

HOME AUTOMATION AND SECURITY USING INTERNET OF THINGS

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ABSTRACT: Internet of Things (IOT) is widely used all over the world nowadays; the IOT offers huge potential for enhancement of various applications such as: Smart homes, Healthcare Monitoring, Internet, Security, and Energy Consumption etc. The construction of ordinary homes into “smart homes” has seen a rise in last few years. Using IOT at home helps to save energy consumption and Automates home appliances using mobile phones. In this paper a brief overview of different techniques and experiments done on IOT based Smart Homes and security system is presented. Different methods and modules are also present. Using voice assistant like Amazon Alexa, Google Home, Google Assistant, Apple Siri, or Microsoft Cortana to detect voice commands from a person with speaking disabilities in a much more natural way to control ordinary electrical appliances, and analysing the method of security. The different technology used in every research is also discussed in this paper.

KEYWORDS: Alexa, GSM, Home automation, multi sensor, Siri, Smart Home Security System, SMS, theft alarm, voice activated system.

I. INTRODUCTION

In recent years, Internet has grown rapidly and changed human's life by providing better connectivity and communication. The Internet technology can be extended to connect objects that are used in day to day life. This expansion of internet services is called Internet of Things (IOT)[1].

Unintentionally, a lot of power is wasted away on daily basis. Sometimes TV and/or lights are left on while sleeping. This increases the amount of energy consumption and generates a lot of electricity bill. Besides, it gives no warning while the use of electricity, so that they just overuse the electricity without noticing about it.

Home automation is the method of using devices and programming through a network. To access home appliances for better life, for physical disabilities and the older persons home automation is helpful [2]. It helps in reducing human efforts and interaction as much as possible and use programs to perform those tasks. Most of the smart home system use wireless technology like internet, radio frequency and Bluetooth to communicate between the controllers and receivers. Users can send commands and control the smart home systems via computers, smartphones and pre-built programming codes.

Security in homes is also a major concern nowadays, securing homes using IOT is widely implemented. A secured smart home should keep the home safe from theft and external dangers that includes house fire and LPG gas leakage. Mostly, the home appliances and gadgets are connected with specific sensors, which reduces labour and physical work, by sensing and proactively responding to their needs automatically[3]. A Home Security System provides security and safety to a home, by alarming the home inmates from theft, burglary, natural adversity and miss happenings such as fire accident, gas leakage etc. In this paper, they aim to discuss related technologies[4].

II. TECHNIQUES FOR SMART HOME SYSTEM

Generic framework for smart home system

In a study, a generic framework for smart home system is presented which is unique in nature and handles all the concern associated with making a house smart. It covers various components such as “auto-configuration and device management, auto-monitoring & control, cross platform communication protocol and object access control”. The auto configuration and management component helps in self-configures/self-organizes objects, objects communication and resolve the scalability problem. Communication Protocol responsible for sending-receiving data and control information to and from connected objects and addresses interoperability issues. Auto Monitoring, monitors the status all objects. Auto Control, controls automatically based on context. Prevention, protection of data and control information transmission to and from objects from unauthorized access is handled by Object Access Control[5]. The components of smart home system are designed to take care of various issues such as scalability, interoperability, device adaptability, security and privacy.

Multifunctional Secured Smart Home

In a research, a prototype Multifunctional Secured Smart Home (SSH) model is developed, which sends SMS and calls the admin of the system when it detects intruder, theft, gas leakage and fire in the house using Raspberry Pi. Arduino board is used for command processing and control. This prototype is so secure that if an intruder de-activates the system by entering the correct password within three try then also an SMS is sent to admin that “System de-activated”, so that the owner can react appropriately. Snapshots are sent to the mail of the user, to overcome the problem of false detection by the sensors[6].

Sensors used in the prototype are Passive Infra-Red (PIR) sensors for detecting intruder, LM35 is used as temperature sensor, MQ2 Smoke sensor detects not only LPG gas but also H₂, CH₄, CO, Smoke, Propane and Alcohol.

The system is not so expensive to send an SMS.

Smart Home intelligent system for monitoring the electrical energy

In this research, the model proposed an Ethernet based system that allows user to monitor real time switching information of the electrical devices and controlling them through an android app as well as monitoring the security of their homes in case of intruder or fire detection. This model use temperature and smoke sensors to sense fire in the home, PIR motion sensors for the theft at their homes and control the real time tracking and switching of all their electrical appliances through an android based mobile app using internet for fast connectivity. This model can access devices by either sending voice commands or by simple tap-to-toggle system, which makes it user friendly and easy to manage[7].

It has a view status mode which is the energy management mode where the user can keep real time tracking of their devices. It shows the current status as well as the energy consumption of the device and if the device was being switched on for a very long time it generates an alert about the usage so that the user can keep the track.

Comparative study of different research

In this paper comparative study of different research on Smart Home System to Control, Monitor and Secure Home, based on technologies like GSM, IOT, Bluetooth and PIC Microcontroller with Zig Bee Modulation is presented. Every smart home system is wireless. Role of android is very important in all types of system. In GSM based home automation system, it sends command to control device and get alert in form SMS. For GSM home security also SMS is used as Communication medium between admin and system. Bluetooth having 2400 Hz frequency and range of 100 meter for connectivity with 3 Mbps speed. As compare to other technologies used for smart home, Bluetooth have distance limitation and will not work beyond 100 meters, but Bluetooth will work properly and efficiently within the range. Bluetooth based system is very low cost and easy to use [8]. The basic concept used in IOT (Internet of Things) is to connect and monitor things remotely using Internet.

Table 1: Comparison of Methodology

Technology	Features	Limitation
GSM	Access devices and control home security by sending and receiving commands in form of SMSs. MQ2 and MQ7 sensors used to sense gas leakage.	In case of weak mobile network, command sending gets delay.
Bluetooth	Android based GUI is developed to help to communicate with smart home.	Range is only 100 meter.
IOT	Sensors and IOT enabled devices used for smart homes.	If sensor fails then whole system can collapse because of dependency in sensors.
PIC Microcontroller With Zig Bee	Use voice commands and relays are used to control home appliances.	Low end controller. No inbuilt communication module.

Smart homes appliance control for physically disabled person

This paper presents a system that has smart plugs, smart power strips, smart cameras and a digital assistant such as Amazon Alexa, Google Home, Google Assistant, Apple Siri, or Microsoft Cortana to receive voice commands, from physically disabled person, spoken in a much more natural way to control ordinary home electrical appliances in order to turn them on or off, with minimum efforts [9].



Fig. 1: Using Alexa to Control Devices

The regular appliances can be plugged in Alexa enabled power strips which has four small sockets which can be individually and independently powered on and off. Stove, slow cooker, lamp and microwave oven can be plugged in respective plug.

The smart plug support Wi-Fi and are configured to communicate with Alexa using smart phone apps that are downloadable from Google Play and Apple Store.

Different commands can be used to operate the system such as: -

“Alexa, turn on the stove”,

“Alexa turn off the slow cooker”

“Alexa turn on the lamp”, etc.

The person with a walking disability could ask Alexa to show different views of the premises via the camera by simply saying that: -

“Alexa, show me outside”

“Alexa, show me the bedroom”

In this way user can control the system with his\her voice command [10].

III. RESULTS

As many system and prototype has been discussed in this paper, all of them have different efficiency and results. The average accuracy rate of heat sensor (LM35) is 97.78% which was calculated at different times in a day. 99% accuracy was found if temperature sensor was provided with a separate power supply. Prototypes based on sensors may perform accordingly, based on the accuracy of the sensors, Internet connectivity is required in almost every system because they need to communication between the device and the user (admin) of the system. Maximum distance a PIR sensor can detects human motion is 10 meters.

IV. CONCLUSION

This paper contains a brief study of different prototype built for smart homes. GSM, Bluetooth, IOT, PIC Microcontroller is being used in almost every system for the connectivity. A GSM is a wireless technology the user can get alert anywhere in the world thus making the system independent of location.

System which uses voice command is very helpful for the physically disabled people, as in those systems they don't need to move from one place to another they can use Siri or Alexa depending on the model. In future such system should implement because they are user friendly as well as cost effective for the user.

V. REFERENCES

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