

ENERGY SAVING AND ROBUST SURVEILLANCE SYSTEM USING SENSORS AND RASPBERRY PI

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Abstract: Forgetting to put off the electrical device while not in use, keeping the device ON while not necessary, thus leading to wastage of power has become common in our day to day life. Not much attention is paid towards such silly mistakes, but these little wastages can form a formidable amount of overall energy wastage if we consider the same mistake happening in every work place, house, educational institute, public place etc. In today's world, wherever everybody needs to keep their valuables safe and secure, video surveillance for observing a particular area has become the need of the hour. We are proposing a system which consists of PIR sensor for energy saving and MEMS Accelerometer sensor identify intrusion attack and alerts to the owner using GSM Modem. We can observe the person using live camera on webpage.

Keywords: PIR sensor, MEMS Accelerometer sensor, GSM Modem.

I. INTRODUCTION:

The development of any country depends to an outsized extent on availability and usage of electricity. Conservation of electricity has now become a significant component of economic process giving profit to state's funds and this conservation is additional essential because of the priority for fast depletion of non-renewable sources of energy in the country^[1]. Surveillance, from homes to very large industries, plays a major role within the fulfilment of our security. Aspects such as burglary and theft have always been a plight. In large industries, personal safety refers to the monitoring of the people's shifting information like activities and behaviour to protect, manage, and influence personal details. Surveillance refers to observent over from a distance by use of equipment like CCTV cameras. Security systems like CCTV have proved to be vastly well-liked for security functions because their price economical nature and straightforward maintenance. Surveillance is extremely useful for enforcement to investigate/prevent criminal activities, for recognizing and monitoring threats. These CCTV systems tend to monitor activities continuously. This result in high power consumption and memory wastage^[2]. Moreover, it doesn't provide alert on any suspicious activities detected. This paper includes an alert system to overcome the shortcomings of the regular surveillance systems.

II. Related Work:

As of now, we have some solutions for the problems mentioned above. They are using PIR sensor for both Energy Saving and Smart Surveillance^[1].

The disadvantages associated with these systems are :

If any human presence is sensed by PIR sensor it automatically turns ON the load and by using GSM module it send the SMS to the owner even when no intrusion attack.

Considering all the disadvantages associated with the existing devices we came up with a new device.

III. Proposed Methodology:

As an add on to the existing method, our proposed device will consist of two sensors

1. PIR sensor for Energy Saving
2. MEMS Accelerometer sensor for Smart Surveillance

With the help of MEMS Accelerometer sensor we can get the alert message only when any intrusion takes place.

III.I Hardware Requirements:

The following are the components which we used:

Raspberry PI:

Raspberry pi3 is dependent on a Broadcom BCM2835 system on a chip (SoC). It incorporates an ARM1176JZF-S 700 MHz processor. The Raspberry Pi Foundation started served by a 256MB RAM, that was named as Model A, and later made one B with 512MB RAM. The GPU utilized might be the Video Core IV, had through the Broadcom. The Raspberry Pi's GPIO port is arranged on upper left of the PCB, it's named as P1. It's a 26-pin port, fitted with two columns of 13 male 2.54 mm headers at the port. The dispersing of those headers is especially vital: 2.54 mm stick dividing,) is a kind of sight in gadgets, and it is the ordinary separating for prototyping plat shapes which incorporate ss trip board and breadboards. Each stick of the GPIO port highlights its own motivation, with a few pins cooperating additionally it frames specific circuits.

PIR SENSOR:

PIR sensor distinguishes a person moving around inside approximately 10m from the sensor. This is a normal esteem, as the genuine detection range is somewhere in the range of 5m and 12m. PIR are on a very basic level made of a pyro electric sensor, which can recognize dimensions of infrared radiation. For various fundamental tasks or things that need to find when an individual has left or entered the territory. PIR sensors are incredible, they are level control and negligible exertion, have a wide lens range, and are easy to interface with.

MEMS ACCELEROMETER SENSOR:

The MMA7660FC is ± 1.5 g 3-Axis Accelerometer with Digital Output (I2C). It is a low power, low profile capacitive MEMS sensor highlighting a low pass channel, pay for 0g counterbalance and increase blunders, and change to 6-bit advanced qualities at a client configurable samples per second. The device can be utilized for sensor information changes, item introduction, and signal detection through an intrude on stick (INT). The device is housed in a little 3mm x 3mm x 0.9mm DFN bundle.

GSM:

GSM stands for Global System for Mobile communication. Here we are using GSM for sending the message to the well-wishers indicating that the person is in trouble and along with location details. In our project, we are using 3G slot for the sim. So, we need to use a network subscriber which supports 3G.

USB Camera:

A camera is an optical instrument that records images that can be stored legitimately, transmitted to another area, or both. These images might be still photos or moving images, for example, recordings or films. The term camera originates from the word camera obscura (Latin for "dim chamber"), an early system for anticipating images. The advanced camera developed from the camera obscura. The working of the camera is fundamentally the same as the working of the human eye.

III.II Software Requirements:

Here we are using PYTHON for programming microcontroller. As we are using Raspberry PI as microcontroller, we use Raspbian OS. It is not purely an OS as it comes with numerous packages and pre-combined software for ease of installation and efficiency of operations. We will write the code for interfacing all the hardware components and dump the code into the microcontroller. After writing the code connect the microcontroller to the computer using USB cable and then dump the code.

III.III Algorithm:

The following is the algorithm for the proposed system:

- Supply the power using power cable.
- GSM is initialized.
- If human presence is detected by PIR sensor ,loads turned ON automatically
- Else loads are in the OFF state
- If intrusion attack is detected by MEMS Accelerometer sensor by using GSM it sends alert message.
- We can observe the person using live camera on webpage.

III.IV Flowchart:

The flow chart of the proposed model is as shown below:

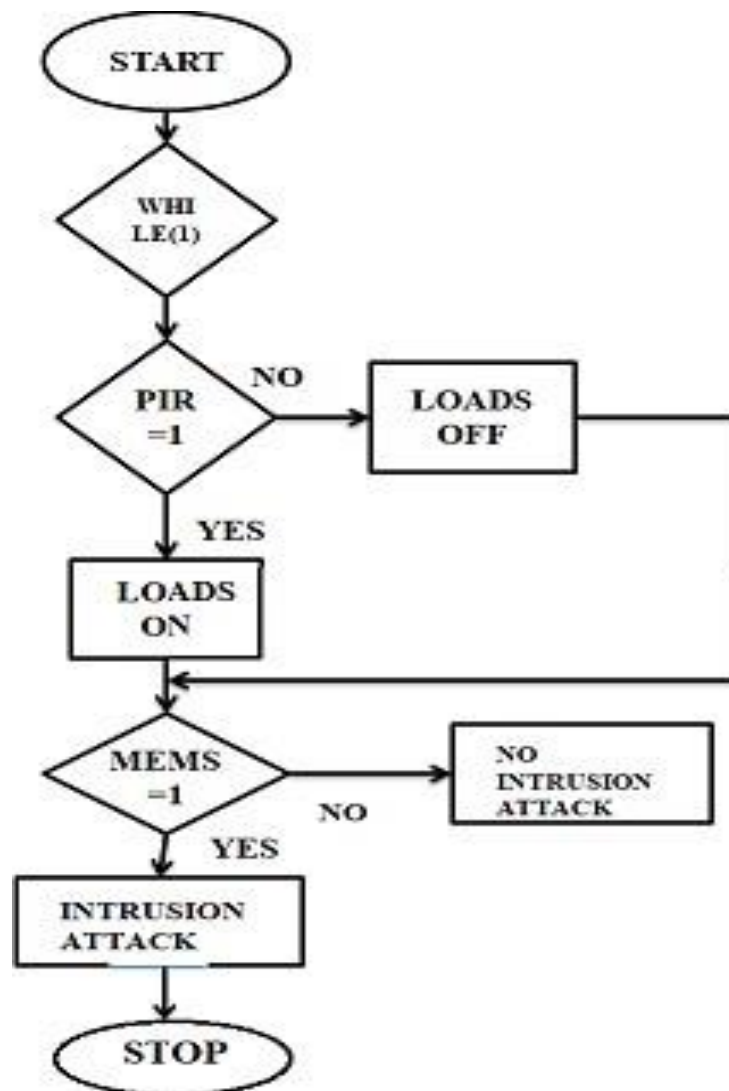


Figure 1: Flowchart of the Proposed Method

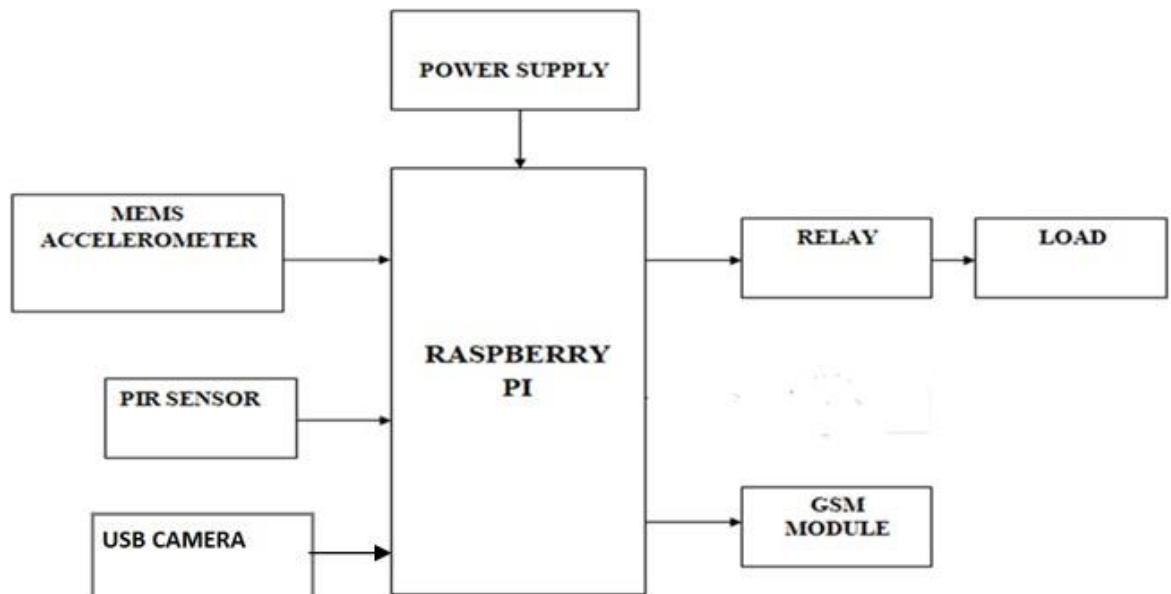
III.V Schematic Diagram:

Figure 2: Block diagram of proposed method

III.VI Working:

This prototype of a system is designed to do the task of controlling loads in a room based on presence of human activity by PIR sensor. If human presence is detected then electrical devices will turn on/off automatically. In addition to this we are using GSM module and MEMS accelerometer to identify the intrusion detection and to alert the owner using SMS. By using camera we can observe the person on the webpage.

IV. Results:

These are the results which we got

- [1] Human presence is detected by the PIR sensor so it turns ON the light as shown in figure 3.
- [2] When motion or vibrations sensed by MEMS accelerometer the owner received alert message as “MEMS Disturbed” as shown in figure 4 and the message will be sent to the registered mobile number.

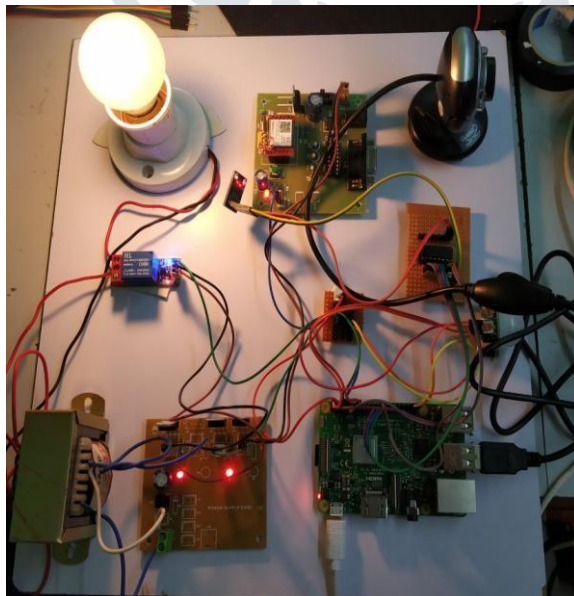


Figure 3: Loads ON due to human presence

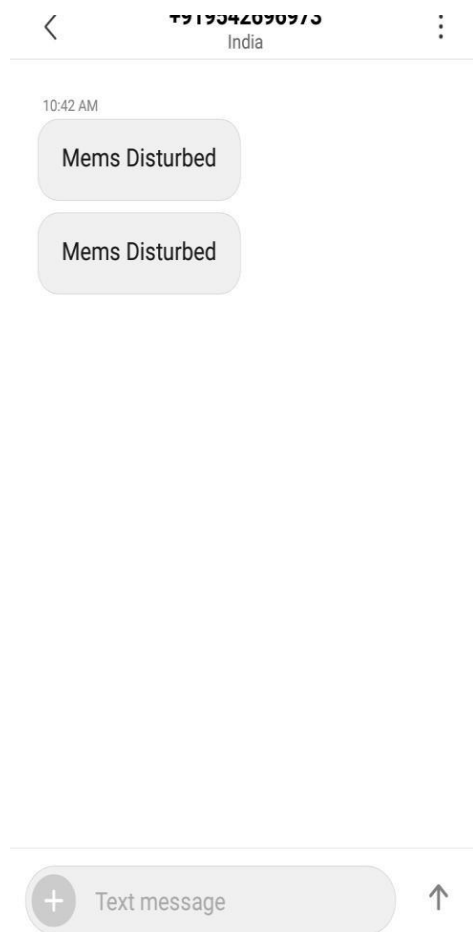


Figure 4: Message alerts

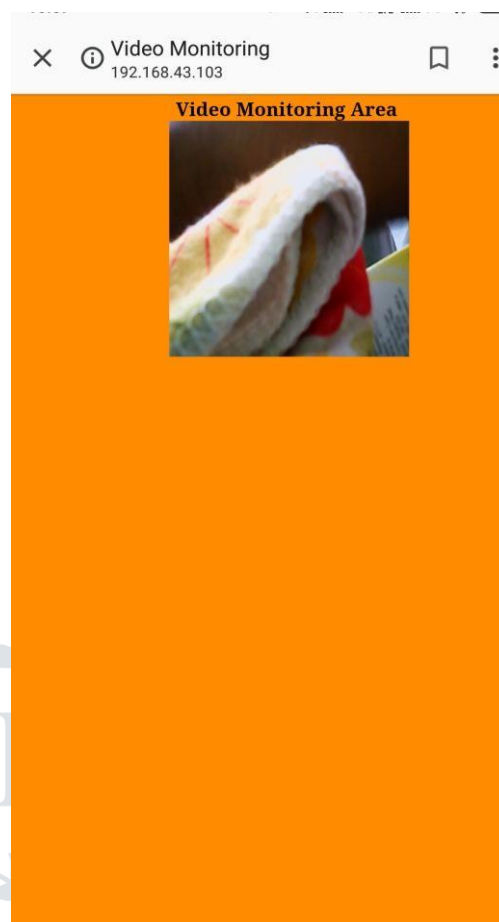


Figure 5: Video surveillance

- [3] Here owner can see the video of area under surveillance as in figure 5.

V. Conclusion:

This system is a prototype to provide an efficient method to prevent unnecessary usage of electricity which can able to turn automatically the appliances ON and OFF and for monitoring suspicious activities and by sending alert message to the owner using GSM. The system has an attractive value features including low cost, compact, easy to customize easy to deploy and easy to maintain.

VI. References:

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