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IOT Based Secured Smart Home Automation Using Raspberry Pi

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Abstract: **This paper deals with the design and implementation of Raspberry pi based IOT concept it means internet of things. In this present generation everything is going on internet itself. So in this project we concentrate totally on the present generation life how they can get security to their home or office and control the devices by using android app just by using internet in there smart phones. The main security is provided by camera module which captures the images and uploads into the internet and also stores the same images in Raspberry pi module SD card. Raspberry pi acts like a small minicomputer it is totally a Linux platform. By just connecting mouse and keyboard we can operate it as minicomputer where we can play games, play videos etc just like our personal laptop work. And also the WI-FI module is used in this project to control the devices from remote location also by getting the status of the devices into smart phone android app everything is going on internet itself our day to day life. Future generation will work on internet itself by sitting in one place we can do anything on internet.**

Keywords: **IOT, Wi-Fi, automation, camera, cloud, android, Raspberry pi**

1. INTRODUCTION

An **embedded system** is a special-purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Unlike a general-purpose computer, such as a personal computer, an embedded system performs one or a few predefined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded systems are often mass-produced, benefiting from economies of scale.

Personal digital assistants (PDAs) or handheld computers are generally considered embedded devices because of the nature of their hardware design, even though they are more expandable in software terms. This line of definition continues to blur as devices expand. With the introduction of the OQO Model 2 with the Windows XP operating system and ports such as a USB port — both features usually belong to "general purpose computers", — the line of nomenclature blurs even more.

Physically, embedded systems ranges from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants.

In terms of complexity embedded systems can range from very simple with a single microcontroller chip, to very complex with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

Figure 1.1 Expression Tree

A custom-made Raspberry Pi will be fitted at each power points or switch boards. It will act as the control for all electrical appliances (lighting, fans, air conditioners etc). There will be no work for the user regarding his/her appliance. One has to initialize the required settings at the time of setting up of the system. After that the system will be individual and self sustained. The custom Raspberry Pi will have relays fixed on, which will control all lighting and fans or any other electrical appliances. This board will have a Wireless connection that connects to an Internet hub. This Internet hub will be connected to the internet via LAN or Wi-Fi (Depends upon the choice of the user). As mentioned earlier the internet acts as a master since the entire control process is taken care of by an online server-side program (ASP or PHP modules). The user just has to login in to the specified webpage during the time of initialization and in case there is a need to change the automation settings. The web-page will be coded in such a way that it provides complete control to the user over the automation process such as timing and conditions for the automation process.

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2. LITERATURE SURVEY

The security of one's belongings when a person leaves his/her house is always a concern with increasing number of incidents of theft, robbery etc. Many automated systems has been developed which informs the owner in a remote location about any intrusion or attempt to intrude in the house. . However, this paper looks into the development of an ANDROID application which interprets the message a mobile device receives on possible intrusion and subsequently a reply SMS which triggers an alarm/buzzer in the remote house making others aware of the possible intrusion[1]. They can provide several useful services such as support for the elderly and disabled people, access control, environmental monitoring, and home automation. Furthermore, with the widespread diffusion of mobile devices and their integration with new auto-identification technologies, the need to control and manage the smart home through these devices is increasing. In this context, the main goal of this work is to develop and validate an architecture, both hardware and software, able to monitor and manage a KNX based home automation system through an Android mobile device in an efficient and safe way[2]. With the rapid development of mobile devices and Internet services, managing home security with these devices and services is gaining popularity. To expand the range of usability of conventional home surveillance cameras, we propose the UPnP-based Surveillance Camera System (USCS), which employs UPnP technology to search, control, and manage IP-based cameras. With UPnP, interconnected equipment and the control network inside the home can be accessed for data sharing, communication, and entertainment. However, the current UPnP was originally designed for local networks. Therefore, we integrated the UPnP control module into the Open Service Gateway Initiative (OSGi) framework to access UPnP services from a remote network. The control point is an external network that can access the UPnP device, which is hosted in a home area network via USCS. Our system showed improved searching, management, discovery, and manipulation of IP-based cameras in a home network using our system, compared to a conventional system. Users can use a mobile device to monitor the home security status in real time by a remote access function provided by OSGi. Hence, users can monitor their homes more efficiently and instantly, ensuring the safety of house members and the property[3]. The next paper is aimed to present a new idea of using the embedded system on FPGA platform with the microprocessor Micro Blaze and the real time operating system Free RTOS to control and to monitor household appliances through GPRS and using the PIR sensor to carry out monitoring break-in. Due to the strict requirements of the time constraints, the use of resources and the importance of scheduling, real time operating system (TRTOS) plays a very important role in the development of embedded systems[4].

The use of wireless technology in home and industrial automation systems is on the rise due to several advantages such as cost reduction, easy placement and installation, easy extension, comfort benefits, and mobile device connectivity. This paper provides a comparative study of different wireless protocols such as ZigBee and Bluetooth for the selection of appropriate technology for Load Control. It also describes a project model for remote controlling and monitoring of various loads/appliances and a means of efficient power utilization through real-time power level indicator with the help of a PC-based GUI application. Further the analysis of various performance parameters such as Latency, Received Signal Strength Indicator (RSSI) value, Round-Trip Delay time, Network coexistence of the ZigBee technology are evaluated for the implemented system[5]. Photovoltaic System of the renewable energy industry is regarded as an important alternative. Recently, the trend is to improve Photovoltaic System Applying Ubiquitous computing because the advent of Ubiquitous computing concept and the smart phones is has propagated. Due to the advent of Cloud technology into the home has saved computing resources that is the personal and the household making or spending. Public-Cloud combines and shares resource when necessary. Using external server Private-Cloud's method that combine Public-Cloud, Hybrid-Cloud has been put to practical use. In this paper, Mobile's photovoltaic monitoring system that is based Web service is implemented. Web application framework that has emerged in recent years has been implemented based Sencha-Touch framework. And, the unique benefits of the Sencha-Touch framework, introducing the concept of ubiquitous computing, user convenience-oriented monitoring is possible on smart phone or tablet PC. In addition, Reports were implemented without restrictions on different kinds of device or OS because the mounting High charts was written in pure JavaScript. Lastly, Use of Cloud middleware based Web services, because the future is more easily scalable photovoltaic system monitoring, and When combining the Bluetooth, wireless network and 4G LTE device will be helpful in the new monitoring technology development [6]. As experimental collaborations become larger and more international, there is a growing need for web based tools that can allow collaborators to securely and reliably monitor and control their respective systems both on-site and remotely from their home institutes. Increased adoption of mobile devices such as smart phones and tablets also opens new possibilities for system monitoring, including push technologies to send notifications about important events or error conditions. We present a system based on state-of-the-art clients implemented in HTML5. These thin clients have high performance capacities due to modern technologies like web workers for multithreading and web sockets, a protocol with extremely small overhead. The client is adaptable to different platforms and requires no installation whatsoever. The client can provide highly complex functionality and offers a large number of controls and information channels through a simple-to-use gui, while major computation is handled by middleware. Beyond basic controls such as disabling/masking problem nodes or restarting processes, our system is also capable of processing data volumes and presenting live graphs and histograms on the client. If necessary, users can be alerted with text messages (sms) for rapid reaction to special events or error conditions. In these messages a uri is included that brings up the client in

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a browser with the data and the controls necessary to begin dealing with the event. All transactions such as control signals are handled reliably through use of enterprise integration patterns. Security is based on industrial strength proven protocols including SSL. We share our experiences implementing and testing these new tools in realistic experimental environments, including projects in which our group is involved[7]. Home automation refers to a system that is used to control devices around the home. These devices can include doors, lights, surveillance systems, and consumer electronics. A user can control a variety of home devices with the help of a home automation system. To provide mobility, a mobile phone-based home automation has been developed. As another approach toward home automation, an Internet based home automation system has been proposed, providing a graphic user interface.

3. PROPOSED SYSTEM

In the proposed system design and implementation of Secure Home Automation using Raspberry Pi for mobile devices that leverage mobile technology to provide essential security to our homes and associated control operations. The proposed home security solution hinges on our novel integration of cameras and motion detectors into web application. Raspberry Pi operates and controls motion detectors and video cameras for remote sensing and surveillance, streams live video and records it for future playback, and finally manages operations on home appliances, such as turning ON/OFF a television or microwave. For instance, when motion is detected, the cameras automatically initiate recording and the Raspberry Pi device alerts the homeowner of the possible intrusion. Raspberry Pi has two main components interacting with each other: the Web application that executes on the mobile device's browser and server-side scripts that run in a cloud which will be operated by the Raspberry Pi hardware tool component

Security over household always pays a high price which a middle class person cannot afford for such a price. Hence this paper leverages a security progression over the household in a very cheap cost and which he can itself provide a security which could also be said that 'he can be the ironman of his house'. Our Project, SHARP provides a greater benefit to any person who can afford a cheap product which could provide home automation features to any device carrying a browser. The home automation system works by using the internet as the master and Raspberry pi as hardware tool.

A custom-made Raspberry Pi will be fitted at each power points or switch boards. It will act as the control for all electrical appliances (lighting, fans, air conditioners etc). There will be no work for the user regarding his/her appliance. One has to initialize the required settings at the time of setting up of the system. After that the system will be individual and self sustained. The custom Raspberry Pi will have relays fixed on, which will control all lighting and fans or any other electrical appliances. This board will have a Wireless connection that connects to an Internet hub. This Internet hub will be connected to the internet via LAN or Wi-Fi (Depends upon the choice of the user). As mentioned earlier the internet acts as a master since the entire control process is taken care of by an online server-side program (ASP or PHP modules). The user just has to login in to the specified webpage during the time of initialization and in case there is a need to change the automation settings. The web-page will be coded in such a way

that it provides complete control to the user over the automation process such as timing and conditions for the automation process.

Specifically, Raspberry Pi makes the following contribution (a) operates the cameras and motion sensors, which is also used for security purpose (b) operation of home appliances.

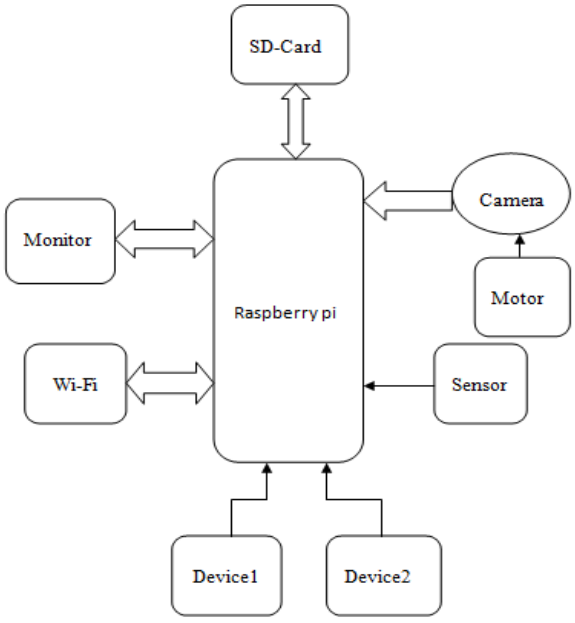

Figure 3.1 System Model

Explains the overall connection of the hardware. Raspberry-Pi is connected to various sensors such as fire sensor, soil moisture sensor, temperature sensor and PIR sensor. Fire sensor is in turn connected to buzzer and water pump. Soil moisture sensor is also connected to the water pump. Motion sensor is connected to camera to capture image and live video streaming. Light is connected to capture the clear image at night. Temperature sensor is connected to Raspberry-Pi which in turn is connected to the motor to draw the curtain. Raspberry-Pi is connected to the Internet via Wi-Fi or LAN which can be accessed by the user through web interface.

3.1 Webcam:

Active Webcam captures images up to 30 frames per second from any video device including USB cameras, Analog cameras connected to capture card, TV-boards, camcorders with FireWire (IEEE 1394) interface and from Network cameras. The program broadcasts captured live audio and video content in real time to client computers either from your

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computer or through any FTP server. Viewers can watch real video and audio using or Internet browser, or another copy of the Active Webcam program. When the program detects motion in the monitored area, it can sound an alarm, e-mail you the captured images, start broadcasting or record a video. The program has features to add text captions and image logos to the images, to place a date/time stamp on each video frame, and to adjust the frame rate, picture size, and quality.

Ways to Use:

1. Banking

Figure 3.2 Bank

2. Buildings, offices, shopping-malls and parking lots.

Figure 3.3 offices

3. Retail.

Figure 3.4 Retail shop

4. Home security

Figure 3.5 House

4. RESULTS

The system consists of mainly 3 components is a Wi-Fi module, raspberry pi board and relay circuits. Wi-Fi is used a communication channel between web interface and raspberry pi board. This provides a full security support for homes. This system is more flexible and provides attractive user interface compared to other home automation systems.

Webcam Result:

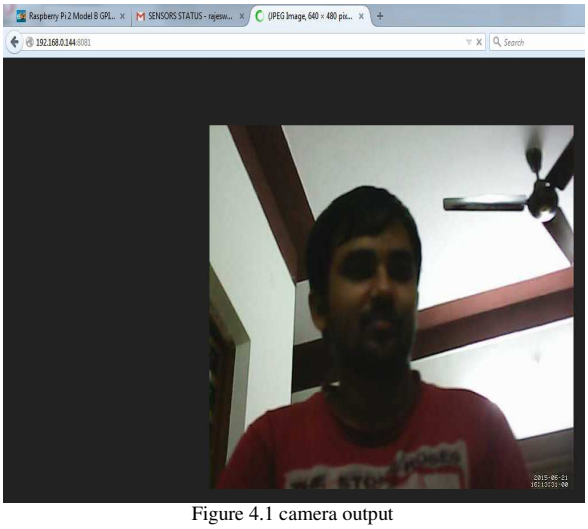

Figure 4.1 camera output

Home automation web page:

Figure 4.2 automation web page

CONCLUSION

Developed a comprehensive solution that provides a user friendly home automation and security application for homes. We accomplished this through the integration of cheap, off-the-shelf, widely available devices, interfaces and software coupled with a user friendly interface. This work provides users with an easy to use in mobile and pc for which they can remotely access and control their home appliances and security. In future we intend to provide a wireless relay connection and wireless sensors which can be movable and can be operated and which can be used in company and instates for Security to the whole building with one single system. This provides a full security support for homes.

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