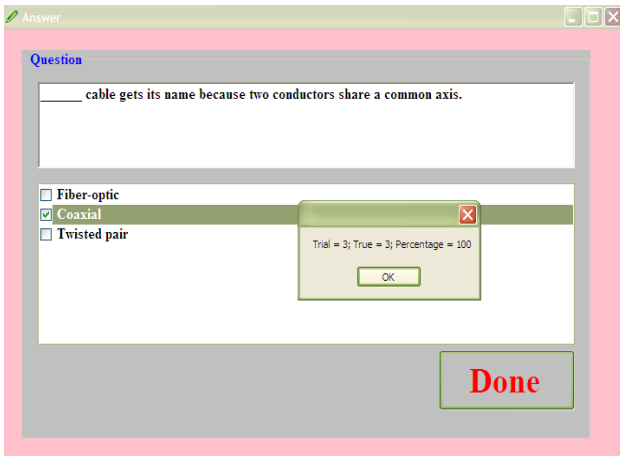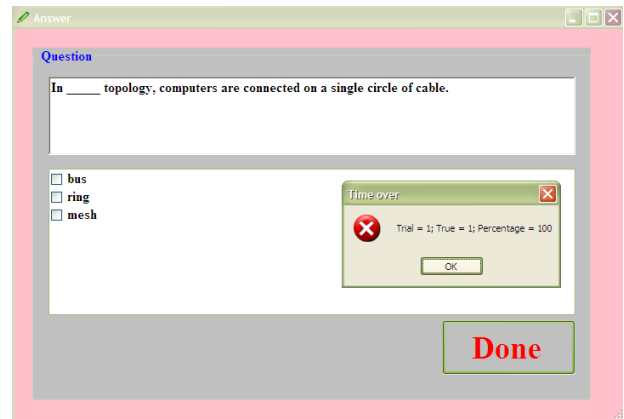

Figure 7. Score Message Box

Figure 8. Time Over Message Box

6.1.4. Learning

First, the people who want to give lecture notes or lecture movies or pictures or sound files must place these files at the computer. There are so many file types used in the lecture. Texts and graphics audio, video, and animation all make up the form and functional elements of CAT/L materials. The term's hypertext as shown in Figure 9, hypermedia, and interactive multimedia have each been used interchangeably to describe CAT/L delivery. Regardless of the term, the concept has best been understood as the merging of formally separate media in a manner that has allowed associations or links between the various elements. The flexible nature of CAT/L materials has been highlighted as one of its prime advantages over traditional learning materials.
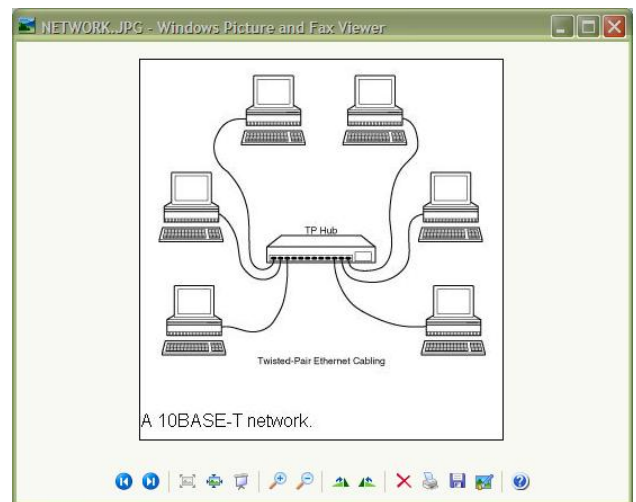

Figure 9. Graphic File used in CAT/L

7. CONCLUSION

CAT/L system is intended to be interactive and non-passive from the student's perspective. Students may be continually asked to type or speak responses into the computer and to navigate nonlinearly based upon discretionary controls (buttons, hot words, and menus) or challenge controls that navigate by depending on the type of response (e.g., the answer to a question) given by the student. CAT/L materials may be placed on campus network servers or distributed in CDs and floppy discs such that students may access them outside the classrooms. These materials may be sophisticated simulations or even virtual realities that are in many ways better than real-life experiences because simulations may be repeated over and over

at the student's own learning place and may take place in future and past settings for which there are no current opportunities for real world experiences.

Using this system, the teacher does not need to teach repeatedly, the student can easily learn the lessons repeatedly when he/she does not understand them. Moreover, this system can be used by the user who wants to apply any subjects.

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Microcontroller-based 9 Digits Code Lock System

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Abstract: Security has been an important factor in life. We need homes, offices and our properties to be secured as much as possible to protect from unauthorized access. So security control systems and access control methods play vital role in modern technologies. A lot of research has been conducted on these methods and techniques. Discovering the more and more efficient control technology concerned with security becomes a challenging matter. In this paper, microcontroller-based code lock system which is simple in design, low in cost and high in level of security is presented. The system consists of microcontroller, 16x2 Liquid Crystal Display, 4x3 keypad and buzzer. The system has been developed and implemented by applying embedded control technique. The core value of the system is that it can provide user longer password length up to 9 digits compared with the other microcontroller-based password lock systems of which password length is just maximum 6 digits. So the system can provide higher level of security than any other system of its kind because longer password length makes the password more secure and the system more powerful in term of security. Moreover, the user can vary the password length as needed within the one to nine digits.

Keywords: Security; access control methods; microcontroller; embedded control technique; password length

1. INTRODUCTION

Due to many efforts and researches made in the field of security control techniques, today security control systems are very intelligent and give satisfactory results. But every system has its own advantages and disadvantages and no exception for these systems. The more advanced the system is, the more it costs and the more the system is complicated. In the environmental point of view, some systems operated in the very high frequency are hazardous to the health and pollute its associated environment. And some systems cause interference to nearby electronic devices. In this paper, 9 digits code lock system is presented to overcome these drawbacks. Although the code-protected security control system is not as secure as the biometric system like eye scanning, it is still critical in daily-life security-demanded applications especially in the protection of one's properties because of its cost-effectiveness and ease of use. Moreover it is user-friendly and does not pollute the environment. The proposed system is very simple in design and easy to implement. The block diagram of the 9 digits code lock system is shown in Figure 1. The power supply unit is for providing the required power for the whole system and power consumption is very low. Peripheral Interface Controller PIC16F877A produced by Microchip Technology is used as a main controller in this system. PIC microcontroller is selected because of its powerful features and its rich resources. Economically, it has low cost compared to other products. A four by three matrix keypad is used for entering the password. Keypad is the simplest form of electronic access control. Matrix keypad is a type of Human-Machine Interface (HMI) with numerical or function keys. A Liquid Crystal Display (LCD) is used for displaying the condition of the entered password and prompting for necessary information. In every step, LCD will show every instruction for the user and function of the microcontroller. Alarm unit is for alerting that an intruder or an illegitimate person is trying to gain access to the system. Buzzer is used for this purpose. Output signal will be activated when user enters the correct password. This means that user will gain access to the system.
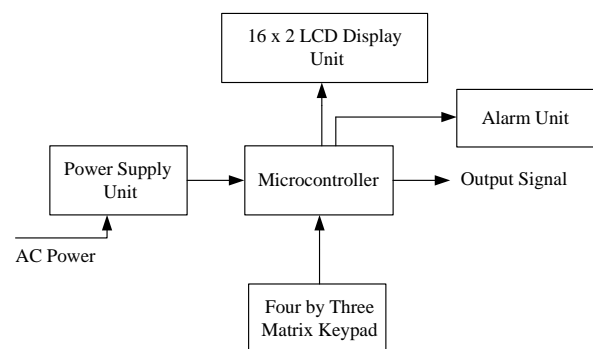

Figure 1. Block diagram of Microcontroller-based 9 Digits Code Lock System

2. OPERATION OF THE SYSTEM

When the system is powered, the LCD will display the text 'WELCOME TO YOU'. After that, the LCD will display the text 'SECURITY SYSTEM'. Then the microcontroller reads the previous stored password in its EEPROM location showing the message 'READING EEPROM' on the LCD. The microcontroller stores that read password in a specific RAM location. Then, the LCD will display the message 'ENTER PASSWORD'. At this time, the user can input the password by pressing the keys on keypad. While entering the password, the message 'SCANNING KEYPAD' will be displayed on the LCD. The entered password is stored into another RAM location. Two special characters '#' and '*' are used. The key '#' is used for 'ENTER' key and the key '*' is used for changing the password. The entered password is compared with the stored password. When the controller is comparing the passwords, the LCD will display the message 'COMPARING CODE'. If both the entered password is correct and the last character is '#', the user will gain access to the system showing the message 'ACCESS GRANTED'. If the user inputs more than nine digits, only the last nine digits will be valid. Green LED is used in this system just for showing that the specific task is being executed. After five seconds time is up, the LED will turn off. If the entered

password is incorrect, the user will be prohibited to access the system showing the message 'ACCESS DENIED'. The controller will give the user the next two chances to enter password. If the user enters incorrect password for three times, the controller will give an alarm notifying that the user is an illegitimate person. Alarm will continue until the power supply is cut-off. If the user wants to change password, the correct password together with the key '*' must be entered. At that time, the LCD will display the message 'CHANGING CODE'. Then, the LCD will display 'ENTER PASSWORD'. The user must enter the new password and the special character '#'. Then, the LCD will display the message 'CONFIRM AGAIN'. The user must input the new password again together with the special key '#'. The controller will compare the next new password with the previous password. If they are not same, the password in EEPROM will not be changed showing the message 'CHANGING FAILED'. If they are same, the new password will be written into the EEPROM location showing the message 'CHANGING SUCCESS' The user must use the new password to access the system at the next time.

3. SOFTWARE IMPLEMENTATION

In developing the program, it must be sure that no programming or logical errors present in the program as the whole system totally depends on the program. In this system, MPLAB Integrated Development Environment (IDE) software developed by Microchip Technology is used for developing the program. Assembly language, one of the high level programming languages, is used as the programming language. Utilizing the rich resources of PIC, EEPROM data reading and writing techniques, indirect memory accessing technique and software debouncing technique are applied in this system. The main program is composed of many subroutines or procedures. Each procedure is created for specific functions or tasks. Critical subroutines contained in this main program are explained in detail with respective flowcharts. Figure 2 shows the main flowchart for code lock system.

3.1 Scan Procedure

It is used for scanning the user's input and saving this in the buffer, and passing the data concerned with the input to the respective section of the program. Keyscan procedure for sensing which key is entered is nested in this procedure. Readchk_enter subroutine, a nested subroutine of scan procedure, is for checking whether the special keys, '*' for code change and '#' for enter, are pressed or not. The scan procedure also makes the last nine digits of the entered password valid if the user enters more than nine digits because the system password length is only nine digits. To read keys pressed, the program requires the switch debouncing. This means that the delay of approximately 20 to 30 milliseconds is needed between button presses. This part is required to allow the key hits to settle for a few tens of milliseconds before establishing a firm contact. In this program, 24 milliseconds delay is used for debouncing. The flowchart for scan procedure is shown in Figure 3.
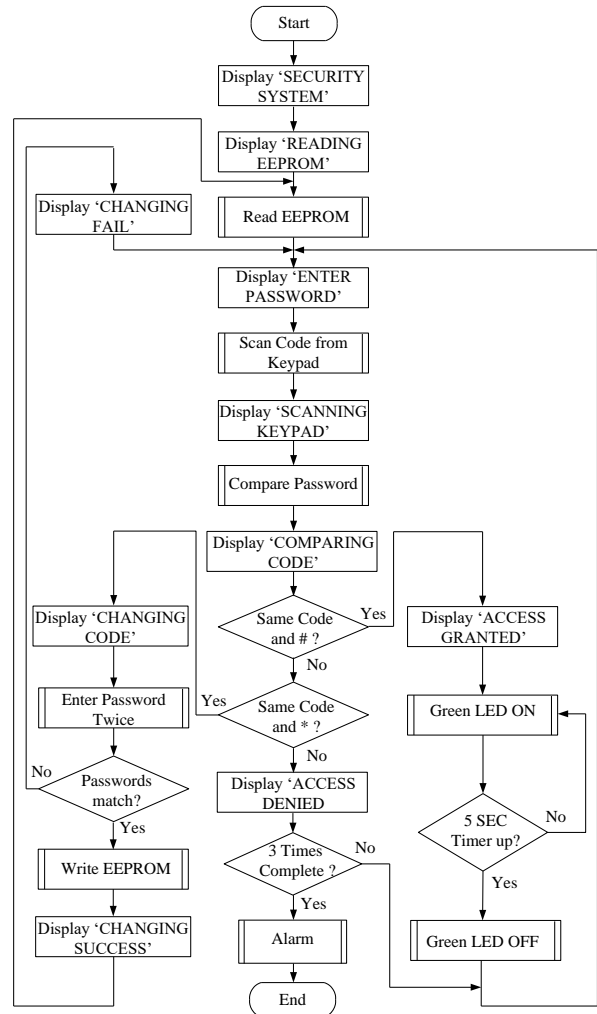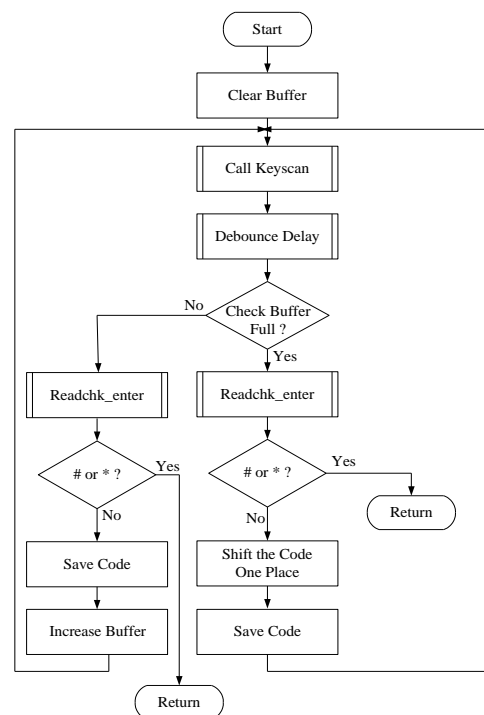

Figure 1. Flowchart for the overall system

Figure 3. Flowchart for scan procedure

3.2 Readchk_enter Procedure

This procedure checks the keycode from RAM register locations whether the last character is the same as '#' key or '*' key. If it is '#' key or '*' key, it will return with zero flag bit of status register, Z = 1. Otherwise it will return with Z = 0. The flowchart for this procedure is shown in Figure 4.
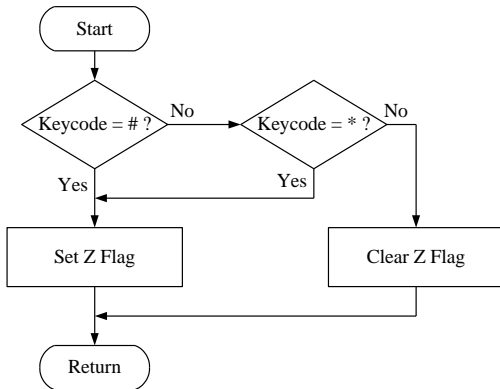

Figure 4. Flowchart for readchk_enter procedure

3.3 Compbuf Procedure

Compbuf procedure is created to compare the code from RAM locations with the entered code in read buffer. In other words, this procedure checks whether the user's entered codes and the stored codes in the microcontroller. When the user wants to change the password, it checks the confirmation password whether they are same or not. If they are same, it will return with Z = 1, otherwise Z = 0. The flowchart for compbuf procedure is shown in Figure 5.
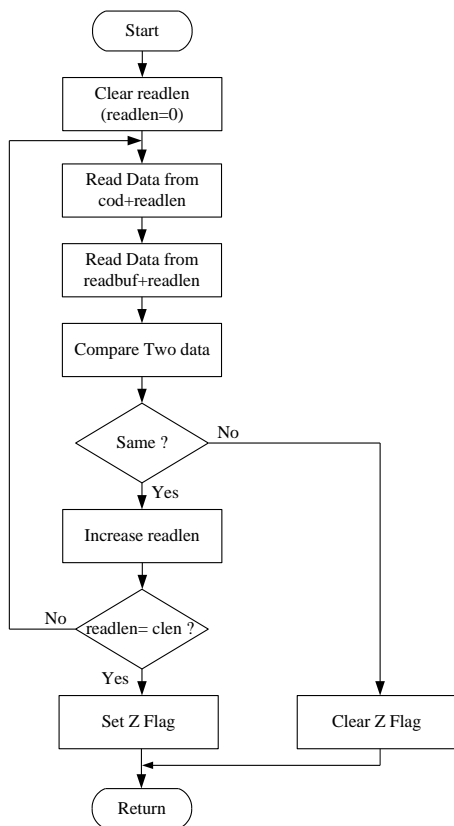

Figure 5. Flowchart for combuf procedure

4. HARDWARE IMPLEMENTATION

By utilizing the efficient resources of the PIC, the circuit of the whole system is very compact and very simple. If power supply is not taken into account, all necessary components in this circuit are just only keypad, LCD, 4 MHz crystal oscillator, LED, buzzer, a general purpose transistor, two ceramic capacitors and some resistors. The entire circuit diagram is shown in Figure 8. The main components of the system will be explained briefly.

4.1 Microcontroller

PIC 16F877A is chosen as main controller for this system because it meets the requirements of the system and it has rich of features. PIC 16F877A is the mid-range pic and it has 40 pins.
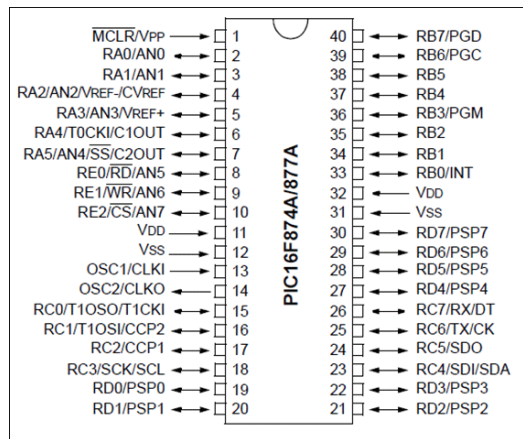

Figure 6. Pin diagram of PIC 16F877A

4.2 16x2 LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines.

Figure 7. Pin diagram of 16x2 LCD Display
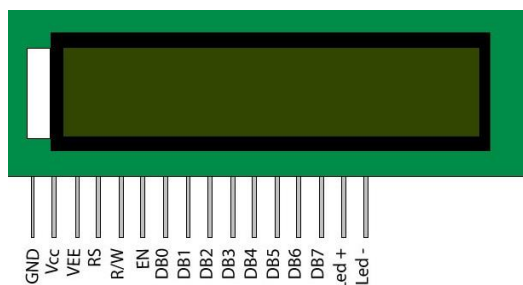
4.3 4x3 Matrix Keypad

The keypad is a part of the input device used in this system to input authentication digits. Keypads are organized in a matrix of rows and columns. When a key is pressed, a row and a column make a contact; otherwise, there is no connection between rows and columns. A 4x3 matrix keypad means 4 rows and 3 columns keypad with total 12 combination patterns.
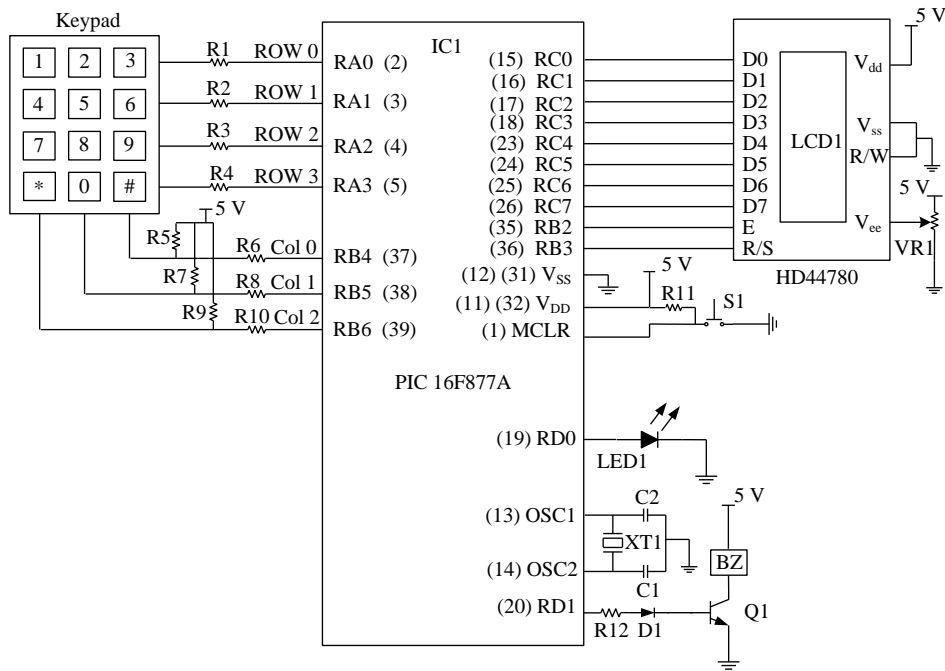
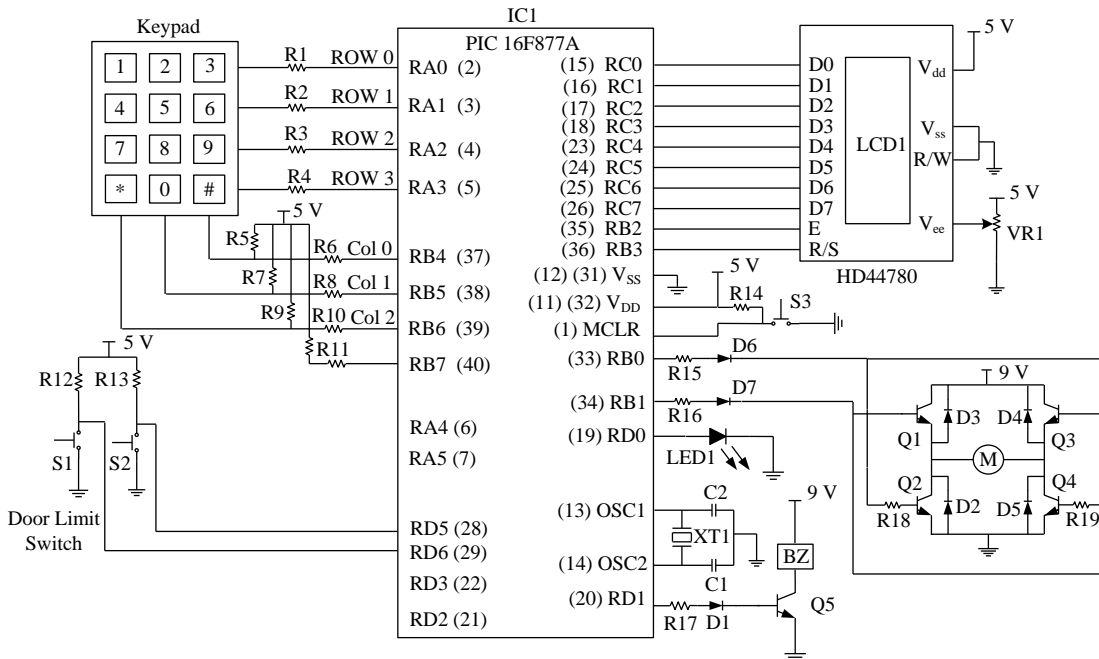Figure 8. Schematic circuit diagram of the code lock system

Figure 9. Schematic circuit diagram of the code-protected door control system

5. DOOR CONTROL SYSTEM

Door control system is presented here just for an example as one of the applications of the proposed system and for showing the idea how the proposed system can be applied for the desired application areas. Just modifying the code lock system a little, code-protected door control system can be implemented. In this system, door will be opened if the password is correct and automatically closed after a reasonable time delay. Time delay is set to 10 seconds. The alarm will be activated if the password is entered incorrectly for three times. Schematic circuit diagram of the code-protected door control system is shown in Figure 9.

6. SIMULATION, TESTING & RESULTS

Simulation is necessary for monitoring and evaluating the expected results. In this paper, simulation is performed by using ISIS software, the product of Labcenter Electronics. It is a very powerful tool for developing the embedded system designs. This product combines mixed mode circuit simulation, micro-processor models and interactive component models to allow the simulation of complete microcontroller based designs. Simulation of the code lock system is shown in Figure 10 and simulation of the door control system is shown in Figure 11. Experimental testing of the two systems is shown in Figure 12 and Figure 13 respectively.
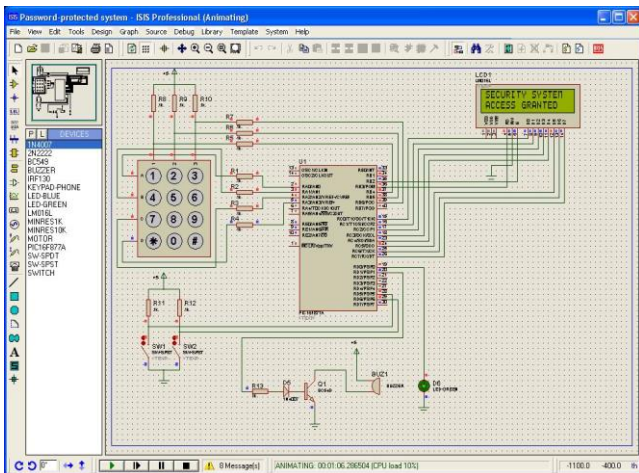
cx

Figure 10. Simulation of the code locks system

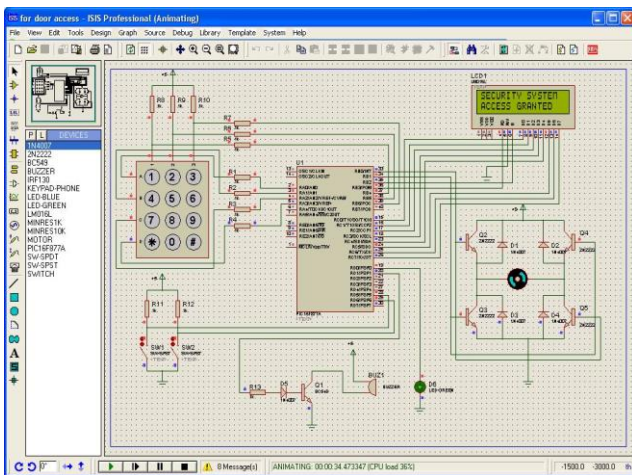Figure 11. Simulation of the code-protected door control system
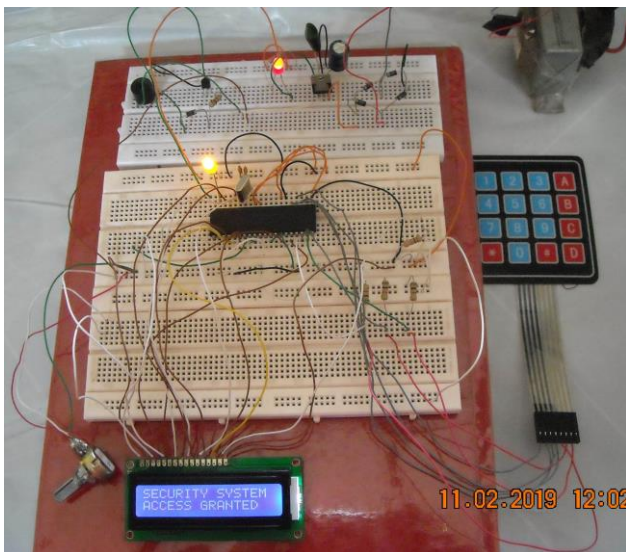
Figure 12. Experimental testing of the code lock system

Figure 13. Experimental testing of the code-protected door control system

7. CONCLUSION

In this paper, microcontroller-based 9 digits code lock system has been presented. By taking advantages of the rich resources and features of PIC, the required program for the system has been developed. EEPROM data reading and writing techniques, indirect memory accessing technique and software debouncing technique are applied in developing the program. Assembly programming language has been used for developing the program. The developed program together with the system circuit has been simulated by ISIS interactive simulation software. As this software supports the real-time interactive simulation, the necessary changes in software and hardware can be made even in the developing phase. The circuit of the implemented system is very compact and straightforward as the system is based on the embedded system design.

8. ACKNOWLEDGMENTS

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Performance Analysis of Black Hole attack in MANET

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Abstract: Due to the mobility and non-centralized management, Mobile adhoc Network (MANET) is broadly used in current communication system. The researchers have been proposed various MANET routing protocols in order to improve network reliability. However, most of the MANET routing protocols have lack of attack prevention. While the MANET communication system becomes larger, the various types of attacks appear in parallel. Therefore, performance analysis of attacks in routing protocols is one of the important issues in the case of MANET improvement. In this paper, two routing protocols, AODV and DSDV were tested with black hole attack. The performances of those two protocols were compared when they were attacked by malicious node.

Keywords: Black Hole attack, MANET, AODV, DSDV,NS2

1. INTRODUCTION

MANET allows devices to create a network on demand without prior configuration. Thus, nodes within a MANET are involved in routing and forwarding information between neighbors [1]. As shown in [1], the basic characteristics of MANET are network infrastructure, network topology, self-organization, limited resources and poor physical security. Consequently, the design of a routing protocol should be considered with the following issues: distributed network, dynamic topology, power awareness, addressing schemes, network size and security. In order to improve security goals, the routing protocols should be analyzed with various attacks.

2. Related Work

In [2],the authors defined that network overhead, processing time and energy consumption were the three security parameters in MANET. Security issues can be categorized into two types: security services and attacks. Services refer to some protecting policies in order to make a secure network, while attacks use network vulnerabilities to defeat a security service. They discussed that the important security services were availability, authentication, confidentiality, data integrity and non-repudiation. Detecting and eliminating malicious nodes, is another aspect of the MANET security. Due to special features like hop-by-hop communications, wireless media, open border and easy to setup, MANET became popular for malicious nodes. Some of the most important attacks in MANET are as follows: black hole attack, worm hole attack, Byzantine attack, Snooping attack, Routing attack, Resource consumption attack, Session hijacking, Denial of service, Jamming attack, Impersonation Attack, Modification Attack, Fabrication Attack and Man-in-the-middle attack.

The detection system for black hole attack was proposed in [3]. To detect the black hole attack their proposed system checks the RREPs that come from multiple paths. As the black hole node immediately send RREP message to the source without checking its routing table, it is more likely that the first RREP comes from the black hole node. Then the solution will discard the first RREP packet using the route reply saving mechanism that come from malicious node and choose the second RREP packet. The authors used NS-2.35

for the simulation and compared the result of AODV and BDS solution under black hole attack. The BDS solution against Black hole node has high packet delivery ratio as compared to the AODV protocol under black hole attack.

In wormhole attack, an attacker creates a tunnel between two points in the network and creates direct connection between them as they are directly connected[4]. Wormhole attacker records packets at one end in the network and tunnels them to other end-point in the network. This attack compromises the security of networks. A potential solution is to avoid wormhole attack is to integrate the prevention methods into intrusion detection system but it is difficult to isolate the attacker using only software based approach because the packets sent by the wormhole are similar to the packets sent by legitimate nodes. All the simulation work was performed in OPNET MODELER network simulator version 14.0. The effect of wormhole attack was analyzed by using parameter like number of hops, delay, retransmission attempt, and data dropped.

MANET often suffers security attacks more than wired networks because of its nature features such as dynamic topology and open medium[5]. Some these attacks are such as wormhole attacks, flooding attack, gray-hole attack, routing table overflow attack, Denial of Service (DoS) attack, selfish node misbehaving, impersonation attack, black hole attack, modification attack, etc. The warm hole attack creates a tunnel by attackers which placed themselves in the strategic position of the network; declare the tunnel as a shortest path of transmission in order to record the traffic or ongoing packets, also transfer usually the selective information to other location, and then retransfer them to the network. In black hole attack, when a malicious find out that neighbors initiate to send a RREP packet, it RREP the fake packet with highest value of sequence number and lowest hop count, order that it assumes that this malicious node has the best route to the destination. Thus, the source node discards all other RREPs; malicious node drops all the packets in other words, it stops forwarding packets to the right destination. In the flooding attack, the attacker set up path between network's nodes to disseminate its unpleasant packets and congest the network.

The authors implemented a cryptographic and trust based system to enhance the security of the Zone Routing Protocol

(ZRP) so that the communication between the source and the destination can be made secure along with the additional security of the intermediates nodes[6]. To prevent the Denial-of-Services (DoS) Attacks, keyed-Hash Message Authentication Code – Secure Hashing Algorithm 512 (HMAC-SHA512) is implemented. HMAC-SHA512 guarantees that the data packets are received by the destination only and in its original form but at the expense of the increased processing time at the source and the destination. The Trust Based system increases the Packet Delivery Fraction (PDF) but at the expense of the increased End to End Delay. The simulations further show that as the malicious nodes percentage goes past 30%, the performance of the system degrades considerably. Furthermore, the mobility plays an important role while analyzing the network. If the pause time is increased, the mobility decreases that leads to more stable networks.

In a wormhole attack two nodes are connected with one another with the help of a medium which is not available to normal nodes, with the help of this out of band channel the nodes are able to communicate with one another over a range in which normal nodes cannot[7]. The authors have proposed an approach that will be using the information present in the routing table for the detection of the wormhole links. The approach has been applied to DSDV and the detection of self-sufficient wormhole nodes and attacks.

3. AODV and DSDV

Ad-hoc On-Demand Distance Vector Routing (AODV) protocol provides self-starting, dynamic, loops free, multihop routing[8]. Protocol allows mobile nodes to establish routes quickly for new destinations as well as to respond to changes in network topology and link failures as only affected set of nodes are notified. Nodes do not maintain routes to the destinations that are not in active communication. New routes are created on demand. It means control packets are broadcast when needed and hence eliminate the need for periodic broadcast of routing updates. AODV protocol works in two phases a) route discovery process and b) route maintenance process.

Route discovery process uses Route Request (RREQs) and Route Reply (RREPs) messages. The routing messages contain information only about the source and the destination. When a route to destination is needed, the node broadcasts a route request (RREQ) packet to its neighbors to find the optimal path. RREQ message contains route request broadcast ID, Destination IP Address, Destination Sequence Number, Source IP Address, Source Sequence Number and Hop Count. Sequence number is used for route freshness, loop prevention and faster convergence. Route maintenance is performed with two additional messages: Hello and RRER messages.

The idea of Highly dynamic Destination-Sequenced Distance-Vector Routing (DSDV) protocol was introduced in 1994[9]. The design is to operate each Mobile Host as a specialized router, which periodically advertises its view of the interconnection topology with other Mobile Hosts within the network. Packets are transmitted between the stations of the network by using routing tables which are stored at each station of the network. Each routing table, at each of the stations, lists all available destinations, and the number of hops to each. Each route table entry is tagged with a sequence number which is originated by the destination station. To maintain the consistency of routing tables in a dynamically varying topology, each station periodically transmits updates, and transmits updates immediately when significant new information is available.

4. Black Hole Attack

Mobile Ad Hoc Network using the AODV protocol faces an attack named Blackhole attack where a malicious node or Blackhole node consumes the network traffic and drops all data packets[3]. When the source node(A) broadcasts the RREQ message for destination node(D) to establish a path for data transfer, the malicious node(B) immediately responds to source node(A) with a false RREP message showing that it has the highest sequence number of destination node(D), as if it is coming from Node (D). Node A assumes that Node D is behind Node B with 1 hop count and discards the newly received RREP packet come from Node C or E. Node A then starts to send out all data packet to the node B. Node A is trusting that these packets will reach Node D but Node B will drop all data packets. The malicious node or Black hole node takes all the routes coming up to itself. It stops forwarding any packet to any other nodes. The network operation is hampered as the black hole node B consumes the packets easily.

5. SIMULATION RESULTS

The Blackhole attack was implemented for AODV and DSDV protocols. Then the performance of attacks was examined by using NS2 simulator. In NS2,all routing protocols are implemented in the directory "ns-2.35".
In the file "aodv.h", the malicious variable was added as *bool malicious*. Then "aodv.cc" was modified to declare malicious node as follows:

```
if(strncasecmp(argv[1], "hacker", 6) == 0) {

    malicious = true;

    return TCL_OK;

}
```

Figure. 1 Malicious Node Declaration

For the malicious node, the packets are dropped out with the following code:

```
if(strncasecmp(argv[1], "hacker", 6) == 0) {

    malicious = true;

    return TCL_OK;

}
```

Figure.2 Dropout Packets Creation

Next, the "tcl" file was implemented as shown in Table 1.

Table 1. Node Creation for Simulation

Total nodes	7
Source node	0
Destination node	3
Attacker node	5

Similarly in DSDV protocol, "dsdv.h" and "dsdv.cc" were also modified.

There were four "tcl" files for this simulation:"aodv with attack","aodv without attack", "dsdv with attack" and "dsdv without attack". The "tcl" files were compiled to get "trace" and "nam" files. According to trace files, the number of sent packets, the number of received packets, and the number of dropped packets were compared. The analysis results are shown in Table2 and Table3. Figure 3 shows the example of running "nam" file.

Table2. Simulation Results for AODV

	Sent	Received	Dropped out
Attack	1238	0	1238
No attack	1238	1238	0

Table 3. Simulation Results for DSDV

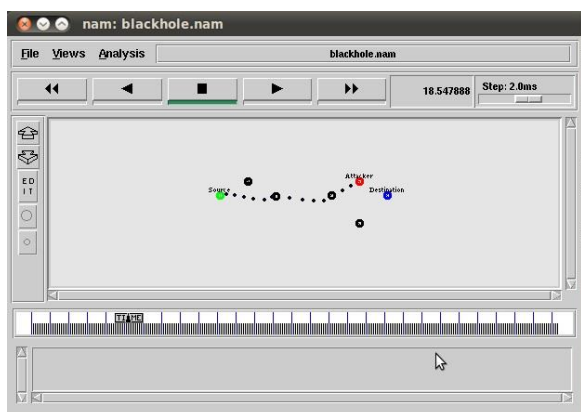|	Sent	Received	Dropped out
Attack	1319	1469	4064
No attack	1319	1462	4016

Figure 3. Simulation for Blackhole attack in AODV protocol

Under the Blackhole attack, AODV cannot work properly since all the packets are dropped out by the attacker. In DSDV protocol, the dropped out packets with Blackhole attack increase 25% more than the dropped out packets with no attack.

6. CONCLUSION

In MANET, most routing protocols do not include security issue. Therefore, analysis on attacks in MANET is an important research to improve mobile adhoc network communication. In this paper, the two routing protocols, AODV and DSDV, are analyzed with Blackhole attack. According to simulation results, Blackhole attack can drop out all the packets in AODV protocol. On the other hand, Blackhole attack can drop out 25% more than the dropped packets in normal case. The future work is to search how many percent of sent packets has been dropped by Blackhole attack in DSDV.

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The strategies and roles used currently by the Wolaita Language Teachers to implement Student -Centered Teaching Approach in Wolaita language Classroom: Focus on Humbo Tebela secondary school in Wolaita Zone

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Abstract: The main objective of the study was to explore the roles and strategies used by the Wolaita language teachers to implement student centered teaching method in Wolaita language classroom. Four purposively selected teachers and six students were involved in the study. Classroom observation and interview were used as a tool to collect the data. Qualitative data analysis approach was used to analyze the data. The study clearly indicated that teachers did not arrange the classroom properly in a way that is easy for the students to work cooperatively with one another and they also did not properly involve students in group and pair work. Moreover, it revealed that teachers did not accommodate the students with various learning styles and level of achievement. Thus, it was recommended that teachers should arrange the classroom before start teaching. They should be sure that there are spaces between chairs, tables and desks so as to effectively implement student- centered teaching. Before classroom teaching, teachers should let students sit in group or in pair. This also helps teachers to be effective in applying student -centered teaching approach. Teachers also should encourage and involve the students in group work so as to ensure the student centered teaching approach.

Keywords: classroom, group work, student centered, teachers' role, Wolaita language

1. INTRODUCTION

According to Schrenko (1996) learner-centered instruction can be used in different ways while learning about a theme, a topic or a subject. The learner-centered approach is also sometimes referred to as "child-centred"or "pupil-centered" and is a specific approach to teaching. Here the main focus is on engaging the learner as opposed to the teacher-centered approach, where the focus is on the teacher.   According to Mubasher Nadeem (2013) the teacher's role is to create an environment, which stimulates the desired behavior and discourages those that are believed to be undesirable. This role makes the teacher the focus of attention. By contrast, the learner-centered approach assumes that learners are active and have unlimited potential for individual development. According to (Zohrabi, et al., 2012) as cited by   Ive Emaliana(2017) Student-centered learning becomes a pioneer of development of learning approach. In this approach, students activities are important indicators in learning process and quality of learning product (Zohrabi, et al., 2012). Student

centered approach is also an approach where learners learn from the teacher, from one another and on their own.

Student centered teaching method is a method in which the teachers use to encourage their students for further learning and autonomously to share ideas in classroom. This also important to develop students' self stem and confidence. Although teachers are taught a variety of instructional methods, the approaches that are considered "best practice" are learner-centered. In a broader sense of education, Kain (2003) as cited by Liu and Qiaoe (2004) explains that in learner-centered approaches, the construction of knowledge is shared, and learning is achieved through learners' engagement with various activities. The idea of focusing on the learner rather than the teacher requires that teachers' and learners' roles be reexamined in the learning process.

The implementation of the   student centered teaching approach is not satisfactory in Humbo Tebela secondary schools due to various factors like the classroom density, less

attention by teachers and students, inconvenient classroom atmosphere in general. Therefore, the main emphasize of this study was to explore the roles and strategies used currently by the teachers to implement student-centered teaching approach specifically in Wolaita language classroom. No research has been conducted in the student centered teacher approach in context of Wolaita language. Thus, this study investigated the current status of student centered teaching approach in Wolaita language classroom and the roles and strategies teachers play   currently to implement student centered teaching approach in Wolaita language classroom.

Objectives of the study

The main objective of the study was to explore the roles and strategies used by   the Wolaita language teachers to implement student centered teaching method in Wolaita language classroom.

2. RESEARCH METHODOLOGY

2.1 Research Design

In order to get pertinent information, the researcher used qualitative research design . This was because the nature of the research needed this approach and it was assumed to be important to obtain genuine and detailed information from the research participants.

2.2 Research Place

The research was conducted in Wolaita Zone which is one of thirteen zones found in SNNPR,Ethiopia. It has 15 districts and five administrative cities besides to newly added districts and cities. Among these, one district Humbo was selected as research place . The reason for selecting this district was the researchers' trust to find sufficient information from the areas as he had spent many days there when he supervise BA degree practicum students at Tebela secondary school.

2.3 The research subjects

 This study was intended to carry out in Wolaita Zone, SNNPR. The populations for this study were one secondary school i.e. Tebela secondary school from Humbo district. From this school, 4(four) teachers and six(6)students were selected by using purposive sampling technique. The purposive sampling technique used since it enabled the

researcher to get the research subjects who could provide appropriate data. Thus, the total population of the study was10 (ten).

2.4 Sample size and Sampling Technique

According to the purpose of the study, the sample size of the study was   selected. The total size of the study participants were 10. Hence, the study subjects were selected by using purposive sampling method and this   was because of the intention of having the participants who could provide relevant information to the intended study. From the selected school, only grades 9 students were selected purposively to obtain pertinent data. Again from grades-9 two sections were selected by using random sampling technique so as to minimize   un necessary bias. From each section, only 3 students were selected by using purposive sampling technique as it helped the researcher get better respondents and four(4) teachers were selected using the same techniques so as to participate active Wolaita language. Thus, from two sections (3x2=6) students and 4 teachers were selected for interview. Therefore, the total population of the study was 10.

2.5. Tools for Data Collection

1.1   Two instruments were used to collect data for this study. These were interview and observation. These tools were valid as relevant and intended data was obtained through them.

2.6. Data analysis

The data were effectively   collected   using the two instruments and analyzed qualitatively in the form of a text. This was because the data were collected qualitatively by using interview and observation which need textual analysis. Therefore, the data gathered by using these two tools were analyzed qualitatively. During analysis priority were given to class room observation   and then to interview. The data gathered using these tools were analyzed in the form of text. After that the result of data gathered by using the two tools were triangulated to provide comprehensive final findings.

3. DISCUSSION AND ANALYSIS

The strategies and roles used currently by the teachers to implement student -centered teaching approach in Wolaita language classroom in Tebela secondary school.

The data found from classroom observation in Tebela secondary schools shows that teachers did not arrange the classroom properly in a way that is easy for the students to work cooperatively with one another. It also indicated that teachers did not participate the students on group work and pair work. The interview data also supported the information found from the class room observation. Here are some responses :

Teacher enters the class and start teaching rather than checking and arranging the classroom and due to this students do not sit in a way that is suitable for group and pair work.(S1&S4). Most of the time we do not involve in group work in pair. Teachers simply work to cover the portion rather that giving chances for us.

The above interview data clearly shows that teachers do not arrange the class room before start teaching. Teachers also do not involve the students in pair and in group.

Therefore, based on the above classroom observation and interview data we can generalize that teachers did not arrange the classroom properly in a way that is easy for the students to work cooperatively with one another and they also did not properly involve students in group and pair work.

4.   CONCLUSIONS   AND RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made.

- The study disclosed that teachers did not arrange the classroom properly in a way that is easy for the students to work cooperatively with one another and they also did not properly involve students in group and pair work.
- The research findings plainly indicated that teachers did not ask students different types of questions and they also did not praise the students who answer
- The study also clearly designated that teachers teach the students in the form of game and they also use target language in the classroom.

- The study proved that teachers identify and explain new ideas to the students and they also offer clear instructions to the students to do activities.
- The research findings clearly shows that teachers well treat the students whenever they made mistakes.
- The findings of the study approved that teachers do not accommodate students with various learning styles and level of achievement.
- Teachers should consider students with various types learning styles and should address all of them when teaching.

4.1 Recommendations

- Teachers should arrange the classroom before start teaching. They should be sure that there are spaces between chairs, tables and desks so as to effectively implement student- centered teaching.
- Before classroom teaching, teachers should let students sit in group or in pair. This also helps teachers to be effective in applying student -centered teaching approach. Teachers also should encourage and involve the students in group work so as to ensure the student centered teaching.
- Teachers should raise various questions to the students so as to rouse students' interest towards students centered teaching approach.

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