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Home Automation using IoT

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Abstract: Home Automation combines hardware, software technologies to manage basic tasks in the home using IOT. IOT means devices communicate with each other without the need for human intervention. It plays a significant role in conservation of energy and utility costs. The electrical appliances in the home such as fan, lights, heater etc., can be controlled using the home automation. The system is designed using Raspberry Pi as the microcontroller. The motion is encountered by the PIR sensor and the image of the unauthorized person is captured by camera which is interfaced with the Raspberry Pi. The image of the person is sent to the owner of the home through the mobile application.

Keywords– IOT(Internet of Things), Raspberry Pi, PIR Sensor

I. INTRODUCTION

We live in a world where everyone is giving priority to the work. And it's a world in which, if you lose your job or business, you never get it back. It's a competitive positioning world. So everyone is running out of time. As a result, we need an effortless system which balance their work in home from anywhere in the world. To provide convenience and security, home automation system can be used. Conventional wall switches are located in different parts of a house. It requires manual operations like to switch on or off these switches to control various appliances. Home Automation makes our daily life easier and it helps elders, physically handicapped people. It also helps people who are lazy and overcome their procrastination by automation system. Home security plays a vital role, by detecting fire outbreaks. The in-depth analysis of the latest statistics on home burglary 2019 says theft and burglaries have increased by 74%. To avoid such crimes, home security industry is undergoing series of developments and providing safety alarm systems. It can be easily afforded and installed in every home. The Home Automation systems is the smart choice to provide safe environment, by capturing and recording any activity within your home or office for security purposes.

Significance of the Home Automation System are:

- A. Gives the ability to control the appliances and lighting, with the simple tap of your finger on your favorite technological device like mobile phones.
- B. Home automation increase family safety by recording clips if movement is detected during the day or night.
- C. It easily saves our precious time and experience more daily productivity.
- D. It allows us to see what is going on at home without physically being there and increases peace of mind.

II. LITERATURE SURVEY

A. Iot Based Home Security System Using Raspberry PI

In this paper, the Automation of security is achieved by designing an application on Raspberry Pi using sensors such as motion sensor. Passive Infrared sensors for detection of any intruder in the house, upon detection an alarm is raised. In this system main components associated with Home Security are Passive Infrared Sensor –PIR and piezo buzzer are connected to the R-PI. Piezo Buzzer is used to raise an alarm when the presence of a person is detected in the house with the help of PIR Motion sensor. Keypad is used to arm or disarm the security of the system with the help of unique passcode.

B. Iot Based Home Automation For Car Theft Prevention Using Image Processing

In this paper we came to understand about face recognition in IOT base home automation. Internet of things is capable of connecting various devices such as sensors, actuators. Home Automation system for controlling Home appliances such as controlling home door, getting information about room temperature, gas leakage and fire alarm notification in home from anywhere in the world. This system uses automatic door open lock facility to secure the car in home using controller, RFID transmitter and receiver. Face recognition system gives accuracy in image and check whether the person entering the home or driving the car is authorized or unauthorized.

C. Home Automation System Using Raspberry Pi and Sensor

In this paper it tells about how the home appliances are monitored and controlled using Raspberry Pi. This system uses micro SD card and Raspberry Pi operating system. The system is mainly used to automate all devices and provide security. It uses Raspberry Pi module with Computer Vision techniques. The home appliances are controlled with the help of monitor. Raspberry Pi operates and controls motion sensors and video cameras for sensing and surveillance. It captures person's identity and detects its presence using simple Computer Vision Technique (CVT). When motion is detected, the cameras will start recording and Raspberry Pi device alerts the owner through an SMS.

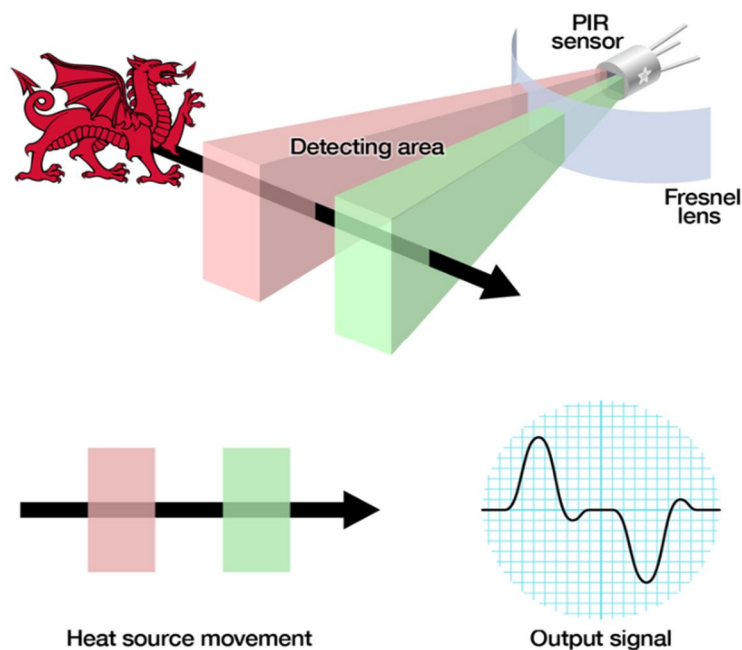
D. Gesture Human-Machine Interface (GHMI) in Home Automation

From this paper we understood that Gesture Human-Machine Interface (GHMI) is based on hand gesture recognition algorithm which is used to control electronic/electrical devices. The hardware module consists of an accelerometer, flex sensor, Bluetooth model, raspberry pi and Arduino kit. When the switch at door is pressed, the user will receive a text message to inform that someone is at the door. With the help of the camera installed at the door, image captured from the camera is compared with the image stored in the data base of home authorized persons. After processing and comparing the image, authorized person is given access and message is been forwarded to updated owner about the presence of person at door. The email containing the photo, fixed format SMS and a personal phone call is generated by the system and send to owner via email.

III. METHODOLOGY

A. Motion Detection

A motion detector is a device that detects moving things, animals and people. It is integrated as a component of a system and automatically performs a task and alerts a user of motion in an area. PIR sensor is utilized to detect the presence of unauthorized person in the house. Humans or animals emit heat in form of radiation which is not visible to the naked eye, even though they can't be seen but it can be detected. If the Passive Infrared Sensor detects the presence of a human being, a signal is sent to the Raspberry Pi 3. Then it initiates the Pi camera to snap a photo which is stored onto memory card of Raspberry pi.



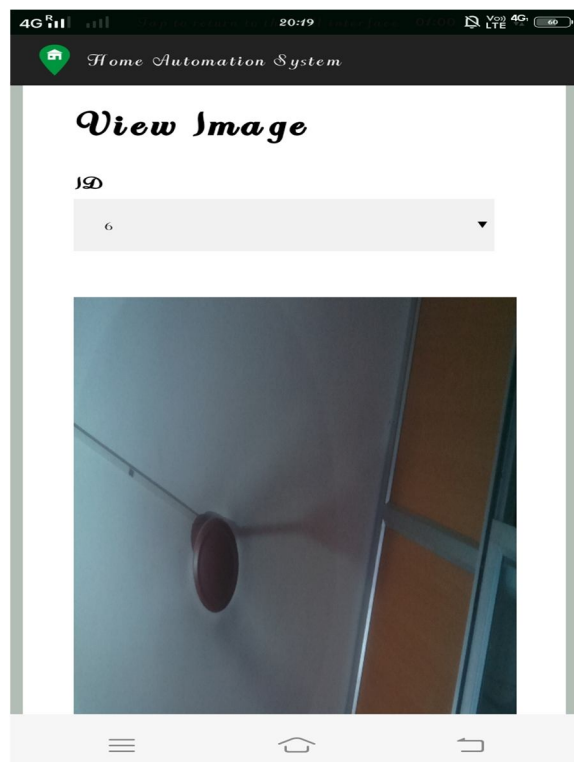
B. Capture Image

A Pi camera is connected to the Raspberry Pi for capturing the image of intruders after detecting motion via sensor. Follow the instructions to insert Pi camera in the Raspberry Pi:

- 1) Gently pull up the edges of the plastic clip in the Raspberry P
- 2) Insert the camera ribbon in the given slot and also make sure it is the right way.
- 3) Push the plastic clip back into the place as it were before the edges were pulled up.

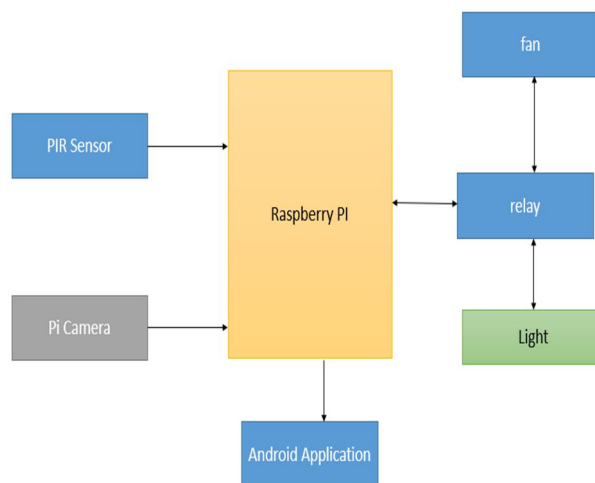
C. Notification

The Captured Image is verified with the image in database, if it differs from the stored pictures then owner of the house is notified via mobile application.



IV. ARCHITECTURE OF HOME AUTOMATION SYSTEM

The main components involved in the architecture of Home Automation are

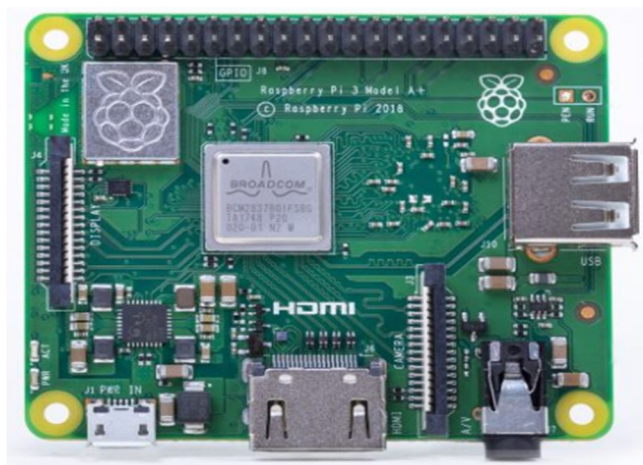


A. Raspberry Pi 3

The Raspberry Pi 3 Model A+ is similar to the Raspberry Pi 1 Model A+. It is the third generation Raspberry Pi.

Important Features are:

- 1) 64-bit quad core processor which runs at the speed of 1.4 GHz
- 2) 512MB RAM
- 3) On board WiFi and Bluetooth



B. Pi Camera

The Raspberry Pi Camera is the high quality 8 megapixel camera board released by the Raspberry Pi Foundation. It has fixed focus lens and is capable of 3280 x 2464 pixel static images, and also supports 1080p30, 720p60 and 640x480p90 video. It is attached to the small sockets of Raspberry Pi and uses the dedicated CSI interface, which is designed for interfacing to cameras. The focus of pi camera can be adjusted by reducing the focal length.



C. Relay

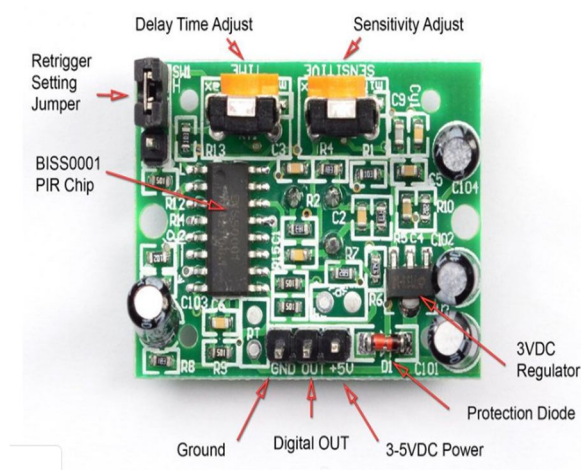
A relay is a switch operated by small electric current and has the ability to turn on or off a much larger electric current. When electricity flows through it, a coil of wire becomes a temporary magnet. The important part of a relay is an electromagnet. The Pi can tolerate a maximum of 5V and the GPIO's only 3.3v. without relays, the risk is that the Pi could burn out.



D. PIR Sensor:

PIR sensors are used to sense motion, when a movement is detected in or out of the sensor's range. It contains crystalline material at the center of it which detects the radiation emitted by humans or animals. The actual detection range of a PIR sensor is between 5m and 12m. The PIR sensors are:

- 1) Small (size)
- 2) Inexpensive
- 3) Consumes low-power
- 4) easy to use (user friendly)



E. Keyboard and Mouse

Keyboard and mouse plays a significant role, it is used to give operate Raspberry Pi 3 like normal desktop computer.

V. CONCLUSION

Security is very important in today's world, traditional system has attempted to provide it using microcontroller and updated versions i.e. Arduino Boards. The System provides Security by detecting the presence of any unauthorized person and it helps to monitor and control devices in our home. If any intruder is detected, the image is captured using picamera and the owner is notified. The proposed Home Automation System eliminates the overhead which is in traditional system such as high down time during repair, maintenance and any kind of device tampering that the hacker can do to the system. The method is to use Raspberry Pi as the controller which provides more compatibility with the latest devices, sensor. It also provides more room for future enhancement with open source applications.

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