Smart Security and HomeTomation Using ESP 32

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ABSTRACT

The main goal of this project is to create a home automation system utilizing an Arduino board with Bluetooth that can be operated remotely by any smart phone running the Android operating system. Houses are becoming smarter as technology advanced. The traditional switches in modern homes are rapidly giving way to centralized control systems with remote-controlled switches. Currently, it is difficult for the user to approach standard wall switches because they are dispersed across the house. The elderly or those with physical limitations find it even harder to do so. With smart phones, a remote- controlled home automation system offers the most cutting-edge solution.

Keywords— ESP32, Smart phone

I INTRODUCTION

Home automation refers to handling and controlling home appliances by using micro-controller or computer technology. Automation is popular now days because it provides ease, security and efficiency. In this, a sensor senses the status of appliances and updates to web server. If user is far away from home, he can access and change status of appliances i.e. switches it on/off. User can use local PC. This paper will describe approach of controlling home appliances by using web server.

This IOT based smart security and smart home automation systems are trying to achieve comfort combined with simplicity. Wireless Home security and Home automation are the dual aspects of this project. The currently built prototype of the system sends alerts to the owner over E-mail using the Internet if any sort of human movement is sensed near the entrance of his house .On the other hand if the owner identifies that the person entering his house is not an intruder but an unexpected guest of his then the user/owner can make arrangements such as opening the door, switching on various appliances inside the house, which are also connected and controlled by the micro-controller in the system to welcome his guest. The same can be done when the user himself enters the room and by virtue of the system he can make arrangements from his doorstep such that as soon as he enters his house he can make himself at full comfort without manually having to switch on the electrical appliances or his favorite T.V. channel for an example. Thus using the same set of sensors the dual problems of home security and home automation can be solved on a complementary basis. One of the main advantage of this IOT is even though Wi-Fi is not available we can go through 3G or 4G services. In other existing methods it is not possible so, by overcoming all the drawbacks we have implemented a project IOT based Smart security and Smart Home Automation. This project provides more

comfort combined with simplicity.

II. EXISTING METHODS

A. *Bluetooth based home automation system*

Home automation systems using smartphone, Arduino board and Bluetooth technology are secured and low cost. A Bluetooth based home automation system proposed by R.Piyare and M.Tazil [2]. The Bluetooth system uses a PC or smart phone as receiver device. It has a high communication rate, great security and low cost, so it can be implemented as a real time system. Bluetooth network has limited range of 10 meters if the smart phone is out of range, then it will not be able to control the home appliances, this is one of the main disadvantages of Bluetooth based home automation system

B. *Voice recognition based home automation*

A voice recognition based home automation system proposed and implemented by a researcher [3]. The wireless communication between the Smartphone and the Arduino UNO is done through Bluetooth technology. This will be more helpful for handicapped and aged people who wants to control appliances by speaking voice command The main drawback of this system is that communication between user and voice recognition tool depends on signal to noise ratio (SNR), if voice signal is noisy then communication can highly effect andthe system will fail to show accuracy.

C. *ZigBee Based Wireless Home Automation System*

ZigBee based wireless home automation system has also been studied [4], ZigBee is similar to Bluetooth technology. It is one of the broadly used transceiver standard with low data rate and power. It has physical range is between 10 to 20 meters, which can increase up to 150 meters by using direct sequence spread spectrum (DSSS). It is ideal for developing prototypes and research related activities.

D. *GSM Based Home Automation System*

A smart home automation system implemented by using Global System for Mobile communication (GSM) [5]. In GSM based home automation systems, communication between main module and appliances is done through text messages. The main drawback of GSM based home automation system is that there is no guarantee text message deliver to the system every time so it is not a reliable system.

These are the drawbacks of existing methods, To overcome that drawbacks we are implementing "IOT Based Smart security and Smart Home Automation".

III. COMPONENTS REQUIRED

A. ESP32 BOARD

B. IR Sensor

C. Relays for connecting home appliances

D. Mobile phone to operate home appliances andNetwork Scanner app to see results

E. Arduino IDE (Software)

A. *ESP32 BOARD*

ESP32 is a series of low-cost, low-power system on chip microcontrollers with integrated **Wi-Fi** module and dual-mode Bluetooth and Camera. The ESP32 series employs either a Tensilica Xtensa LX6 microprocessor in both dual-core and single-core variations, Xtensa LX7 dual-core microprocessor or a single core RISC- V microprocessor and includes built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules.
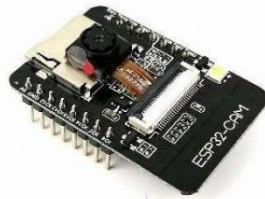

Fig.1 ESP32 BOARD

firmware which runs on the ESP8266 Wi-Fi SOC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the dev kits. It's having 128KBytesof memory and its storage space is 4Mbytes and power is supplied through an USB and it is a single board microcontroller and alsoit is having 16 GPIO pins.
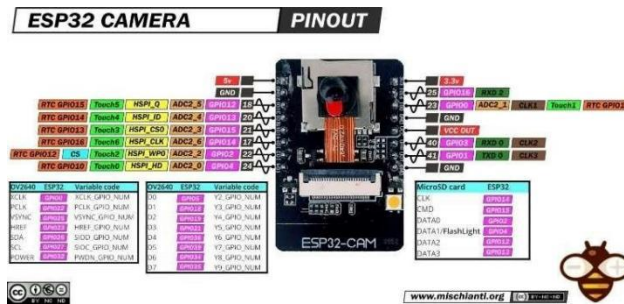

Fig.2 Pin Diagram of ESP32

B. *PIR SENSOR*

Fig.3 PIR Sensor

An Passive infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of

measuring theheat being emitted by an object and detecting motion.

Definition and relationship to the Electromagnetic spectrum. Infrared radiation extends from the nominal red edge of the visible spectrum at 700 nanometers (nm) to 1 mm. This range of wavelengths corresponds to a frequency range of approximately 430 THz down to 300 GHz.

B. RELAY BOARD

Fig.4 Relay board

IV PROPOSED SYSTEM

In this proposed system we using a ESP32 based home automation system. This system controls the home appliances through mobile app. The command from the user can be anywhere through internet. The main idea was to use the ESP32 chip, which we have installed with a camera module to monitor a house, and inbuilt Wi fi module. The data collected from the sensors is sent wirelessly to the control unit. The other created HW modules are an input panel with a touch screen and input panel with an ESP32 board. It is used to unlock and lock the house to activate the motion sensor and cameras. The user has control over himself too he can adjust each and everything via automation. Thus using the same set of sensors the dual problems of home security and Home Automation can 5 be solved on a complimentary basis.
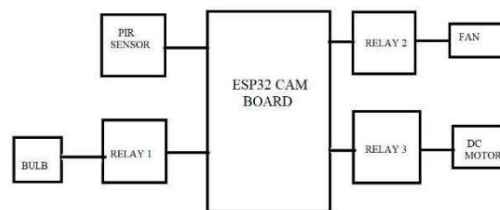
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Fig 8 Block diagram

WORKING OF PROTOTYPE

The prototype can be used in following two ways:

a. As a smart security system

b. As a smart home automation system

a. As a smart security system

If we place a IR sensor at the entrance of a building. These sensors as explained earlier detect the motion of obstacle. This signal which detects their presence becomes the input trigger for the micro-controller. The owner, who may or may not be present in that building, will receive an image captured by a camera module through an E-mail on his mobile phone (whose Mail is predefined in the program)stating that 'There is an Intruder in the House'. To turn ON the lights and fans , so that the intruder will be warned, the owner can press '1' from his mobile keypad. Moreover, if the owner finds that his building is not safe, he can send an SMS to the concerned authority to police department explaining his situation. *b As a smart home automation system*

Under the Home Automation we can control all electrical appliances from long distance through an mobile phone. In this project we are controlling Lights and Fans through an Internet

.Even though if Wi-Fi is not available we can go to 3G or 4G services to operate the system. This will helps us to operate our home appliances through a long distance. This will helps the handicapped and aged people to control their home appliances easily.

ADVANTAGES

1.   This low cost system with minimum requirements takescare of both home security as well as Home automation.
2.   More helpful for handicapped and aged people.
3.   Devices can be controlled from long distance.
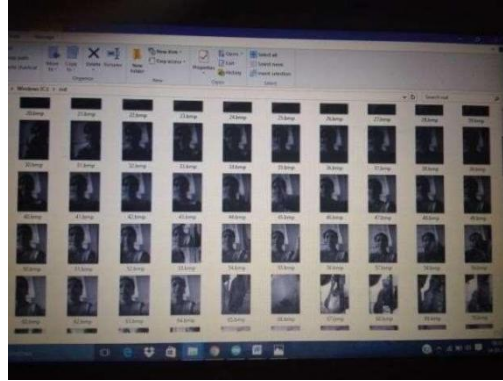4.   Highly secured and Time saving.

RESULT

The results that have been obtained from the above set upcan be seen in been shown below.

The captured image of OV7670 camera shall be stored in one folder of our PC and it sends the captured image to the usermail.

CONCLUSION AND FUTURE SCOPE

Internet of things based home automation system can only work in the presence of internet. The rapid growth of IoT devices brings concerns and benefits. Even though Wi-Fi is not available we can go to 3G or 4G services. This is one big advantage of IOT In this project, the use of a camera connected to the microcontroller might help the user in takingdecision whether to welcome the guest after receiving the captured picture of the guest or intruder, If the user identifies he is an unknown person then the user can further forward the same photograph to the police station by explaining his situation. This project can also be implemented by using Raspberry

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