A Review on Various IoT Based Security and Automation System

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Abstract: IoT based home security is the concept of monitoring and controlling household appliances using the internet as the medium irrespective of the location of the owner of the house. This is a review paper on three different ways of implementing Iot based Home security and Home automation. All the system discussed here aims at sensing the changes in the house and sending an alert message to the owner through different ways like SMS, voice call or facebook status, so that the owner can take further actions accordingly to safe guard his/her house.

Keywords –Internet of Things; Automation; Raspberry Pi

I. INTRODUCTION

Home security system is generally monitoring and taking necessary actions accordingly from a remote location. The IoT is network of objects that can be remotely monitored or controlled, hence this system is very suitable for implementing security alert system. This system involves Iot enabled devices such as sensors, smart phones, PDAs etc. This paper concentrates on different approaches of Alert Systems based on IoT.

II. SURVEY

The authors of [1] propose the idea of detecting an intruder in the house and sending an email alert to the owner. This alert system is realized using pyro electric Infrared (PIR) module and Raspberry pi, these hardware provide flexibility and reduced delay in the process of sending email alert. When the owner is away and an intruder enters the house the PIR sensor detects the motions of the person and sends the signal to the Raspberry pi, which processes the signal, captures the image if the intruder using a camera and send it to the owner through Email. The owner can take further actions like informing the nearest Police station and his/her neighbors about the intruder.

Three main components are used in implementing this system:

a) PIR-Passive Infrared Sensor: (Specification: Hc-Sr501 Pyroelectric Infrared PIR motion sensor) this is a low cost efficient sensor. It measures the infrared light emitted by the object in the range of sensor and hence detects the motion. This device sends the signal to the Raspberry pi when any motion is detected inside the house.

b) Webcam: (USB 2.0 security camera with night mode) this captures images of the house when there is no activity as well as when there is some activity and it is sent to 5thr Raspberry pi for processing. The images of the intruder are sent to the owner.

c) Raspberry pi 3 Model B: (Specifications: ARM Cortex-a53, 1.2Ghz, 64-bit quad-core ARMv9 CPU, 1 GB RAM.802.00n wireless LAN) This processor receives the signal from sensor and image from camera processes the signal and sends the email through IMAP (Internet Message Access Protocol). It is connected to the internet through a Wi-Fi module or RJ45.

The program algorithm is as follows: Previous signal and current signal received by the Raspberry pi are compared and if they are same it means there is no activity but if there is any difference in the signal then the captured image is attached and an alert email is sent to the owner.

The disadvantages are that this system focuses of reduction of time delay and cost but the main disadvantage of the system can be that if the owner has received the email but did not access it at the right time then there shall be a delay in taking necessary action. There can also be a chance that an unexpected guest can be mistaken as a thief.
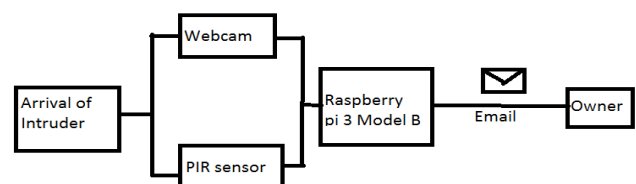

Fig 1. System Description

[2] proposes the idea of low cost implementation of both home security, where in the owner receives an alert message on his phone or optionally activate the alarm when there is any intruder in the house and home automation, where in the owner can control the devices of his house for an unexpected guest while he is away in a single prototype. The hardware used in this prototype are

Launchpad, PIR sensor, Alarm, Relays to connects home appliances, Wi-Fi, mobile phone and a software called Energia is used in the implementation of the above. The main advantage of this system is that the mobile phone that receives the alert message/call need not be a smartphone and also no need of internet access.

The setup for the above system has a Launchpad that is programmed using Energia IDE. The PIR sensor is given at the in/out pin of the Launchpad. Other digital pin is given with the mains of the home appliances connected using relay .The Launchpad must also have access to Wi-Fi.
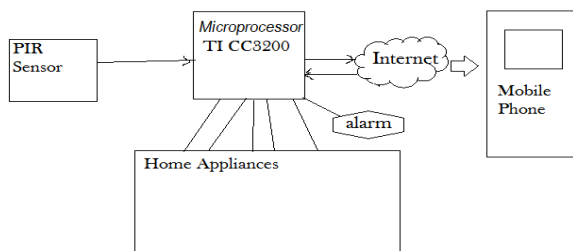

Fig 2.   Implementation Setup

The Launchpad used in this setup is TI CC3200 Launchpad has Wi-Fi Network Processor, Power management subsystem and Application Microcontroller. ARM Cortex M$ Core Processor at 80 MHz is used by this Launchpad and it also has a embedded memory (with RAM 256KB). Other features of this Launchpad are:

- FTDI USB driver
- Operated with 2 AA batteries
- Sensors, LEDs and Push-buttons
- 4 wire JTAG and 2 Wire SWD is supported.

Other major device in this system is the PIR sensor. These are adjusted so that they ignore the regular movements in the house. This paper describes 2 way working of this prototype. One as home security alert where in when the sensor sense some changes the signal is sent to the Launchpad which further alerts the owner through a voice call with a predefined message loaded in the Launchpad. The owner can activate the alarm by pressing the predefined key on his/her phone to alert his neighbour or the police about the intruder. The alarm goes off after a specific time and if the sensor still senses the intruder the owner gets the call. The same prototype can work for home automation just like the owner controlled the alarm he can control other devices like lights, ac, doors and windows of the smart home. This facility is suitable when there is an unexpected guest when the owner is away. Smart phone is more suitable for this application.

Disadvantages: This system does not specify how the owner can identify the intruder as a thief or a guest as there is no camera used. Usage of Basic keypad phone is

suitable for only security alert system but not efficient for home automation.

The paper [3] initially discuss the scope of IoT based home automation and the proposed the idea of implementing a home security system where in the alert message is presented through a social networking site here updated as facebook status. The innovative idea of using social network in this system makes it more efficient as monitoring and controlling can be done using the built in features of the social networking sites and safety of the system is also ensured. The highlight of this system is that the owner can give controlling authority to other family members. The authors discuss various examples other than theft. Just like all other Iot based home security or automation system this system also uses PIR sensors and also other sensors suitable for application like temperature sensing, smoke detection etc. Other hardware components used are Raspberry pi, PIC microcontroller and relays. The software used here are Raspbian OS to program the system, MYSQL, MYSQL Database to add packages to Raspberry pi, Apache Web Server to support authentication.

System working: This assembly uses PIR sensor for motion detection, MQ5 sensor for Smoke detection, LDR (Light dependent resistor) and cameras as input devices. The signals received from the sensors are given to Raspberry pi gateway, where the signal is processed and message is sent to the owners facebook account. Here raspberry pi gateway is used instead of internet router. All the house hold devices are connected by relay to the PIC microcontroller. Further the owner can control the house hold devices using the options in the social networking sites. Considering two examples, one is when there is a fire in the house there is an abrupt change temperature which is sensed temperature sensor that signal is processed and sent to the owner and then he can turn off all the devices in the house using the controls. Second example is the gas leakage where the temperature is sensed by the MQ5 sensor, then the processed signal is received by the owner and he can take suitable actions like turning off all the electrical appliances of the house.

Disadvantages: The system uses a social network site which is used by millions of people, hence the server may be busy at times. Hacking can also be a threat to this system. All the sensors used must be calibrated with suitable threshold to avoid unwanted alert messages. Changing these thresholds according to seasons or other changes in the house is a difficult task.

III.   CONCLUSIONS

Home security and automation has become very important aspect nowadays. IoT provides the most suitable platforms to implement these security and automation system. The three different methods discussed this paper are efficient in their own ways. The idea of providing the control to more than one member of the family is very effective.The system should be quick in alerting and also cost effective. The alert system must be designed in such a way that the owner can easily inform

others like his family members, neighbours or the nearest police station and take actions quickly.

REFERENCES

[1] S. Tanwar, P. Patel, K. Patel, S. Tyagi, N. Kumar and M. S. Obaidat, "An advanced Internet of Thing based Security Alert System for Smart Home," 2017 International Conference on Computer, Information and Telecommunication Systems (CITS), Dalian, 2017, pp. 25-29.

[2] R. K. Kodali, V. Jain, S. Bose and L. Boppana, "IoT based smart security and home automation system," 2016 International Conference on Computing, Communication and Automation (ICCCA), Noida, 2016, pp. 1286-1289.

[3] Vineet Pratap Singh, Prof. Urmila Deshmukh, Prof. Anjali M. Patki, "Facebook based Home Appliance Security Control and Monitoring using Microcontroller"in International Conference on Recent Trends in Engineering,Science & Management (ICRTESM-17)