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Smart Home Monitoring For Development of Smart Grid Using Raspberry Pi Processor

Vinay Kumar Kalavakuri
M.Tech,
Dept of ECE,
Chiranjeevi Reddy Institute of Engineering and Technology.

B.Mohan Reddy
Assistant Professor,
Dept of ECE,
Chiranjeevi Reddy Institute of Engineering and Technology.

ABSTRACT:

The Smart Grid is an evolution of the existing electricity grid. It comprises of a two-way communication where electricity and information is exchanged by the consumer and utility to maximize efficiency. Home automation is an important milestone in achieving smart grid and is ever exciting field that has exploded over the past few years. Advancement in technologies have made homes more convenient, efficient and even more secure. Introducing the Raspberry Pi to the world of home automation provides numerous customizations to turn a regular home into a smart home. Raspberry Pi provides a low cost platform for interconnecting electrical/electronic devices and various sensors in a home via the internet network. The main objective of present work is to design a smart home using various sensors which can be controlled and monitored by the Raspberry Pi via the Internet of Things (IoT).

This will help the home owners to provide a simple, fast and reliable way to automate their environment. This paper focuses on two aspects of smart home i.e. home security and home automation. Home security system, capable of motion & disturbance detection at entry points and creating an alarm system with email notification alerts having picture, was implemented to allow real time monitoring for the house. The home automation system was also implemented around the same Raspberry Pi, which includes a smart doorbell, an automated lighting system and a temperature & humidity controller that turns an air-condition unit or fan on/off automatically under given conditions. Python codes were written for interfacing each sensor and a prototype of smart home was developed. Smart home was fully tested and performance was found satisfactory.

Keywords:

Raspberry Pi, Smart Home, GSM technology, sensors, Home Security, Smart Grid.

I.INTRODUCTION:

The project is aimed at evaluating the performance of an operating system on an embedded system. Before delving into its implementation, an introduction is needed to the parts involved in the project. The whole report is centered around the field of embedded systems and the use of Linux to run applications on them. Hence an introduction to Embedded Systems and using Linux as an OS in them is provided.

The smart grid is an advanced platform to the way we receive electricity today. In earlier times the demand for electricity was substantial compared to that presently. Since the demand for electricity has tremendously increased, a redesign of the current grid system is much needed. With the technology available in these modern times, the smart grid could be designed in such a manner, that it uses digital communications technology to detect and react to local changes in usage.

The system will feature a two-way dialog where electricity and information can be exchanged between the consumer and utility. This can increase or decrease the amount of energy a consumer needs by analyzing the feedback of the two-way dialog. The transfer of electricity and information between consumer and utility would increase efficiency, reliability and security. The smart grid also enables renewable energy technology to be integrated into the system for a greener, more environmentally friendly method of obtaining energy, thus reducing a percentage of dependency on fossil fuel [1-3].

II.RELATED TO WORK:

2.1.BLOCK DIAGRAM:

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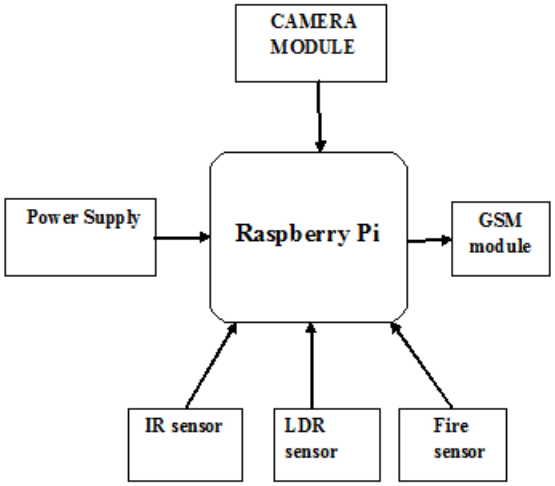

Figure-1: Block diagram

2.2EXISTING SYSTEM:

Presently, the home security system is major defect in our country. In homes or any industry security system is not available not only that security any other conditions like fire accidents or theft alert. To overcome the security problem our project is implemented with advanced technology.

2.3 PROPOSED SYSTEM:

This paper deals with the design and implementation of home surveillance monitoring system using Raspberry pi and IR sensor, LDR sensor and fire sensor for mobile devices. It increases the usage of mobile technology to provide essential security to our homes and for other control applications. Capable of motion & disturbance detection at entry points along with security alarm system having alerts containing picture, was implemented to allow real time monitoring of the home anywhere and anytime.

III.HARDWARE COMPONENTS:

3.1 RASPBERRY PI PROCESSOR:

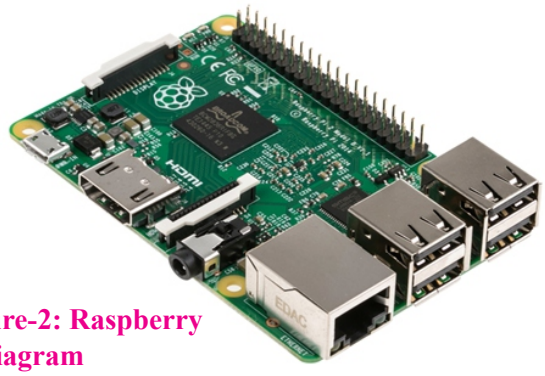

Figure-2: Raspberry Pi diagram

The Raspberry Pi board involves a processor and snap shots chip, Random Access Memory (RAM) and more than a few interfaces and connectors for external devices. Some of these instruments are main others are optional. It operates in the identical method as a ordinary pc, requiring a keyboard for command entry, a show unit and a vigor give. considering that raspberry Pi board operates like pc it requires 'mass-storage', but a tough disk pressure of the variety observed in a ordinary pc is not relatively in maintaining with the miniature dimension of Raspberry Pi.

3.2 GSM MODEM:

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. The working of GSM modem is based on commands, the commands always start with AT (which means Attention) and finish with a character. For example, the dialing command is ATD, ATD3314629080; here the dialing command ends with semicolon. The frequency range specified for GSM is 1,850 to 1,990 MHz (mobile station to base station).

3.3 IR COMMUNICATIONS:

IR wireless is the use of wi-fi science in instruments or methods that deliver information via infrared (IR) radiation. Infrared is electromagnetic power at a wavelength or wavelengths quite longer than these of pink gentle. The shortest-wavelength IR borders noticeable crimson in the spectrum. The longest-wavelength IR borders radio waves. The name means below red, the Latin infra meaning "below". Red is the color of the greatest wavelengths of noticeable light. Infrared light has a longer wavelength than that of red light visible to humans, hence the literal meaning of below red.

WHAT IS INFRARED:

Infrared energy is light that we cannot see, but our bodies can detect as heat. It is part of the electromagnetic spectrum that includes radio waves, X-rays and visible light. All of these forms of energy have a specific frequency, as represented in the chart below.

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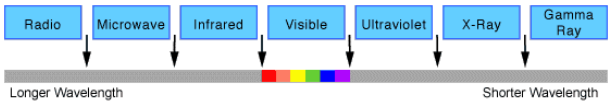

Figure-3: IR sensor Rays

Infrared vigor is made out of those frequencies that exist just below the purple end of the visible spectrum, and for cooking homes they've an awfully specified improvement - once they strike healthy molecules (reminiscent of any variety of food), they cause the molecules to vibrate, thereby growing warmness. Even though practically any kind of electromagnetic vigor can cause heating, for the motive of cooking, infrared vigor is the excellent choice.

3.4 FIRE SENSOR:

This fire sensor circuit exploits the hearth sensing property of an usual signal diode IN 34 to realize warmness from fire. On the moment it senses warmth, a loud alarm simulating that of fireside brigade will probably be produced. The circuit is too touchy and can detect a rise in hearth of 10 measures or extra in its vicinity. Usual sign diodes like IN 34 exhibits this property and the inner resistance of those instruments will cut down when fireplace rises.

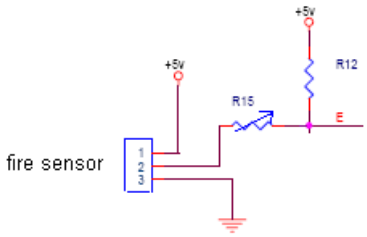

Figure-4: Fire Sensor

3.5 LIGHT DEPENDENT RESISTOR:

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1,000,000 ohms, but when they are illuminated with light, the resistance drops dramatically. Thus in this project, LDR plays an important role in controlling the electrical appliances based on the intensity of light i.e., if the intensity of light is more (during daytime) the loads will be in off condition. And if the intensity of light is less (during nights), the loads will be switch. LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.

Figure-5: LDR sensor

IV.RESULTS:

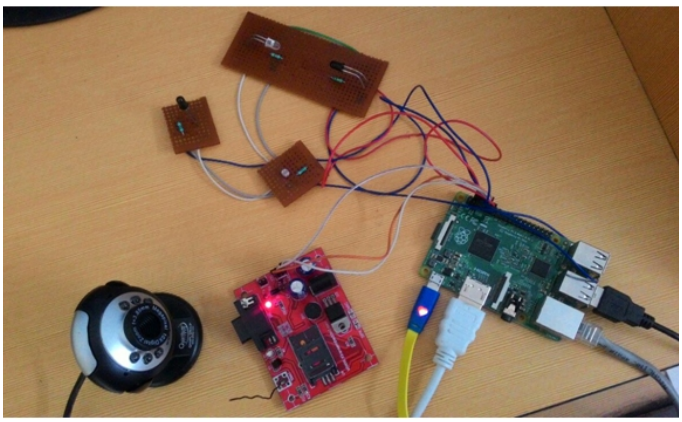

Figure-6: Hardware diagram of project

Figure-7: Video Monitoring System

V. CONCLUSION:

The project "Raspberry Pi based Smart Home for Deployment in the Smart Grid" has been successfully designed and tested. Integrating features of all the hardware components and software used. Positioned to the high-quality, secondly, utilizing highly developed ARM11 board and with the support of developing science the venture has been efficiently implemented.

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Author's Details:

Vinay Kumar Kalavakuri
M.Tech, Dept of ECE,
Chiranjeevi Reddy Institute of Engineering and Technology.