Home Automation Using Internet of Things

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Abstract - The main aim of the project is to develop a system that will provide remote control of home appliances and also provide security against the mishaps when the home host is not at home. This paper is mainly concerned with the automatic control of light or any other home appliances using internet. It is meant to save the electric power and human energy. This project is made with the help of controller and raspberry pi. The various appliances connected to the micro controller and sensor is connected using wireless network.

Key Words: wireless Home automation System (WHAS), Internet of Things (IoT), Wi-Fi network, Microcontroller

I. INTRODUCTION

A. Overview
Homes of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. A home automation system is a means that allow users to control electric appliances of varying kind.

Many existing, well-established home automation systems are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes very high. In contrast, Wireless systems can be of great help for automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere.

B. Advantages of Home automation systems over wired system
In recent years, wireless systems like Wi-Fi have become more and more common in home networking. Also in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only.

- Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g. into walls) is expensive.
- System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network necessary. In contrast to wired installations, in which cabling extension is tedious. This makes wireless installations a seminal investment.
- Aesthetical benefits: Apart from covering a larger area, this attribute helps to full aesthetical requirements as well. Examples include representative buildings with all-glass architecture and historical buildings where design or conservatory reasons do not allow laying of cables.
- Integration of mobile devices: With wireless networks, associating mobile devices such as PDAs and Smartphones with the automation system becomes possible everywhere and at any time, as a device's exact physical location is no longer crucial for a connection (as long as the device is in reach of the network).

For all these reasons, wireless technology is not only an attractive choice in renovation and refurbishment, but also for new installations.

II. RELATED WORK

This paper proposes a Home Automation system that employs the integration of multi-touch mobile devices, cloud networking, wireless communication, and power-line communication to provide the user with remote control of various lights and appliances within their home. This system uses a consolidation of a mobile phone application, handheld wireless remote, and PC based program to provide a means of user interface to the consumer.

[2] Basil Hamed
The main objective of this Paper is to design and implement a control and monitor system for smart house. Smart house system consists of many systems that controlled by LabVIEW software as the main controlling system in this paper. Also, the smart house system was
supported by remote control system as a sub controlling system. The system also is connected to the internet to monitor and control the house equipment’s from anywhere in the world using LabVIEW. [3] Deepali Javale, Mohd. Mohsin, Shreerang Nandanwar The prime objective of this paper is to assist handicapped/old aged people. It gives basic idea of how to control various home appliances and provide a security using Android phone/tab. The design consists of home automation website, Raspberry pi B, ATMEGA8 microcontroller. User can interact with the website and send control signal to the Raspberry pi kit which in turn will control other embedded devices/sensors.

III. SYSTEM ANALYSIS

A. Problem Definition

Many people are always on the move from place to place due to business demands. Some people can spend a couple of days away from their home leaving all their household appliances without any kind of monitoring and control. Some devices are left plugged into power sockets whereas others are supposed to be plugged into and out of power sockets at different intervals depending on the time of the day. All this requires an individual to manually attend to each of the devices independently from time to time. All such monitoring and control can be done without necessarily being around or inside the home. Some devices if not controlled properly consume a lot of energy which leads to extra expenditure on electricity. Therefore we propose to design an internet based home automation system which will enable one to remotely manage his/her appliances from anywhere, anytime.

B. Proposed System Feature

As we enter the 21st century, the interaction between humans and computer is breaking old barriers and entering a new realm. In the highly technology driven world of today’s mobile phones have become a part of our Lifestyles. Mobile phones are not just communication tool. Our project tries to derive solution providing better control on home appliance with help of cell phone. The Existing System consists of physical appliances in our home that are been controlled through switches. These devices can be switched ON & OFF manually whenever needed. This system is less secured and prone to electrical hazards. Also the wastage of electricity tends to be a major factor of concern. The proposed project is conceived networking our mobile phone to all appliances via a smart logic circuit. The proposed system consists of Smart Logic Circuit connected to the appliances. Status of all home appliances could be controlled by user from remote location with help of user’s mobile phone.

IV. SYSTEM DESIGN AND IMPLEMENTATION

A. Proposed Home Automation System

The end user can use their mobile phone to log into the system. An initial check is performed for whether the hardware device is ON or not. Only if the Hardware is authorized and ON then the user is Authenticated. Once the authentication is done successfully the user is able to send the control signals to the Hardware machine. At the hardware machine the SL driver program will continuously track for the change in the status & will accordingly send the signals to the Circuit. When a user select a change in the status for any of the device [i.e.. ON or Off], the data from the handheld is sent to the Web Server in a string format, where the Web-site is hosted. On the server the status is stored in the database in their respective device field. At the Hardware end, the circuit drive program a web page is [retrieve.aspx] is used to retrieve the status of the devices in a timely pattern [every 10sec]. These changes come in to form of cookies [temporary internet files] from the webserver & are stored on the computer in the name of the web site. Hence every 10 sec as the page refreshes the new cookie values are updated. The cookie values are read from the program using the VB component GETINTERNETCOOKIE after a fixed delay. As the program receives any change in the Device values it send the control signal [binary data] accordingly to the required data pin of the parallel port.

B. Proposed Home Automation System Functions

The proposed home automation system has the capabilities to control the following components in users home and monitor the following alarms:

- Temperature and humidity
- Gas leakage detection
- Control appliances
The proposed home automation system can control the following appliance:
- Lights on/off/dim
- Fan on/off
- On/off different appliance
- Leakage of gas

C. Software design

Front End Design:
HTML is a format that tells a computer how to display a web page. The documents themselves are plain text files with special "tags" or codes that a web browser uses to interpret and display information on your computer screen. HTML stands for Hyper Text Mark-up Language; an HTML file is a text file containing small mark-up tags. The mark-up tags tell the Web browser how to display the page. An HTML files must have an htm or html file extension.

Database Storage:
The system generates forms to collect data and stores the responses in a database. The system is very flexible since the data can include HTML, allowing the system to perform additional processing using JavaScript or other HTML techniques.

D. Implementation Setup

Figure 2 illustrates the sequence of activities in WHAS. When the connection is established it will start reading the parameters of sensors like fan, tube light, gas sensor etc. The threshold levels for the required sensors are set as t1, t2, and t3 etc. The sensor data are sent to the web server and stored in the cloud. The data can be analysed anywhere any time. If the sensor parameters are greater than the threshold level then the respective alarm a1, a2, a3 etc. will be raised and the required actuation is done for the controlling of the parameters.

A model house is built for the home automation system and is as shown in the figure. Light 1 will turn on automatically when light sensor detects the darkness. A cooler/Fan will turn on when the room temperature exceeds the set threshold and in turn reduces the room temperature. The gas sensor LM35 is placed in the kitchen to detect any gas leakage, if any leakage is detected the alarm in the hall is raised. Relay is used to switch the electrical appliances like light, fan etc. The Intel Galileo is placed in store room or garage. The Raspberry Pi B is connected with WiFi or LAN for the connectivity with internet.

V. RESULTS

After the successful connection to the server, the data of sensor are sent to the web server for monitoring of the system. The figure 3 shows the web server page which will allow us to monitor and control the system. By entering the assigned URL address in the web browser this web server page will appear. The web server gives the information about the temperature in different places of the house. It also gives the status of the various electrical appliances like light, fan etc. which we can control remotely.

Figure 4: Data base of the sensors data stored in the cloud

All the required data is stored in the database. The stored data can be analyzed at anytime and anywhere. The figure 4 shows the temperature in degree Celsius stored at different time intervals. And also it shows the state of the motion detector along with the time. It also provides information about time of motion detected and how many times as well. All this information is stored in the cloud which can be checked by the user any time when away from home.
VI. CONCLUSION AND FUTURE WORK

A. Conclusion

The home automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, gas, light, motion sensors, but also actuates a process according to the requirement, for example switching on the light when it gets dark. It also stores the sensor parameters in the webpage (database) in a timely manner. This will help the user to analyze the condition of various parameters in the home anytime anywhere.

Future work

Using this system as framework, the system can be expanded to include various other options which could include home security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring, or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.

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