

Home Automation and Surveillance: A review

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Abstract—Home automation and Surveillance systems are being consistently undergoing changes due to developments in electronics and communication fields. Right from telephone controlled home appliances and simple camera based system, the Home Automation and Surveillance today has entered the IoT era. Home automation makes life easier by providing all home appliances control at single point which is mostly a smart phone. Surveillance requirement is rapidly increasing in domestic and commercial applications due to its low cost and ease of deployment. This paper takes stock of how Home Automation and Surveillance systems have been changed and implemented. Home Automation and Surveillance related literature of last 7-8 years has been referred for the review.

Keywords—Home automation, Surveillance, Raspberry Pi, OpenCV, CCTV, ZigBee, XBee, SimpleCV, Cloud, Gamma ray etc.

I. Introduction

The Surveillance and automation systems have become very important and indispensable for security reasons and energy conservation. Home automation and Surveillance system are in use since last 25-30 years. Initially systems were bulky and were not so sophisticated as they are today. Home Automation terminology includes the functioning of all household appliances. For example, a micro-controller based system can have the capability to control everything from Fan, air conditioning, lighting and overall electrical appliances. The home automation will help individual to monitor and control home appliances remotely through internet. This paper reviews how home automation and surveillance systems developed in last 8-10 years. Different techniques used for surveillance like OpenCV, SimpleCV, Gamma ray correction etc. are discussed and different home automation architectures have also been focused in the paper.

II. Literature Survey:

The brief review of techniques for developing Home automation and surveillance system using IoT based frameworks is presented below.

Dae-Man Han , 2010 (1) addresses a new smart home control system based on sensor networks to make home networks more intelligent and automatic. He developed smart home automation and home energy management system using IEEE 802.15.4 and ZigBee. It gathers sensing information using occupancy sensor, Passive InfraRed (PIR) Sensor and photo sensor.

Jihua Ye, 2012 (2) presented research work on adaptive smart home system. In this system, the central controller uses feedback information from household appliances to learn the habits and to adjust the system automatically. The system uses toddler (used to find out the operation rules of user) and correlation algorithms (used to find out the relation of operations) to learn the habits of the users.

G. V. Vivek , 2015 (3) proposes IoT services using WiFi-ZigBee gateway for a home automation system. A smart home automation is an integration of smaller electrical devices and communicates with each other with a central processing unit. ZigBee nodes communicate wirelessly to the coordinator which is connected to a Linux board at the receiver end or the control panel which is interfaced with a ZigBee

transceiver, this transceiver module is designated as a coordinator. Coordinator receives the sensor data and sends the commands accordingly to the ZigBee nodes present at the sensing environment with in the node.

Vamsikrishna Patchava, 2015(4) proposed a system for Smart Home Automation technique with Raspberry Pi using IoT. Here system uses a Raspberry Pi module with Computer Vision techniques. Using this, system connected home appliances can be controlled through a monitor based internet. sensing and surveillance function is carried out by Raspberry Pi . Here intrusion detection is done using motion sensors and camera will record on motion detection.

Mattia Gamba, 2015(5) in their research paper has proposed a solution based on XBee a showed how XBee modules can be utilized to build up a scalable and fully customizable home automation system through an easy way to link any new device to the others. Furthermore, user interface in home automation has been addressed in state of the art approaches exploiting mobile devices use as portable home automation control tools.

Neel Oza, 2016(6) has proposed a low cost surveillance system. The proposed system is cloud based surveillance system for live video streaming This system provides the live streaming by using cloud, Raspberry Pi 2 module and FFMPEG based USB Camera. The proposed work has ability to control and live video streaming over the internet via cloud computing. Streaming and controlling is possible from anywhere over the world as well as can upload the data to cloud.

P Arun Chandra, 2016 (7) proposed model uses Raspberry Pi that counts the number of pulses detected by Light sensor module. The sensor is placed on the energy meter. The Raspberry Pi counts the number of pulses to calculate the energy consumption in kWh according to the conversion mentioned on the energy meter. This data is then sent to Google Spreadsheets using Google API. The spreadsheet can be accessed on a website and android app that were designed.

Virginia Menezes, 2015 (8) proposes the motion detection and tracking system for surveillance which uses Raspberry Pi and computer vision using SimpleCV (SimpleCV is an open source framework for building computer vision applications. It is a collection of libraries and software that can be used to develop vision applications.) to detect moving objects in the surveillance area, switch on the lights to capture images and streams the camera feed online using MPJPG Streamer, which can be viewed by any authorized person on the go.

Setiya Purbaya, 2015 (9) proposes design of a system such as IP surveillance camera which based on an embedded system, with improved image recording feature by using gamma correction feature which integrates with cloud service . In the image correction mechanism, image quality improvement is measured using a histogram. Here image clarity is done using Gamma correction formula. Trade off has to be done while selecting value of Gamma (to be used in formula). The larger the gamma value (G), the image is going to be clearer. However, the image is also going to be blurred.

From Literature survey inference can be drawn out that their are many issues pertaining to development of IoT based system for Home automation and surveillance system. Some of the presented research works focus on automatic monitoring and controlling of home appliances [1, 10, 11], effective energy management [3, 15, 1], integration of different protocols [3, 12, 13] and security [14]. However, no single technological solution has been reported for smart home system that addresses all the above listed issues. Therefore, their is a huge potential for developing a generic framework and technological solution for IoT based Technology for smart home system that addresses all the issues.

III. Home Automation and Surveillance system design considerations:

Modularity : The different sub systems of the said system needs to have fair degree of

individuality. Specially home appliance modules to connect them to IoT, surveillance module etc.

Plug & Play scalability : The appliance connecting module should be of plug & play nature making it easy for end users to implement the system.

Robustness : Each sub system should be fault tolerant and must have capability of providing services all the time.

Reconfigurable: If, for some reason subsystems of the system needs to be changed (e.g. upgraded/advanced version of controller), in such case the system must be reconfigurable.

Security : The system must be secure enough to allow access to authorised users only. It should not have security loopholes which can be used in some inadvertent manner.

Power Consumption : Since the system will control the electrical appliances in the house, it would be very much advantageous if the same system can be used to monitor power consumption status of the appliances to reduce unwanted power leakages, resulting in power saving.

Portable : The system must be portable so that the system can be disconnected and connected at new place as and when required.

Integration : Home automation and surveillance systems should be integrated together so as to have cost effective system using single central controller for automation and surveillance.

IoT Platform : Their are numerous IoT platform available for use which has provisions for connecting system modules to networks. Use of these IoT platforms also reduces development time and efforts by providing ready to use libraries for IoT based systems.

IV. CONCLUSION :

The literature review of the Home automation and surveillance shows that their are numerous techniques employed to design the

home automation and surveillance systems. But need of the time is cost effective IoT based Home automation and Surveillance system. The smart phone based cost effective home appliance control system with power consumption monitoring and integrated surveillance features can make the system more effective and popular. Use of IoT platform for the system development can drastically reduce the system development time.

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