FACEBOOK BASED HOME APPLIANCES SECURITY CONTROL AND MONITORING USING MICROCONTROLLER

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ABSTRACT

The real-time home appliance status is now developed in numerous fields. New technology is necessary in order to process the large amount of status information that is received every day. A creative technology that has recently been used to process large amounts of data is cloud computing. Therefore, a prototype to control and monitor home appliances using Facebook in a smart home environment is proposed in this project. UPnP technology is used to extract status information from home appliances. Ethernet device with microcontroller (atmega1284p) analyzes and processes the information and also provides virtualization services to users. In the proposed method, the Facebook authenticated and preloaded Ethernet device collects and stores home appliance information and sends the information to the Facebook user page. The user can control the appliances of smart home by sending commands from their Facebook account.

Keywords – Facebook, UPnP technology, atmega1284p.

I. INTRODUCTION

In this paper, the proposed system is divided into three parts: the Gateway, Facebook, and Smart device. The gateway identifies home appliances that use UPnP services, extracts the status information of the home appliances, and transmits the extracted data to a Facebook. Facebook stores data classified by the user and provides home appliance monitoring services to users using the virtualized status information of the home appliances. It also offers a distributed computing function and data storage service to users. The smart device allows users to monitor and control home appliance functions from the Facebook. The smart device receives the virtualized data of the home appliances from the Facebook. All of the proposed components communicate with each other using HTTP and transmit data using XML. The proposed system provides home appliance monitoring service to users via a home appliance virtualization function supported by a social network.
II. BLOCK DIAGRAM

![Block Diagram](image1)

**Fig.1 Block diagram**

The operation of this block diagram is simple using the microcontroller atmega 1284p and its features and parameters are given in the introduction column of the microcontroller. The device switching circuit is comprised of relay which is used to switch the home appliances, the number of relay to be used will depends on the number of home appliances to be controlled and switched between.

The serial interface transmits and receives data simultaneously and transmits to the Ethernet device.

III. METHODOLOGY

![Methodology Diagram](image2)

**Fig.2 Methodology**

The methodology shown above explains the control and monitoring activity of the smart home environment. The home network has various number of appliances connected to the Ethernet gateway, for example light, fan, T.V etc. All the appliances are connected to the router through microcontroller. The router is connected with the Ethernet gateway. Serial communication interface place a vital role between the gateway and cloud server. The information are passed to the cloud server from the gateway, the cloud server stores the
information and provides a virtualized notification for the user. The user can view the status of their home through the cloud network.

IV. IMPLEMENTATION

A. Power Supply

Initially the device is connected to the power supply, the normal power supply draws a 230V current, it is regulated and given to device as 5V power supply. The regulation action is done by the series connection of step-down transformer, bridge rectifier, capacitor and filter followed by the regulator on the board.

![Diagram of power supply connection](image)

Fig. 3 Connecting with power supply

Thus the 5V power supply is given to the entire device except the home appliances that is need to be controlled.

B. Relay

There are totally four relays used in this prototype, it can control the switching of four home appliances. Here in the prototype, the appliances are indicated with three bulbs which indicates the ON and OFF switching of the appliance from the relay circuit. The relay used here basically draws the current continuously to the appliances, whenever there is a need to control the appliances by the user from the Facebook, the relay follows the command from the Facebook and acts accordingly by the switching operation of the appliances.

The four relays are indicated with a LED, it indicates whether the device is switched ON or OFF for the reference of the user and the calibration purposes. Whenever the appliances are switched OFF, simultaneously the LED also turns OFF if not, it indicates there is a problem inside the relay.

C. Ethernet Device

The Ethernet device used in this prototype draws power from the power supply which is given to the entire device as 5V. The main part of the Ethernet device is the atmega 1284p microcontroller, which performs the entire operation of the home networking area. It draws the status of the different sensors i.e. smoke sensor, temperature sensor, PIR and vibration sensor. The status of the different sensor is transmitted to the Ethernet device i.e. to the microcontroller and it stores the status of the smart home completely. For the user reference and calibration purposes a hyper terminal application is used to monitor the working of the prototype. Whenever the local area network is connected to the Ethernet device, the hyper terminal application connected.
with the prototype shows the status whether the network connection with the server i.e. the server address which is preloaded on the Ethernet is established or not. Here the preloaded Ethernet server is Facebook network therefore it shows whether the Ethernet is connected. Initially the LCD connected to the device shows that it is connecting to the Ethernet, if the connection is not established with the server it shows connection is failed on the LCD screen.

D. Serial Communication Interface

The serial communication interface serves as a mediator between the microcontroller atmega 1284p and Ethernet. It performs the transmitting and the receiving processes simultaneously at the same time. It receives status from each sensors and transmits the status to the microcontroller simultaneously, the commands from the Facebook to the Ethernet device i.e. to the microcontroller is received.

E. Prototype Model

Initially, the home automation device is switched ON and the local area network is connected with the Ethernet module, where the connecting terminal for the local area network (LAN) is given. After the Ethernet device is connected with local area network physically by the user, the LCD screen shows a message checking Ethernet. Once the connection is established between the server and Ethernet device, it shows that Ethernet is connected. For the reference purpose user can initialize the home automation device with the help of hyper terminal because, the main advantage of the proposed prototype is controlling and monitoring the home network without using a computer i.e. the local area network is directly connected to the home automation device. The hyper terminal shows the status of connections between the home network and to the preloaded social network ID on the Ethernet device. After that the receiving commands and transmitting statuses can be verified for calibrating the device. Then, the device functions automatically. If the LPG gas leakage occurs, the MQ5 gas sensor detects and if the LPG value goes above value of 750ppm it automatically sends a message to the network i.e. preloaded on the Ethernet device. Temperature sensor in the prototype protects the home in cases of fire accidents. The fire at the initial stages can be detected i.e., if the temperature range goes above 50°C it automatically send the information to the Facebook same as the gas detection process. The detection process occurs continuously but the information is passed to Facebook only if the temperature range crosses the specified degree Celsius. Each sensors are individually connected to the Ethernet module and to the microcontroller atmega 1284p.

Passive infrared sensor (PIR) detects the unknown person entry into the home when the user is not in the home. It is a highly sensitive sensor which detects immediately without any time lag. The user should calibrate and fix the sensor in a correct place at the entry of the home. The sensor detects and the status is passed to the microcontroller. From the microcontroller it is passed to the Ethernet through the serial communication interface and the Ethernet sends the status to the preloaded network id. The user can note down the status from the particular Facebook account.

Vibration sensor performs the detecting action in cases of any vibration caused near the area where the sensor is place. In the proposed prototype, it detects the vibration in case of burglary activities, if someone tries to break the locker without authentication, it detects and pass the information to the microcontroller, the microcontroller sends the status to Ethernet through the serial communication interface and the Ethernet sends the status to the Facebook.
In cases of switching the home appliance ON or OFF, the user sends command from the Facebook account via messages, the command is received to the Ethernet device and it is transferred to the microcontroller through the serial communication interface and the switching operation is performed.

The status of the home appliances will be stored in the cloud server network i.e. Facebook. The statuses can be seen at any time for the references. The Ethernet device is especially made for the home appliances security monitoring through Facebook. Once the Ethernet is connected with the local area network, it automatically finds the network ID that is preloaded on the Ethernet device. The Ethernet device is not connected with any computers or monitoring devices inside the home, it is monitored by the user via Facebook. It is the main advantage of the proposed prototype i.e. without using a computer inside the smart home and controlling the home network by means of cloud server. The controlling access of the Facebook account must be confidential. The user and other two person should have the Ethernet controlled Facebook account that is created especially for the home automation device. The controlling authority can be maximum of two users, to send commands to the home network.

The user should not share the home automation account to others to maintain security and to prevent from other network issues made by some hackers. Before leaving home, the user must initialize the device in order to check any network issues or connection problems. The initialization of the device can be done using hyper terminal application.

V. RESULT ANALYSIS

A. Detection of Fire

If accidentally fire occurred in the user home, when the user is not available, the temperature sensor detects the room temperature continuously. If the temperature of the room is high means i.e. above the normal temperature, it detects and sends the status to the microcontroller. The microcontroller passes the status to the Ethernet gateway via serial communication interface and finally the status is posted on the Facebook. The output screen shot of temperature detection is given above.
Once fire occurred in the user home, immediately the electrical appliance in the home can be switched OFF or the entire power supply to the home can be turned OFF by sending commands to the device Facebook account from the user account.

**B. Detection of LPG**

If accidentally LPG is leaked in the user home, when the user is not available, the MQ5 sensor detects the smoke content i.e. gas content in the home continuously. If the LPG content of the room is high means i.e. above 750ppm, it detects and sends the status to the microcontroller. The microcontroller passes the status to the Ethernet gateway via serial communication interface and finally the status is posted on the Facebook. The output screenshot of LPG detection is given above.

Once LPG leakage occurred in the user home, immediately the electrical appliance in the home can be switched OFF or the entire power supply to the home can be turned OFF by sending commands to the device Facebook account from the user account.

**VI. CONCLUSION AND FUTURE WORKS**

The proposed prototype i.e. “Facebook based home appliances security control and monitoring using microcontroller” is used to provide real-time home appliance monitoring and control services. The Facebook server stores and manages a large amount of the status data generated by home appliances in smart homes. For transmitting Facebook server status data of home appliances, a gateway is designed to support data communication between the Facebook server and smart homes. The status data of home appliances in the Ethernet device is transferred to the Facebook. Users monitor and control home appliances through the Facebook using the virtualized status data from the home appliance controlling Ethernet device. However, if many users connect to the Facebook server at the same time, a high amount of network traffic will occur in the server. Therefore, we will develop an effective method to reduce heavy traffic in the server. Similar to Facebook update, twitter can also be made as a platform for controlling and monitoring home appliances. On a large scale,
A cloud data can be maintained to collect the details from various automation devices installed in various houses and it can be verified and checked by police and fire department at any time.

REFERENCES


