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Metro Train Safety and Ticket Checking System

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Abstract: Nowadays the modern technologies are helpful in all aspects of our life. Due to this lots of development done in the field of transportation. Thus it can be seen from the trending aspects of railways that they are primarily focusing on increasing the speed rather than SAFETY of the passenger. An efficient utilization of RFID with embedded system facilitate the smart ticketing in metro trains is proposed. This system explains the installation of RFID reader circuit in each and every train stations in metro rail to facilitate the calculation of ticket and passenger .So this system is useful to protect precious lives of passengers and minimize the heavy damages due to the fire accidents control .The objective of this paper is to design an Automatic Fire initiated braking and water pump system for trains .This system consists a microcontroller, motor, fire and smoke sensor, fan, and alert system.

Keywords: DC motor, metro train, IR sensor, Fire sensor, GSM, RFID module, Arduino uno.

1. INTRODUCTION

Accidents which include fire are one of the most dangerous incidents possible in trains. The rapid detection of a fire and its control can save several lives, thousands of injuries, and millions of rupees in property loss .The purpose of this paper to propose an 'Automatic Fire-Initiated and thicket checking Alert System is to detect an occurrence, alert the control panel and proper authorities, and notify the occupants to take action and make the train to stop and water pump is activated instantaneously.

The operation of the metro train is controlled by a central processor unit like Arduino controller, 8051processor or PIC controllers .The intent of this project is ticket checking the metro train automatically with the help of sensors and safety of passengers is the basic concern of our model-based prototype metro train .The stoppage of the train on the stations is also predefined. The RFID sensors and RFID tags are used for checking of the ticket. The whole operation of the train is controlled and performed by a controller.

This project uses Arduino uno as the main controller of the whole system. The operation and control of the train are performed by the Arduino. The different operation or functions of the train is carried out by fetching the programs in the Arduino by using the Arduino IDE software

Some other additional features like LCD display to give messages to the passengers, GSM-based SMS facility to know the position or location of the train and give that information to the control center by SMS service .fire to give indication to the passengers for LCD messages as well as for indication of door operation, automatic door controlling, passenger counting section by using IR modules.

2. RFID TAG

RFID tags are the components which are uses for the purpose of identification .The tag have a sequential arrangement of metal pins. The most significant feature of this is the uniqueness exhibited by each of them. Depends on the power source applied to the tag and the maximum range, the tags are divided into:

a) Active tag: An active tag has an internal battery circuit that supplies power to magnetize the tag.

b) Passive tag: Passive tag is completely dependent on the reader for the required power .The major advantage of the use of these active tags is that these tags can broadcast the signals efficiently up to a distance of 100 feet whereas the latter is limited to a maximum distance of 200 feet. The tags can further be classified depending on the signal transmitted. The active tags transmit signals independent of the reader, whereas passive tags are completely dependent on the signal from the reader to transmit information. In most RFID tags contain at least two parts

i). First one is an integrated circuit for storing and processing information, modulating and demodulating a RF signal, and other specialized functions.

ii). Second is an antenna for receiving and transmitting the signal

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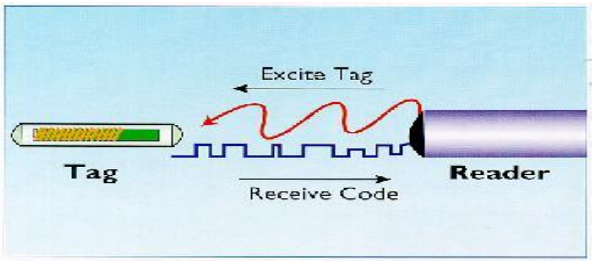

Figure . 1 Interaction between tag and reader

3. BLOCK DIAGRAM

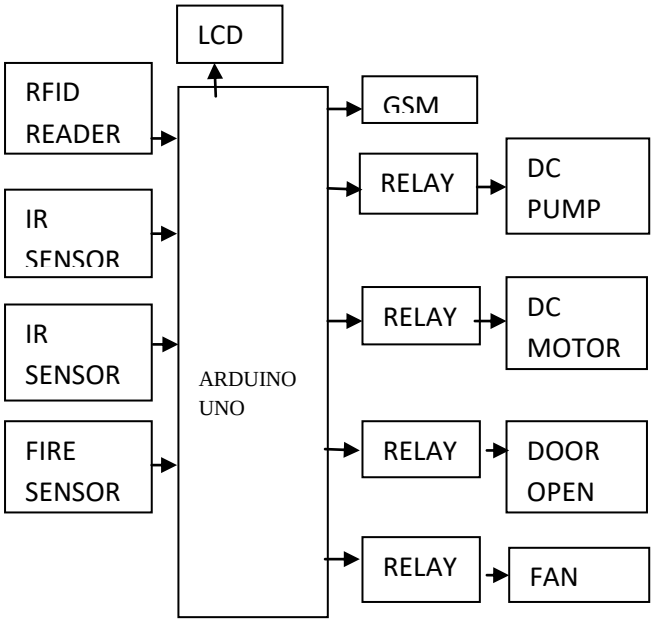

Figure .2 Block diagram of metro train safety and ticket checking system

4. PROPOSED SYSTEM

This proposed system is an automatic ticket checking and Passenger safety of the metro train. We have used Arduino uno as the main controller. The supply of 5V to the Arduino is given by a source like power bank. All the components which are used for the different operation of the train are connected to the Arduino.

At first, the train will get supply from a source and gets ready to move. Here we have used the 12V DC motor for giving supply to the water pump and door motor. But before that, the LCD will display the message that “The train will be fire and inform the station in few minutes”. The message will be send fire station and control station.

The passengers counting section came into action and count the passenger by use of IR modules and display it on the LCD. Then the LCD will display the message that “Doors are closing”. The state of the motor is changed from off state.

In this proposed system, the passengers need not to wait in the ticket counter to get the ticket. It saves the time for the passengers. By this system, we can reduce the fraudulent activities and accidents.

The role of any train conveyance system is to provide secure, consistent, efficient and high-quality service to passengers. As many transit lines run at or near their capacity limits, automation is often the only way to maximize the operative performance of a train service system. Applied on prevailing lines, mechanization is in many cases more remunerative than constructing new lines or increasing platforms

The passengers counting section came into action and count the passenger by use of IR modules and display it on the LCD. Then the LCD will display the message that “Doors are closing”.

When the train is arriving on the station, the LCD will display the message that “Train is arriving on the station in few minutes” with buzzer operation. The state of the motor changes from on state to off state by use of RFID sensor and RFID tags. RFID sensor is fixed on the train and RFID tags are fixed near the station.

By detection of RFID tags by RFID sensor, the train changes its state of motors from on state to off state. Then the LCD will display the message that “The doors are opening” and the door control will open the door. The whole operation of departure and arrival is repeated on every station during the train operation.

This project also contains some additional features like GSM based SMS service. We can track the position of the train by using this system and send the information to the control center by using this service.

The train stops and starts automatically and the doors are closed and opened automatically. The start/stop operation with respect to the doors open/close is performed repeatedly until there is any detection in object

This project also includes smoke detection via the MQ2 smoke sensor for the protection purpose. When there is some problem in the train due to system failure or electric shocks, smoke is produced which is detected by the smoke sensor and give the signal to the Arduino for protection of the train. It protects the train against fire as well as short circuits in the train.

This project also consist an emergency braking button placed on the train. It is used at the time of emergency for pply brakes on the train. We have also used vibration sensor for the protection purpose. When the emergency occurs in the train due to any type of failure, that causes vibration and so vibration sensor senses it and gives an indication to control center by GSM facility.

5. RESULTS

We have demonstrated this project by built a prototype model of driverless metro train. We have used DC gear motors and connected it to the wheels. A simple CD drive is

used for automatic door operation. A DC motor is used for door operation. It is to be noted that a buzzer will operate at every door operation function.

By running this prototype model we got results as getting messages like the name of the station, the number of passengers and door position on LCD display.

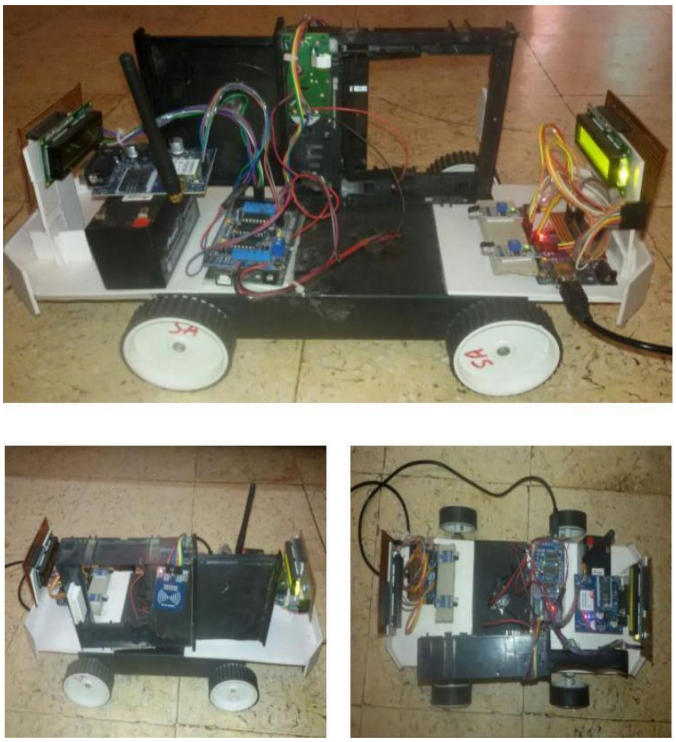

Figure .3 Prototype model of safety system

The speed of the motor is controlled by the motor driver IC and the supply to the motor driver IC and door motor is given by battery of 12 volts.

The door is automatically open and close with detection of the station by RFID sensors. There is some delay is provided between opening and closing of the doors by means of programming.

Detection of the station is done by sensing RFID tags by RFID sensor and it gives a signal to change the motor state from on state to off state.

The passengers will scan their tickets through the barcode scanner which will be there in the respective boogie and accordingly the ticket distribution systems located at various stations will be updated. The train on which station is detected by the RFID sensor by sensing the RFID tags on that station.

GSM system the passengers will scan their Ticket through the barcode scanner which will be there in the respective boogie and accordingly the ticket distribution systems located at various stations will be updated.

The vibration sensor has come into action when the vibrations in the train due to some fault are exceeded from the predefined limit. It sends the signal to Arduino and that signal can be sent to control center by using GSM module.

6. CONCLUTION

The train on which station is detected by the RFID sensor by sensing the RFID tags on that station. So we can get the location of the train on the particular station by GSM system.

The main focus of the paper is to apply the brakes to stop the train as soon as the fire is detected and send signals to driver and the guard so that they can take the necessary measures .Our metro train safety project provides the unique features like it provide fully automatic operation with less time, less consumption of electricity, smoke detection etc. The ticket checking system is the used to the RFID tag. The proposed system can also be implemented in other places like toll gates, bus ticketing and others It reduces the over. One advantage of this system is to transport more people than the normal metro train services. This system makes a better way to build smart cities as well as to provide better metro rail services to the society.

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An Innovative Approach of Big Data and Internet of Things Using 5G Network

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Abstract: The Big Data has achieved huge attentiveness from the educational world and the IT industry. In the digital and computing world, in order is produced and composed at velocities that quickly go beyond the boundary range. Presently, over 3 billion people world wide are connected to the Internet, and over 6 billion individuals own movable phones. By 2020, 50 billion devices are expected to be connected to the Internet. At this point, predicted data production will be 44 times greater than that in 2009. As in sequence is transferred and communal at light speed on optic fiber and wireless networks, the volume of data and the speed of market growth increase. On the other hand, the fast growth rate of such large data generates numerous challenges, such as the rapid growth of data, transfer speed, diverse data, and security. Nevertheless, Big Data is still in its immaturity stage, and the area has not been reviewed in general. Hence, this study expansively surveys and classifies the various attributes of Big Data, including its nature, definitions, rapid growth rate, volume, management, analysis, and security. Cloud computing has unlock up new opportunities for testing departments. New technology and social connectivity trends are creating a perfect storm of opportunity, enabling cloud to transform internal operations, Customer associations and industry value chains. To ensure high quality of cloud applications under development, developer must perform testing to examine the quality and accuracy whatever they design. Business consumers are drawn to the clouds simplified, self- service experience and new service capabilities. In this research paper, we speak to a testing ecological architecture with precious key benefits, to execute execution of test cases and used testing methodologies to improve excellence of cloud applications.

Keywords: Big data, Data analytics, Data management, Big data-as-a-service, Analytics-as-a-service, Internet of Things Storage cloud computing,

1. INTRODUCTION

The Internet dissemination endlessly enhances, as additional and supplementary people browse the Web, use email and social network applications to speak with each extra or access wireless multimedia services, such as mobile TV. Furthermore, numerous challenging mobile network services are now accessible, which necessitate increased data rates for specific operations, such as apparatus storage synchronization to cloud computing servers or high resolution video. The rights to use to such a worldwide in sequence and communication infrastructure along with the advances in digital sensors and storage have produced very large amounts of data, such as Internet, sensor, streaming or mobile device data. Additionally, data analysis is the basis for investigations in many fields of knowledge, such as science, engineering or management. Unlike web-based big data, location data is an essential component of mobile big data, which are harnessed to optimize and personalize mobile services. Therefore, an era where data storage and computing become utilities that are ubiquitously available is now introduced. Furthermore, algorithms have been developed to connect data sets and enable more sophisticated analysis. Ever since innovations in data architecture are on our doorstep, the 'big data' paradigm refers to very large and complex data sets (i.e., petabytes and hex bytes of data) that traditional data processing systems are inadequate to capture, store and analyze, seeking to glean intelligence from data and translate it into competitive advantage. As an consequence, big data needs additional computing power and storage provided by cloud computing platforms. In this context, cloud providers, such as IBM, Google, Amazon and Microsoft, provide network-accessible storage cost by the gigabyte-month and calculate cycle's worth by the CPU-hour.

II. BIG DATA: VS IOT

Big data" and "IoT" are scorching terms, and in Information Technology circles, it's hard to speak about one devoid of the other. Yet, regardless of their intimate connection, they are, in fact, two different technology trends. Here we breakdown how big data and Internet of Things are different.[1]

A. Two very different concepts

Big data, as its family name indicates, characterizes enormous amounts of data. But, that's not all. In adding up to volume, IBM data scientists have recognized big data to show variety, velocity and veracity. Big data is a consequence of a variety of sources – social media, selling's, venture content, sensors and mobile devices, among many others. Rapidity refers to the speed at which big data is composed. Each 60 seconds, there are 72 hours of footage uploaded to YouTube, 216,000 Instagram posts and 204 million emails sent. In regards to veracity, the data collected needs to be of good quality that is continuously updated in real-time. Analyzing big data can offer superior value to the companies and individuals who use it. The Internet of Things (IoT), on the other hand, turns day by day "things" into smart objects. Fridges, watches, thermostats, cars, shipping containers, are prepared with sensors that attach to the Internet and each other to collect and transmit data. This information can become big data when it is shared with information from other sources and meets the other measurements defined above.[2]

B. Diverse time sequencing

Big data is paying attention on the long-game. Big data bring together enormous amounts of data, but it doesn't influence the information to make real-time decisions. Instead, there is more often than not a lag between when the data is collected and when the data is analyzed. For IoT, time is of the essence. It collects and uses data in real-time to optimize operations; become aware of security breaches, correct malfunction and more. IoT data analytics must include administration real-time streaming data, and making real-time analytics and real-time decisions "at the edge" of the network, says Bill Schmarzo, CTO for Dell EMC Services' Big Data Practice. Streaming data management must have the ability to ingest, combined (mean, median, mode) and compress real-time data from sensor devices at the edge. Edge analytics would robotically analyze real-time sensor data and render real-time decisions (actions) that optimize operational performance (blade angle or yaw) or would flag unusual performance or behaviors for instantaneous investigation (security breaches, fraud detection)

C. Diverging Investigative goals

Big data scrutinize regularly human-generated data in the recreation of discovery prototype in human behaviors and movement. To ensure confidence in any human-related patterns, an hard to believe amount of data from multiple sources over longer periods of time is required. This give details the longer lead time required for big data. It is for this reason that big data is used for long-term projects like projecting maintenance, capacity planning, customer 360 and revenue protection. On the contradictory spectrum, IoT aggregates and compresses machine-produce data from a mixture of sensors that include RFIDs, fitness trackers, virtual reality devices, smart air purifiers and every other smart device. The ambition in collecting this data through effective IoT device management is to track and monitor assets and be able to correct problems in real-time. For example, the sensors in a smart garbage container will indicate when it is near capacity. This knowledge is then used to schedule a garbage collector to empty the bin. Big data and IoT are different, but they are intricately linked. Used in racing bike, IoT delivers the information from which big data analytics can sketch the information to create the obligatory insights – helping businesses not only react to problems as they occur, but forecast them and fix them ahead of time.

III. IoT HISTORY

Internet of things from the 1832 can see the different landmark of Electronics and telecommunication. I would like to recall the history of telecommunication and internet from the article History of IoT, that was written on Post capes (2016), catalogs following milestones 1832: An electromagnetic telegraph was created by Baron Schilling from Russia 1844: Samuel Morse sends first Morse code public message 1926: Nikola Tesla to Colliers magazine: "When wireless*1 is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole and the instruments through which we shall be able to do this will be amazingly simple compared with our present telephone. A man will be able to carry one in his vest pocket."

1964: Marshall McLuhan "....by means of electric media, we set up a dynamic by which all previous technologies -- including cities -- will be translated into information systems"
1969: ARPANET developed
1974: TCP/IP started
1989: Tim Berners-Lee proposes World Wide Web
1990: Toaster was created by John Romkey 1
1991: First web page 1995: First e-commerce service started (Amazon, Echo Bay or eBay). 1998: Google integrated.
1998: Mark Weiser: "Ubiquitous computing is approximately the opposite of virtual reality," Weiser wrote "Where virtual reality puts people inside a computer-generated world, ubiquitous computing forces the computer to live out here in the world with people."
1999: The internet of things not precisely exact but the concept was introduced. The Auto-ID Centre Kevin Ashton described Internet of things "I could be wrong, but I am moderately sure the phrase "Internet of

Things" started life as the title of a presentation I made at Proctor & Gamble (P&G) in 1999.Linking the new idea of RFID in P&G's supply chain to the then-red-hot topic of the Internet was more than just a good way to get executive attention. It summed up an important approaching which is still often misunderstood."

Fig:1 An IOT Analytics system with Matlab

2000 to 2004: The term Internet of things or connected word that was remained in Guardian and other Scientific American magazines. There were some discussions about in near future devices that will automatically connect and works independently with very less instructions. When RFID developed on massive scale then the concept of IoT is becoming more and clearer.

2005: Then in 2005 after previous terms become visible in protector and other systematic publications the term starts to gain more popularity so the ITU (International Telecommunication Union) and the first report is published: "A new measurement has been added to the world of in sequence and communiqué technologies (ICTs): from anytime, anyplace connectivity for anyone, we will now have connectivity for anything. Connections will multiply and generate an completely new dynamic network of networks – an Internet of Things"

2006-2008: European Union recognized the Internet of things term in a consultation that was held IPSO alliance (members are: Ericsson, Google, Cisco, SAP, Sun, Fujitsu and Bosch, Intel) opened for study to promote the IP network of smart object and to empower IoT. (IPSO alliance.)[4]

2011: IPv6 was launched After 2011 the big companies like Cisco, Ericsson, IBM produces large educational and promotion intuitive on IoT or other related terms. We can divide internet of things into many stages I have drawn a figure that illustrated the timeline and growth of internet of things.

The time duration is indicated from 2004 to 2018.So the IoT is coming with huge possibilities and challenges for the business and all aspects of the life. The popularity is marked between 0 to 120 where value of 60 means half as popular. Today the google trends IoT popularity worldwide is around 80% so it is very popular and its becoming more popular as the concept is coming to reality. The top five countries that is are more interested are South Korea, St. Helena, Japan, Singapore, Taiwan, Finland is at 21st place as of today about IoT term reputation search on Google.

IV. HOW 5G DIFFERS FROM 3G AND 4G

5G is not merely a supplementary room of 3G and 4G. Instead, it is a transformative ecological unit that includes a heterogeneous network that integrates 4G, Wi-Fi, millimeter wave, and other wireless access technologies. It merge cloud transportation, a virtualized network core, intelligent edge services, and a scattered computing model that derives insight from the data generated by billions of devices. According to Asha Keddy, Vice President in the Platform Engineering Group and General Manager of Next Generation and Standards at Intel, "5G is much more than a G. It is much more transformative. With 5G, we will be moving from a user centric world to one of massive machine type communications where the set of connections will move from enabling millions to billions of devices—an era that will connect these devices intelligently and usher in the commoditization of information and intelligence."5 The promising group capitalizes on a mixture of interfaces across licensed, licensed shared, and unlicensed spectrum in low-, mid-, and high-frequency bands. By design, it will not only increase capacity, it also will enable even the smallest devices to perform high-level working out and connect quickly to processing power that is diffused throughout the system.6 It is imperative to note that 5G is an end-to-end system that shifts communications to a computing platform. 5G symbolize a development from a point-to-point system to one that senses data from billions of devices and works to move those communication packets seamlessly to the right device, using the suitable processing platform. Four factors differentiate 5G from its predecessors: connected devices, fast and intelligent networks, back-end services, and extremely low latency. These qualities enable a fully connected and interactive world with a variety of applications. This includes enhanced mobile broadband, machine-to-machine communications, artificial intelligence, and highly developed digital services

A. 50 billion devices and 212 billion sensors

By 2020, the 5G network is expected to support 50 billion connected devices and 212 billion connected sensors as well as enable access to 44 zettabytes (ZB) of data.7 This will range from smart phones and tablets to smart watches, cars, machinery, appliances, and remote monitoring devices.8 All of these will generate a massive amount of "useful data" that can be analyzed. Indeed, researchers estimate that this connected ecosystem will make it possible to utilize a much larger percent of digital data (35 percent) than before (5 percent).

B. Fast, intelligent networks

High broadband speeds and intelligent networks will characterize the 5G network. Currently, it takes about eight minutes to download a feature movie using 4G; people will be able to do this in less than five seconds with 5G.10 The speed of the network will enable applications such as social gaming, interactive television, high definition and 3-D video, virtual reality, robotics, driverless cars, and advanced manufacturing, among others.

C. Back-end services

The up-and-coming network will enlist back-end data centers, cloud services, and remote file servers into a computational behemoth. There will be "computing at the edge," which means that computations can be performed near the source or in the cloud, depending on the immediate need. These 5G innovations will allow applications to quickly process content and provide an experience that is very responsive. This will make computing more economical, more efficient, and we'll see savings on storage costs. At the same time, as devices make their way into the hands of users, data center network infrastructure and cloud services are evolving to meet the needs of new business. Systems will be optimized so that software can perform difficult tasks and network functions unfettered from physical hardware. That increases network agility, and allows for rapid and customized configurations.

D. Low latency

Latency refers to the time among when people request that a computing command be executed and the actual implementation of that task. In today's mobile world, execution takes place in around 50 to 80 milliseconds. That is a sufficient amount of time for voice, email, and web surfing, which is the bulk of current usage.

Fig:2. 5G Network

V. BIG DATA SPECIFICATIONS

A. Information Increase Rapidly

The rate of 10x every five years [6]. From 1986 to 2007, the international aptitude for hi-tech data storage, computation, handing out, and communication were tracked through 60 analogues and digital technologies in 2007, the capacity for storage in general-purpose computers was 2.9 × 1020 bytes (optimally compressed) and that for communication was 2.0 × 1021 bytes. These computers could also provide accommodation 6.4 × 1018 instructions per second. However, the computing volume of general-purpose computers increases annually at a rate of 58%. In computational sciences, Big Data is a weighty issue that requires serious attention. Thus far, the indispensable landscapes of Big Data have not been unified. Furthermore, Big Data cannot be procedure using existing technologies and methods. Therefore the generation of incalculable data by the fields of science, business, and society is a global problem. With respect to data analytics, for example, procedures and average tools have not been planned to explore and analyze large datasets. As a result, associations come across early challenges in creating, managing, and manipulating large datasets. Systems of data duplication have also displayed some security weaknesses with respect to the creation of multiple copies, data governance, and policy. These policies define the data that are accumulate analyzed, and accessed. They also determine the weight of these data. To process shapeless data sources in Big Data projects, concerns regarding the scalability, low latency, and performance of data road and rail networks and their data centers must be addressed. In the IT industry as a whole, the rapid rise of Big Data has engendered new issues and challenges with respect to data management and analysis. Five common issues are volume, variety, velocity, value, and complexity according to in this study, there are additional issues related to data, such as the fast growth of volume, variety, value, management, and security. Each issue represents a serious problem of technical research that requires discussion. Hence, this research proposes a data life cycle that uses the technologies and terminologies of Big Data. Future research directions in this field are determined based on opportunities and several open issues in Big Data domination. This groups the critical issues in Big Data into three categories based on the commonality of the challenge.

B. Volume of Big Data

The volume of Big Data is characteristically large. However, it does not require a convinced amount of petabytes. The increase in the volume of various data records is naturally managed by purchasing additional online storage; however, the virtual value of each data point decreases in proportion to aspects such as age, type, quantity, and richness. Thus, such expenses are unreasonable (Doug, 212). The following two subsections detail the volume of Big Data in relation to the rapid growth of data and the development rate of hard disk drives (HDDs). It also examines Big Data in the present atmosphere of endeavor and technologies.[8]

C. Swift Growth of Data

The data type that increases most speedily is shapeless data. This data type is distinguish by "human information" such as high-definition videos, movies, photos, scientific simulations, financial transactions, phone records, genomic datasets, seismic images, geospatial maps, e-mail, tweets, Face book data, call-center conversations, mobile phone calls, website clicks, documents, sensor data, telemetry, medical records and images, climatology and weather records, log files, and text. According to Computer World, formless information may account for more than 70% to 80%of all data in organizations. These data, which mostly originate from social media, constitute 80% of the data worldwide and account for 95% of Big Data. Currently, 87% of IT managers process unstructured data, and this percentage is expected to drop by 47% in the near future. Most shapeless data are not modeled, are random, and are difficult to analyze. For many organizations, appropriate strategies must be developed to manage such data. Table 1 describes the rapid production of data in various organizations further. According to Industrial Development Corporation (IDC) and EMC Corporation, the amount of data generated in 2020 will be 47 times greater [40 zetta bytes (ZB)] than in 2009. This rate of increase is expected to persist at 55% to 65% annually. To store the increased amount of data, HDDs must have large storage capacities. Therefore, the following section investigates the development rate of HDDs C. Development Rate of Hard Disk Drives (HDDs).

The demand for digital storage is highly elastic. It cannot be completely met and is controlled only by budgets and management capability and capacity. Goda et al. (2002) and discuss the history of storage devices, starting with magnetic tapes and disks and optical, solid-state, and electromechanical devices. Prior to the digital revolution, information was predominantly stored in analogue videotapes according to the available bits. As of 2007, however, most data are stored in HDDs (52%), followed by optical storage (28%) and digital tapes (roughly 11%). Paper-based storage has dwindled 0.33% in 1986 to 0.007% in 2007, although its capacity has steadily increased (from 8.7 optimally compressed PB to 19.4 optimally compressed PB). Although the topic of IoT security is gaining increasing traction in the networking community, we believe that some important research challenges related to the field still remain substantially unexplored. We summarize and discuss the challenges below, hoping that the following roadmap will eventually stimulate discussion and further research and development in the IoT research community at large.

VI. RESEARCH CHALLENGES IN IOT

A. Toward Secure-by-design IoT Systems

The most important takeaway from the previous discussion is that, as yet, IoT security has been so far approached in an ad-hoc fashion, where countermeasures are not planned for beforehand but instead temporary measures (i.e., "patches") are put in place when an attack is discovered. Considering that the IoT will work at a scale in the order of billions of devices, these patches are not adequate to address the need of homogeneous, standard, widely-adopted security procedures. Our vision is the following. We believe that the complexity and the scale of the IoT require the enactment of a novel, holistic approach to IoT security, where security is approached in a proactive fashion and threats are addressed in a scalable and reliable manner. The IoT technology landscape of today is too complex and disruptive for security to be more than a set of loosely-integrated solutions. On the contrary, security must be deeply embedded in every stage of the production cycle, from product design to development and deployment. Too often, security tends to be an afterthought in development, and while there are exceptions, in many cases economic drivers or lack of awareness of the risks cause businesses to push IoT devices to market with little regard for their security. For these reasons, the concept of security-by-design should be a main driving force in future IoT security research. The secure-by-design approach to IoT security offers several advantages with respect to previous paradigms. First, it provides a framework that abstracts from the specific security threat and tackles classes of problems, rather than a series of specific threats. Second, it stimulates IoT system designers to be proactive in considering security, and to come up with a security design plan that formalizes and addresses threats before their device/technology is released on the market. Third, it is flexible and scalable, since the control and learning modules can be designed and implemented both at the device and the system level to address different security threats, as we will discuss later. Although the secure-by-design approach provides advantages, it also comes with novel and exciting technical challenges. We recognize two main research challenges toward the implementation of our IoT security framework, which are summarized below.

B. Learning to Detect and Mitigate IoT Security Threats.

In every control and learning problem, the inputs and the state of the system must be properly modeled and formalized. This aspect is significantly challenging in the context of the IoT, as devices may generate significantly heterogeneous data (i.e., multimedia, text, sensory). After modeling states and inputs, it is

necessary to design mechanisms able to detect and mitigate threats based on the current state and input. This implies that the characterization of "good" and "bad" states has to be factored into the mechanism design.

C. Design of Polymorphic Hardware and Software Modules to Enact Mitigation

When a threat has been detected, it is necessary to enact countermeasures so as to swiftly mitigate the effect of the ongoing attack. This critical aspect requires the design of hardware and software modules able to "polymorphically" adapt to different requirements and thus swiftly put in action the necessary counterattack strategies.

D. Existing Work on Machine Learning and Software defined Networking for IoT Security

Although ML can be considered a mature field, few works have applied ML techniques to solve issues related to IoT security. Recently, Zhang et al. have proposed a framework [18] to detect and mitigate cross-layer wireless attacks based on the application of Bayesian learning [184]. Specifically, the framework establishes a probabilistic relation between an hypothesis (i.e., the attack is likely taking place) and the supporting evidence (i.e., there are signs of attack activities). This allows to update the hypothesis dynamically when new evidence is available. Therefore, the more evidence is gathered, the more accurate is the resulting hypothesis. The authors demonstrate through experiments and simulations that even small-scale malicious activities can still be detected with high confidence, as long as enough evidence is accumulated.[6]

E. Explore the Use of Reinforcement Learning

An area that is yet to be explored is the opportunity of leveraging unsupervised learning to implement secure-bydesign IoT systems. Specifically, reinforcement learning (RL), which is ML inspired by behaviourist psychology, deals with how agents ought to take actions in an environment so as to maximize a cumulative reward. The problem, due to its generality, is studied in many other disciplines, such as game theory, control theory, operations research, information theory, simulation-based optimization, multi-agent systems, swarm intelligence, statistics and genetic algorithms, among others . The advantage of RL for the IoT context is that there is no need for training or datasets, as the nodes can learn by themselves what is the right strategy to achieve the maximum reward according to the current state.

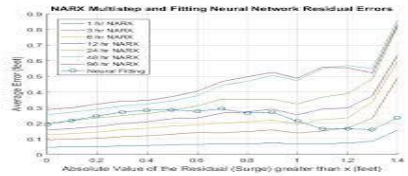

Fig:2 An IOT Analytics system with Matlab

F. Blockchain for Decentralized IoT Security

Although being originally designed to store and validate cryptocurrency transactions, the blockchain has recently attracted much in the IoT networking research community to address scalability and security problems.The blockchain technology relies on decentralized, and thus scalable, consensus mechanisms that check, verify and store transactions in the blockchain while guaranteeing protection against data tampering attacks.

VII. CONCLUSION

The IoT is revolutionizing the world around us by empowering every device, object and person to be connected to the Internet. With such massive presence of interconnected things deployed all around us, and in some cases inside us, the IoT offers exciting yet significant security research challenges that need to be addressed in the upcoming years. In this paper, we have provided our novel perspective on the issue of IoT security, which is based on a unique mixture of the notions of security-by-design, polymorphism, and software-defined networking. We have categorized and summarized the relevant state-of-the-art research, and proposed a roadmap of future research issues. We hope that this work will inspire fellow researchers to investigate topics pertaining to IoT security and keep on the race for a more secure technological world.

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Production of Liquid Biofuel from Algae

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Abstract: Biodiesel has gained much attention in recent years due to its eco-friendly nature, non-toxic characteristics, biodegradability and lower net carbon cycle compared to conventional diesel fuels. In the first step, oil from algae specie was extracted using Petroleum Ether as solvents, while in the second stage; extracted oil was converted into biodiesel. The effects of solvent to oil ratio, size of algal biomass and contact time were studied on the percentage yield of oil extracted. Renewable, carbon neutral, transport fuels are necessary for environmental and economic sustainability. The maximum extracted oil was 220ml by using a blend of solvent at solvent to biomass ratio of 10:1, approximately algal biomass size of 0.4 mm and contact time of 30, 12 and 11 mins.

Keywords: Algae, biodiesel, biomass, renewable energy

1. INTRODUCTION

Algae or microalgae is sunlight-driven cell factories that convert carbon dioxide to potential biofuels, foods, feeds and high-value bio actives and as nitrogen fixing bio fertilizers. This article focuses on algae as a potential source of biodiesel. Algae can provide several different types of renewable biofuels. These include methane produced by anaerobic digestion of the algal biomass. Biodiesel derived from algal oil. Biodiesel is produced currently from plant and animal oils, but not from microalgae or algae. This is likely to change as several companies are attempting to commercialize algal biodiesel. Biodiesel is a proven fuel. Technology for producing and using biodiesel has been known for more than 50 years. Other sources of commercial biodiesel include canola oil, animal fat, palm oil, corn oil, waste cooking oil jatropha oil. The typically used process for commercial production of biodiesel. Production of methyl esters, or biodiesel from algal oil has been demonstrated.

2. EXPERIMENT

2.1. Collection and pretreatment of algae specie

The algae samples were collected from our university ponds. The samples were spread under sun in an open area for 48 hours to evaporate the amount of water associated with biomass. The dried samples were grinded, and the fine powder was passed through a 500 micron sieve, to remove the oversize particles. This step is necessary, to get smaller size particles which will have a physical contact with the solvent used for extraction. Figure 1 showed grinding of algae.

Figure 1. Grinding of algae

2.2. Treatment with Solvent

30 gram of grinded algal biomass was treated with 300 ml of Petroleum Ether. Solvent petroleum ether was used for the extraction of oil from algal biomass. The results are shown in Table 1. The mixture was kept at room temperature for 30 mins. A layer of oil on the solvent surface was formed, which was separated from the residue. Flow chart of Extraction of oil from algal biomass are shown in figure 2.

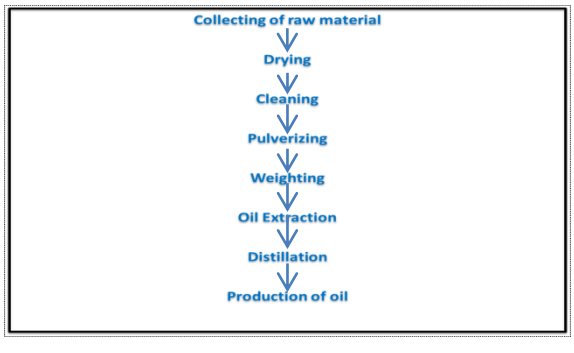

Figure 2. Flow chart of Extraction of oil from algal biomass

2.3. Oil extraction method

Oil extraction from algae biomass was performed in a Soxhlet apparatus using petroleum ether as solvent with sample pre-treatment during 40 min. Soxhlet extractor is a laboratory

apparatus designed to extract substances with a low solubility in the extracting solvent. Figure 3 showed Soxhlet extraction method. Figure 4 showed Petroleum Ether solvent.

Figure 3. Soxhlet extraction method

Figure 4. Petroleum Ether solvent

2.4. Product collection system

The products from the algae are mainly liquids. The algae oils are collected by beaker and then stored in the sample bottles. Figure 5 showed product collection system for soxhlet extraction method.

Figure 5. Product collection system for soxhlet extraction method

3. RESULTS AND DISCUSSION

Table 1. Amount of oil extracted using solvent

Sr No.	Algae, g	Petroleum Ether, ml	Oil, ml	Temperature, ˚C	Time, min
1	30	300	220	40-60	30
2	30	300	220	40-60	12
3	30	300	220	40-60	11

Table 1 showed Amount of oil extracted using solvent. According to their various conditions, it is effect of solvent to algae ratio, size of algal biomass, contact time on the amount of extracted oil, reaction temperature also affects the amount of biodiesel production. The temperature was varied from 40 to 60 ˚C. Reaction is carried out near the boiling point of methanol under atmospheric conditions. It was observed that higher temperature favors the biodiesel production. In this study, maximum biodiesel produced at 60 ˚C, which is in agreement with the available literature. The reaction time for this study was varied between 11 to 30 minutes and it was observed that the yield increases as the reactants spend more time in the reacting vessel.

4. CONCLUSION

Algae was successfully used as a raw material for biodiesel production. Higher algal to solvent ratio, smaller biomass size and longer contact time will enhance the yield of extracted oil. Technology based in these microorganisms currently represents an opportunity for GHG reduction from anthropogenic activities. Biofuels as biodiesel, bioethanol, bio-oil, bio-hydrogen or biogas can be produced. Algae biomass can be used as feedstock for bio-refineries to produce different kinds of products (energy, food, plastics, and fertilizers). Algae appear to be the only source of renewable biodiesel that is capable of meeting the global demand for transport fuels.

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0-1 Integer Programming Formulation for Solving the Student Project Assignment Problem

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Abstract: The assignment process for graduated students at the beginning of each semester is an important process for all academic programs at Benghazi University. This paper presents a model that includes a number of constraints relating to the minimum and maximum number of students in each academic program and the prerequisites and corequisites for each project in each academic program. The objective is to determine a way to assign students to projects according to their preferences. A linear grade function that represents the preferences of each student is introduced to be maximized. A 0-1 integer programming formulation is proposed that was implemented using data from the 2008 fall and 2009 spring semesters in the Industrial Engineering and Manufacturing Systems Department at the University of Benghazi in Benghazi, Libya. The assignment solutions were obtained using different preference criterions and were then compared with the solutions previously obtained using a manual system.

Keywords: Integer programming, assignment, Lingo program

1. INTRODUCTION

The process of assigning students to their preferred projects is done through the use of a certain criterion. Each student orders the available projects according to their preference on the supplied form. The student is assigned to his preferred project if he has completed its prerequisites and corequisite courses and if the number of students in the project has not exceeded the maximum number permitted. For the prerequisites courses, the student must first pass them successfully, while for the corequisite courses, the student must be enrolled in it at the same time or have taken it previously. Students who do not submit a preference form will be assigned to any project after all the students who filled in the form are scheduled. The criterion used to prioritize the preferences of the students is their average grades or scores. Students with the highest grades or scores will be assigned first to their preferred projects. The average grade is the overall grade of the student divided by the number of semesters he has been enrolled at the university. The average score is the overall score divided by the number of semesters that the student has studied at the university. The manual technique that was traditionally used to assign students to projects is tedious and time-consuming. In addition, it has become more difficult with the increasing number of students. Therefore, this paper presents an integer programming formulation to solve this problem. The specific constraints relating to the graduate student's enrolment data and the permitted number of students in each project will be taken into consideration.

(Amit and Anila,2010) Two methods were proposed to solve such type of fuzzy assignment problems and fuzzy travelling salesman problems . The fuzzy assignment problems and fuzzy travelling salesman problems which were solved by using the proposed methods, which were the optimal solution , and simple to understand and apply .

((Trivikram, Anastasia & Frits, 2012) have considered the multi-level bottleneck assignment problem (MBA) and were described in the previous book ''Assignment Problems'' by Burkard et al. (2009), although its complexity status is called open and have viewed the problem as a special case of a bottleneck m-dimensional multi-index assignment problem, but complexity status it was settle, and they have given approximation algorithms and in approximability results, depending upon the completeness of the underlying graph.

Hadi (2012) has proposed approach as a systematic procedure, simple and can be used for all types of assignment problem with maximizing or minimizing objective functions.

Pavlo and Panos (2007), have represented extensively in the previous studies were used the methods of probabilistic analysis by the assignment problems, and many important problems in operations research and computer science can be formulated as assignment problems. Ralf and Olga(2012) presented an extended integer linear programming formulation which implies by using the hypergraph assignment problem (HAP) is the generalization of assignments from directed graphs to directed hypergraphs and proved that all problems with a simple hyperarc size and hypergraphs with a special partitioned structure the HAP is NP-hard and APX-hard.

Eric and Estelle (2012) used theory and field data to study the draft mechanism to determine courses at Harvard Business School and identified a new relationship between fairness ,design a new draft that reduces these costs and drawed several broader lessons for market design.

2. ALGORITHM

A 0-1 integer programming will be used to formulate and solve the problem of assigning students to projects. This algorithm assigns a set of students to a fixed number of projects. The required data include the allowed number of students in each

project, each student's preferences, and enrolment data of graduate students. The objective of this study is to assign the graduate students in the Industrial and Manufacturing Systems Engineering Department to groups for the available projects.

2.1 Problem formulation

The objective function is given as:

$$Max \quad X_0 = \sum_{i=1}^{n}\sum_{j=1}^{P} C_{ij}x_{ij} \qquad (1)$$

The constraints are as follows:
1. Student assignment constraints:

$$\sum_{j=1}^{P} x_{ij} = 1 \qquad i = 1,2,....,n \qquad (2)$$

2. Upper and lower constraints:

$$\sum_{i=1}^{n} x_{ij} <= U_j \qquad \sum_{i=1}^{n} x_{ij} >= L_j \qquad j = 1, 2, 3, ...P \qquad (3)$$

3. Prerequisite and corequisite courses constraints

$$x_{ij} = 0 \qquad (4)$$

4. Student pre-assignment constraints

$$x_{ij} = 1 \qquad (5)$$
$$x_{ij} = 0 \text{ or } 1$$

Where:

n =	Number of students
P	Number of projects
U_j	Maximum number of students assigned to project j
L_j	Minimum number of students assigned to project j
C_{ij}	Preference-criterion coefficient of student i in project j

$$x_{ij} = \begin{cases} 1 \text{ if student i is assigned to project j} \\ 0 \quad \text{Otherwise} \end{cases}$$

The first term in the objective function (1) represents the preference-criterion coefficient while indicating the priority of students for selecting their preferred projects. This criterion may vary from semester to semester.

Constraints (2) ensure that each student is assigned to only one project. Constraints (3) ensure that the number of students assigned to any project must be within certain department limits. Constraints (4) ensure that student is not assigned to a project when he did not complete the prerequisites or corequisites courses. Constraints (5) ensure that certain students (pre-assignments) are assigned to their specific project.

3. IMPLEMENTATION

3.1 IE department

A regular student enrolled in the Department of Engineering at the University of Benghazi is expected to successfully complete 4 years of study (eight semesters) as part of the B.Sc. degree requirements.

The student must complete the general engineering courses taken in the Engineering Science Department during the first year (two semesters) of study before being assigned to another specialized department, taking his preferences into consideration. In addition, the student is expected to successfully complete a final year engineering project (IE415/IE448, IE416/IE449). At the beginning of each semester, the assignment of students to their preferred projects is prepared manually by an appointed committee consisting of several staff members.

The data for this study was taken from the projects offered in the Industrial Engineering Department in the 2008 to 2009 school year (two semesters). In the fall semester, there were 48 students and 13 projects. The grade criterion gave priority to students with higher average grades. The minimum and maximum numbers of students that could be assigned to each project was two and four, respectively. In the spring semester, there were 29 students and 11 projects. The score criterion gave priority to students with higher average scores. The minimum and maximum numbers of students that could be assigned to each project was two and three, respectively. Three students were already assigned to project 11. These students did not fill out the preference form and were not included in the ordering list.

3.2 The manual system

After each student ordered the available projects according to their preferences, the manual system would assign students according to the grade or score criterion. The student would then be assigned to his preferred project if he had completed the prerequisites and corequisite courses and if the number of students did not exceed the upper limit for the project. The steps of the manual system to assign students to a project were as follows:

Step1: Order the students according to the criterion
Step2: Select the first student on the ordering list and start with their first preferred project
Step3: If the student had completed the prerequisite and corequisite courses and the k^{th} preferred project was not full, then go to step 4; otherwise, go to step5.
Step4: Assign the student to k^{th} preferred project and go to step 6.
Step5: Select the project in the next preference (k) and go to step 3.
Step6: If all students are assigned, stop; otherwise, go on to step 2.

3.3 Results

3.3.1 Results of the manual system

The manual system ordered the students according to their average grades and gave priority to the students with higher average grades for the 2008 fall semester. Project assignment was

done within the conditions for the first students in the ordering list. One problem with the manual system lay in determining if all prerequisites and corequisite courses had been completed for the students at the end of the list; if they had not been completed, then the committee changed the prerequisites courses to corequisite courses, which meant that the students with the higher grades were then not assigned to these preferred projects. Therefore, this assignment process was neither accurate nor just.

For the 2009 spring semester, the students were ordered according to their average score, and student assignments were made according to this criterion; however, the manual system ran into the same problem as before. Last students in the ordering list only had a few projects left that they needed to take, but these projects had already been filled by the students with higher scores. Therefore, these students were assigned to other projects for which they had not completed the prerequisites and corequisite courses. In the manual system, the value of average grade achievement of all student's preferences is 62.83 in fall 2008 while the value of average score achievement of all student's preferences in spring 2009 is 384.45**.** Also, in the 2008 fall semester, 10 projects were full and the 2 other projects only had a few students. In the 2009 spring semester, 6 projects were full and the other projects only had 2 students each.

3.3.2 Results of an integer linear formulation

In this study, a mathematical model was developed to solve the student-project assignment problem in the Industrial and Manufacturing Systems Engineering Department for the 2008 fall and 2009 spring semesters. The problem formulations for the two semesters were solved using the Lingo program. The mathematical model for the fall semester had 624 decision variables, 180 constraints for the prerequisites and corequisite courses conditions, 48 constraints to ensure that each student was assigned to one project, and 26 constraints for project limits. The value of average grade achievement was 81.45, 10 projects were full, one project was at the lower limit of students, and 2 projects had 3 students. In the spring semester, the mathematical model had 260 decision variables, 46 constraints for prerequisites and corequisite course conditions, 26 constraints to ensure that each student was assigned to one project, and 20 constraints for project limits. The value of average score achievement was 1121.27, 6 projects were full, and the rest of projects only had 2 students each.

3.4 Comparison between the manual system and the integer linear programming solution

The proposed algorithm was more successful at assigning all students to projects depending on their preferences than the manual system (see Tables 1 and 2). The numbers in these tables refers to the number of students for which k^{th} preference was achieved.

Table 1. Comparison between the manual system and integer linear programming solutions in the 2008 fall semester

K^{th} Preference	Integer linear programming	Manual system
1	27	21
2	12	12
3	2	4
4	2	2
5	1	-
6	-	2
7	2	3
8	-	-
9	-	2
10	1	-
11	-	-
12	1	2

Table 2. Comparison between the manual system and integer linear programming solution in the 2009 spring semester

Kth Preference	Integer linear programming	Manual system
1	12	11
2	4	4
3	3	1
4	1	2
5	2	3
6	1	1
7	-	-
8	1	1
9	-	-
10	2	3

4. CONCLUSION

From the above results, the manual system did not adequately handle the prerequisites and corequisite course conditions. These constraints were difficult to achieve manually. Also, the committee complained about the difficulty of achieving these constraints each semester. Thus, to solve this problem and to make the work of the manual system easier, an integer programming system was developed to formulate and solve these problems. The objective was to maximum achievement of the project preferences of students with four types of constraints.

As can be seen in the comparison between the integer linear programming and the manual system, the top preference of most students was achieved using the proposed mathematical model as opposed to the manual system because this algorithm provided the optimal solution for this problem. The integer linear formulation can more easily handle the problem of the prerequisitesand corequisite courseconditions. This model can easily be adapted to solving the student-project assignment problem for any semester by setting the coefficient of the objective function independent based on average grades, average scores, or student preferences, or by adding conditions or constraints.

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