A Study For IoT Based Home Automation

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Abstract- *Internet of things is an emerging technology which is increasing rapidly and is applied in real time day to day appliances making life simpler and smarter one such application is home automation or smart home, where all devices are connected to each other over a network and can be controlled remotely, Security is the major concern of home automation gas leakage detection, fire detection, Intruder alert, Authorised people access to enter home all comes under security system which can be installed using appropriate sensors and devices. Monitoring the whole system is the most required parameter which can be done by creating a web server or application or any cloud services. The devices of smart home that we created can take care of all the security problems and application or server can monitor the system and send the data to end user.*

Keywords- Internet of Things , arduino, Intruder alert, smart home, home automation, Esp32, Node mcu esp8266

I. INTRODUCTION

Internet of things simply known as IoT is the network of separate, uniquely identified devices that sometimes have the ability to talk with each other, without requiring human to human interaction, or human to computer, IoT is rapidly growing by introducing new devices and connecting devices over the internet, Internet of things is everywhere from mini devices to industry level appliances. It has been widely used in all the fields like Hospitals, Smart cities, Colleges, Army, Smart home and many more.

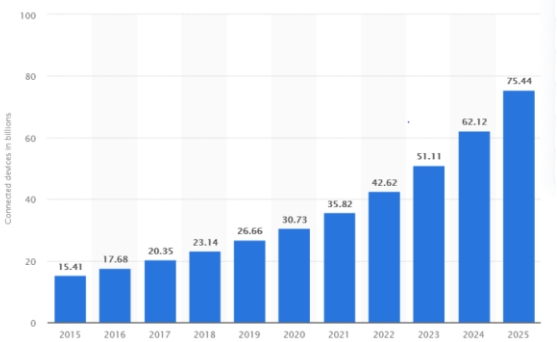

Figure 1: Growth of IoT devices

In this paper we will discuss the home automation using IoT, Since security is the major concern of any home, we can use Arduino, Node MCU esp8266, esp32 camera and few other sensors embedded together to build the home automation system. A user can control the whole system using an android device or computer via application or web server, the user not only can control the appliances but also can monitor using cloud server or by notifications. In this home automation security refers to gas leakage detection, intruder detection, smoke detection which can be done using few sensors.

II. IOT HOME AUTOMATION ARCHITECTURE

Study on IoT architecture published by Chang-le Zhong, Zhen Zhu, Ren-gen Huang 2017 explains about the different layers of Iot architecture and protocols which can be known as:

- *Physical layer / Preception layer*

First, Physical layer / Preception layer consists of all hardware such as sensors, actuators and devices sensors like motion sensor, light sensor, temperature sensor, water sensor and so on .

- *Data link layer*

In Data link layer we can use any microcontroller or microprocessor based programable boards known as gateway for IoT device which is heart of the embedded system of home automation we can use raspberry pi, Arduino, Esp8266.

- *Network and transport layer*

This layer can contain a internet, server, cloud and database where all the data collected from sensors is stored and communication happens between application and data link layers and can send appropriate output.

- *Application lay1er*

Here we can have application or a website with a server which can be accessed through computer or mobile device.

IV. PLATFORMS TO DEVELOPE IOT APPLICATIONS

There exist a huge number of open source and paid platforms which can be used to develop IoT devices. (Milan Zdravković, Miroslav Trajanović, João Sarraipa, Ricardo Jardim-Gonçalves, Mario Lezoche, Alexis Aubry, Hervé Panetto, 2016) published a survey paper on IoT platforms which tells in detail about the different IoT platforms. Few such IoT frameworks and cloud platforms are [1] Arduino Ide [2] Eclipse. Cloud platforms are [1]Arrayent [2]Axeda [3]Bugswarm [4]Carriots [5]Evrythng [6]Exosite [7]GrooveStreams [8]Ifttt [9]Kaaproject [10]LinkSmart [11]Mbed [11]Nimbits [12]Particle.io [13]Autodesk SeeControl [14]SensorCloud [15]PTC ThingWorx [16]ThingSpeak. In recent days there are many more cloud platforms which are having more security and services such cloud services are [1] IBMWatson [2]Microsoft Azure IoT [3]Google Cloud [4]Amazon Web Services(AWS) [5]Cisco IoT Cloud Connect [6] Salesforce IoT [7]Zetta [8]SAP [9]HP Enterprise Universal [10]Arduino IoT [11]Oracle IoT [12]Flutter [13]ThingsBoard [14]SiteWhere [15]Predicx IoT [16]Node-Red [17]ThingWorx [18]Qualcomm's IoT Development Kit [19]Particle.io [20]Thinger.io [21]Kinoma [22]Mocana. These are the few platforms/frameworks and cloud platforms where we can build our own IoT devices for Home automation though there are few platforms which lack in case of ease and management. Ubidots, Adafruit IO Thingspeak are the majorly used platforms in our idea where we can monitor the home automation and also can get security alerts based on prediction and real time algorithms

V. HOME AUTOMATION USING DIFFERENT TECHNIQUES AND METHODOLOGIES

The different ideas, methodologies and technique for home automation using IoT presented by different people is mentioned below:

(Gouping You and Yingli Zhu, 2019) Aim of idea is to create a smart village which includes smart home and smart agriculture, Smart agriculture uses various sensors and Zigbee wireless transmission function for monitoring the temperature, humidity and green house. In smart home remote control is used to control household appliances like lights, air conditioners, television, fan. The gateway and server establish bridge between user and the whole system. So collected data will be processed and sent to the mobile phone of users to view the data, so that user can control the system.

(Kumar Sai Shankar, 2020) proposed Cost effective home automation and security system the idea uses Node MCU esp8266 as the gateway and embedded system adafruit IO is the cloud platform used to create the virtual devices and keys which works on MQTT protocol. So added virtual keys are connected to Ifttt server where the google assistant is connected to the virtual devices created in Adafruit IO, applets are created which works on 'if this then that' logic the same is implemented in the embedded system so that the whole system can be controlled using google assistant and authorized google account.

(Satyendra K Vishwakarma, Prashanth Upadhyaya, Babita Kumari, Arun Kumar Mishra, 2020) introduced smart energy efficient home automation system using IoT. This presents the method to save the power consumption for reducing electricity bills smart home automation system which is a basic application which will help old age people and people with disabilities this paper uses Node MCU and relays to control all the lights of the home. Google assistant and adafruit io are the main component which is used to control the lights of home.

(Shradha Somani, Parikshit Solunke, 2018) described Smart security and home Automation based on IoT which mainly aims to overcome the security of home when the owner is away from home which is also known as intruder detection. The person can also control the home through the mobile application. Here Raspberry pi, camera module, PIR sensor are used to detect the motion in house or near door.

(Asma Mahgoub, Nourhan Tarrad, Rana Elsherif, Abdulla Al-Ali, Loay, 2019) presents IoT based Fire alarm system which uses microcontroller Esp8266 Node MCU, and sensors for Smoke, humidity, temperature, fire and gas detection sensors are used since node mcu can be connected through Wi-Fi it is connected to a server also so that it can send data and alerts continuously through which the user or owner can get alerted and stop the accident in home.

(Zainal Hisham Che Soh, Mohamad Azeer Al-Hami Husa, Syahrul Afzal Che Abdullah, Mohd Affandi Shafie, 2019) describes about Smart waste collection monitoring and alert system via IoT they have used Arduino uno embedded with ultrasonic sensor and motors connected through ubidots cloud server where ubidots sends the notification system using mqtt protocol, Wet and dry waste can be distinguished and reusable wastes are separated by using addon sensors to the embedded system which can be implemented in smart home and even in rural and urban areas to throw the waste.

(Tamizharasan.V, Ravichandran.T, Sowndariya M, Sandeep R, Saravanavel K, 2019) introduces Gas level detection and automatic booking using IoT where Arduino

uno r3, load cell, gsm module and gas sensors are embedded together with a program. The gsm module send the notification to the end user load cell measures the pressure on the cell once the gas is consumed by the user for coking food or some other household things the pressure gets decreased on the cell once the pressure is less than the preset value the notification is sent to the end user. Gas sensors detects there is gas leakage and again a notification is sent to the user through the GSM module.

(Pritam Ghosh, Palash Kanti Dhar, 2019) also introduced Low-cost gas leakage, Explosion and fire Alert system using GSM with advanced security, here they use gas sensor and IR sensor for detection of flame and gas leakage. The system is connected to outlet fan once the gas leakage is detected by the sensor immediately send data to Arduino which will turn on the outlet fan which decrease the chance of spreading of gas in home.

VI. IOT BASED HOME AUTOMATION

After a survey done by us, we understood that there are so many home automations projects where they used only few components for home and the whole home is not automated. Home automation's prime concern is security, Everything in home is automated, monitoring the home and low cost for installing home automation so we can use Arduino and node mcu as a gate way which can do serial communication between each other so that internet can be provided to Arduino as well without using Ethernet shield for Arduino uno r3, we can use all the possible sensors in home automation and is embedded with Arduino and Node MCU, which will be connected to cloud servers like Azure IoT, thingspeak, Ubidots to send notifications and monitoring the system. As we all know that recently we suffered from pandemic situation like covid-19. As a precaution we can use sensors to detect the health condition of a person and decides to send in home or to give the precaution which will help the people inside home to get precautions.

As security is also a major concern, we can use esp32cam module for face recognition and allowing person into home. Intruder alert system can also be installed by using appropriate sensors.

VII. CONCLUSION

In this paper, a survey and study of home automation is presented. As we saw there are various technologies and methodologies to establish in home automation we will be using prediction and real time algorithms which will improve the accuracy and efficiency of home automation we can use ubidots or thingspeak to send notification which can reduce the component known as GSM module similarly we can add few more things like esp32 cam for face recognition and figure print based door unlock from remote location, Home monitoring system through an application, Guest health monitoring system. These all-extra features in home automation adds more attention and value in future.

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