Wireless Home Automation System Using Wi-Fi And GSM

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Research Article

Keywords: Short service messages (SMS), Home Automation System (HAS)

DOI: https://doi.org/10.21203/rs.3.rs-442191/v1

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Abstract

In recent scenario the home automation system has rapidly evolved with specific advantages using internet and Wi-Fi. This paper based on the GSM technology used to send the very short message service to operate the devices connected in the common node. The home assisting software has installed in smart phone to make the system simple. A smart home automation system based on Zigbee wireless communication is used to monitor and control the devices which are connected to the common test bed simultaneously minimize the energy cost.

Introduction

In recent scenario building and home need home automation systems. People expect more comfort, flexibility. Early home automation was basically labor saving devices. Before Nowadays an elder person, handicapped people, Patients are much struggle to operate the home devices. Intelligent Controller is gives security, the safety of the home ensured by using efficient utilization telecommunication. Zigbee technology interfaced with Arduinio with different relay to control the various loads. The proposed system used for control and monitor the sensors. The Zigbee based home automation system is low cost with easy installation. In section II literature review is discussed and in section III presents overall system architecture. The software and hardware implementation of the proposed system is justified section IV and V. Section VI the gives conclusion of the proposed system and further research work

Related Work

Shoplan Dey et al [1] proposed developed a system by using an intelligent sensors and setting up a server for a certain house. Users need to install specific software on a smart phone. Once the every user is registered with a unique password and user id and then user able to control the devices using IOT by sending commend to the sensors. The amazon centralized server is used to control the all rooted operation such as data storage, sensor control and feedback control, etc. Ahamed El Shafee et al [2] develop a system to utilize a solar panel and windmill which is placed at the flat terrace to save the electrical energy from the main supply. This system also controls the AC home appliance of count 2 fans and 4 lights and 2 AC where in four control level is for controlling the illumination level, speed level and cooling level for lamp, fan and AC respectively. In addition to this timer setting is utilized for the purpose to control the cyclically for a chosen period of time according to that resident staying at the home. Hayoung Oh et al [3] proposed a new sensor scheme for home automation system, namely Relative direction based sensor routing (RDSR). The home automation area is divided into different sector and each sector has manager node. All collected data are received by a manager node and send to the based station through the shortest path efficiently. By using this routing scheme the energy consumption is considerably reduced than the conventional routing scheme. Khusvinder gill et al [4] develop a Zigbee based home automation drawback of slow adoption was rectified. Thus scanning of all accessible channels is 9 secs which is comparably very low. It helps to reduce theexpense of the system using the
Zigbee technology. The wide range of interfaces of control and monitoring devices is an attractive feature of this technology.

Jinsoohan et al [5] the energy consumption and energy Generation for the installed PV array source. The energy management and communication unit and PLC modems are installed in outlets and each solar panel respectively. The PLC based solar panel stored the status of the solar panel and it can be sent to the renewable energy gateway and this data can be fed to the home server. On the basis of weather forecast, the energy consumption was estimated using home server and it controls the energy schedule. Resulted in reducing the energy cost and enhance the home automation system. Felix et al [6] utilize a Zigbee technology with radio frequency communication and GSM module connects the microcontroller and user. The home appliance can be controlled via sending a message to the control device.

Muhammed Asadullah at al [7] suggested the system using Bluetooth technology that more features system using soil moisture sensor and ultrasonic sensor for plant irrigation and water level detection respectively. Taewan Kim [8] et al offers an intelligent Universal Remote Control (URC) with Zigbee, RF receiver and Wi-Fi to control, monitor and secure the all home intelligent appliances using all kinds of smart phones. Bharad wajmanda et al [9] present a GSM based home automation system to control the home appliance by sending a message without affecting the other local area network. Muhammad Raisul Alam et al [10] presents a new area of research topic in the home automation to intelligent utilize of electricity is named as smart grid. Results in it enhance the uninterrupted electricity utility also this smart grid ensures the bidirectional data communication.

System Architecture

Smart home automation system could organize unified device integration, we propose a Wi-Fi cloud network using Ethernet pattern of home circumstance.

A. User Interface URC

The efficient control of the home automation with URC, an application programmed need to be installed in the smart mobile. Whenever each button is pinned and their corresponding action screen is displayed resulted in sending a recorded message to the microcontroller which operate the corresponding relay and device

B. Receiver Control Techniques

The proposed system control circuit built using RF signal based Zigbee protocol. IF relay receiver linked with the URC and control device using RF. RS232 receiver gets the control signal from RF protocol and converter RS232 signal send to the various devices through the relay. 15 m to 30 m control area is workable using RS232

Home automation system consists of variation of input supply. Based on the requirement of simplicity and easy handling, we proposed a model for rechargeable battery power for smart home automation
systems. This battery power is the advantages of having the ability to operate under multiple operating
systems and need of battery power. The rechargeable power supply from main power supply depicts in
Eqs. (1) and (2)

\[ P_{RB}(t) = V_{RB}(t)I_{RB}(t) = \frac{1}{T} \int_0^T v_{rb}(t)i_{rb}(t) \]  \hspace{1cm} (1)

\[ P_{RB}(t) = P_{s1}(t) + P_{s2}(t) + P_{s3}(t) + P_{s4}(t) \] \hspace{1cm} (2)

Where \( P_{RB}(t) \) is a sum of consuming power of sensor s1 to s4, the power is supplied by the main power
and battery power,

\( V_{RB}(t) \) Voltage level of sensor s1 to s4

\( P_{RB}(t) \) Current level of sensor s1 to s4

The architecture of the proposed smart home automation system is illustrated in Fig. 1 in which the
testing of four devices was incorporated in the system. The connected four device rules are stored in a
database and a suitable sequence of operations is activated in accordance with the consumer need. In
the consumer smart mobile, we would create a user name and password and then the operation of the
proposed framework is depicted in the Fig. 2. Consumer need based proposed system could work with
manual switch and smart way depends on the situation. This system used for any type of devices like
refrigerator, air conditioner, fan and light and any number of devices.

**Software Implementation**

Arduino is an open-source electronics proposal build with easy to operate Hardware and software.
Arduino mounts are fit to read inputs lights on a sensor, a finger on a button, or the message and move it
into an output actuating a motor, turning ON light Emitting Diode (LED), in turn operating a particular
device in real time situation. In a single board four independent relay is mounted and connected to the
home devices. The status of the relay/device is monitored by LED. By means of serial data
communication the GSM module is interfaced with the microcontroller. One end of the relay board is
connected to the input and other end to the microcontroller. The sensors of the loads 1 to load 4 are
connected to the relay board and then power supply is fed to relay board through microcontroller.

For Device 1 to 4 operations, the system needs 10 commands to switch ON and OFF. We are able to
observe, monitor and control the device from our smart phone efficiently. The complete block diagram of
the proposed system is shown in Figure. 1 for different home appliance and Fig. 2 depicts the flowchart
of the complete algorithm of the proposed home automation systems. Table 1 shows the messages
between the smart phone and home devices. Figure 3. to Fig. 7 clearly indicate the activation of device 1
to device 4 and also all the devices is activated simultaneously according to the requirement of customer
need which is depicted in the Fig. 7. Light emitting diodes (LED) are turned ON after receiving the Wi-Fi
signal which is also clearly observed from the Fig. 3. to Fig. 7
Tabulation .1 Messages for device 1 to Device 4.

| Status of the Device | Messages sent                                      |
|----------------------|----------------------------------------------------|
| Device 1 ON          | Switch ON the device 1 connected to Relay 1         |
| Device OFF           | Switch OFF the device 1 connected to Relay 1        |
| Device 2 ON          | Switch ON the device 2 connected to Relay 2         |
| Device 2 OFF         | Switch OFF the device 2 connected to Relay 2        |
| Device 3 ON          | Switch ON the device 3 connected to Relay 3         |
| Device 3 OFF         | Switch OFF the device 3 connected to Relay 3        |
| Device 1 to 4 ON     | Switch ON all the devices connected to Relay 1to 4  |
| Device 4 ON          | Switch ON the device 4 connected to Relay 4         |
| Device 4 OFF         | Switch OFF the device 4 connected to Relay 4        |
| Device1 to 4 ON      | Switch ON all the devices connected to Relay 1to 4  |
| Device1 to 4 OFF     | Switch OFF all the devices connected to Relay 1to 4 |

Hardware Implementation

The hardware implementation of the proposed home automation system specification is shown in Fig. 8 to 12. In order to function of the wireless power output module, active lighting experiment has been devised and performed on the testbed. After making the circuit connection GSM based modulesim is inserted in a smart phone and ensure authentication. The Wi-Fi module ESP8266 is connected through the mobile Hotspot to the load cloud computing. Log on to the specially made mobile application app using email id and password. After verification of the default messages, when the person wants to turn OFF/Turn ON the device via respective relay by sending messages as per requirement from the smart phone to the concerned number which is displaced in the module.

The layout of home load is accessed using PHP. Wi-Fi module sends signal from cloud to microcontroller ATMego328by pressing any load using mobile and sequentially microcontroller send the analog signal to the relay board 4SH and current sensor module ACS712T. The LED $D_1$ to $D_4$ are activated with respect to the received messages for the and in turn the corresponding devices are turned ON which is clearly illustrated in table.2. Finally the relay operates the required load and relay operation indicates that by LED which is shown in Fig. 8 to 12.

Table.2 Device switching scheme
The Wi-Fi HAS adaptable for any combination of load such as Device 1 & device 2, Device 2 & Device 3, Device 3 & device 4, Device 1 & Device 3, device 1 & Device for the device 1 clearly depicted in Table 3

Table 3. Possible combination of the device operation
Conclusion

The technology is efficiently used in our system is very simple through affordable GSM technology and smart phones which are easily available by a large population in a modern world. GSM signal booster could be set up at home so as to magnify the signal strength of GSM module and enhance the system performance. When the home is away one can like a very few load to be operated as to perform certain basic need of a kind that switch on the air conditioner and heater and etc. at any moment.

Declarations

AUTHOR DECLARATION TEMPLATE

We wish to draw the attention of the Editor to the following facts which may be considered as potential conflicts of interest and to significant financial contributions to this work.

[OR]
We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed.

We further confirm that the order of authors listed in the manuscript has been approved by all of us.

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

We understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office). He/she is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs. We confirm that we have provided a current, correct email address which is accessible by the Corresponding Author.

Signed by all authors as follows:

Signed by all authors as follows:

1. Dr.N.STALIN –

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References

[1] ShopanDey, ayon Roy and sandip Das, “Home Automation Using Internet of Thing” in the Proc. of IEEE, 2016.

[2] AhamedElShafee and karimAlaHamed, “Design and Implementation of Wi-Fi based Home automation systems” in the Word Academic Science, Engineering and science, pp, 2177-2183, August 2012.

[3] Hayoung Ho, HyoyungBahn and kiJoonchae, “ An Energy-Efﬁcient Sensor Routing Systems for Home Automation Networks”, in the IEEE Transaction on consumer Electronics, Vol 51, No.3, pp.836-839, August 2005.

[4] Khusvinder Gill, Shuang -HuaYang, Fang Yao and Xin Lu, “Zig Bee based Home Automation System” in the IEEE Transaction on consumer Electronics, Vol 55, No.2, pp.422-429, May 2009

[5] Jingo Han, Chang Sic Choi, Ilwoo lee and Sang Ha Kim, “Smart Home Energy Management System Including Renewable Energy based on Zigbee and PLC” in the IEEE Transaction on consumer Electronics, Vol.60, No.2, pp.198-202, May 2014.
[6]. Felix c and JacobRaglend, “Home automation using GSM”, in the Proc. IEEE International Conference on Signal processing communication Computing and Networking Technology, pp.15-19, Thucka –fay, India 2011.

[7] MuhammedAsadullah and Khalil ullah, “Smart Home Automation System using Blue Tooth technology”, in the International Conference on Innovation in Electrical Engineering and computational Technologies, pp. 1-6 IEEE, 2017.

[8] Taewan Kim, hakjoon Lee, Yunmo Chunk, “Advanced Univeral Remote Controller for home automation and Security” in the Proc. IEEE Transaction on Consumer Electronics, Vol.56, Issue.4, pp.2537-2542, November 2010.

[9]. Bharad wajmandaV L K, Voona Khusai and Ramasubramaniyan N, “An elegant Home Automation system using GSM and ARM based Architecture”, in the proc. o IEEE Potential, Vol.37, Issue.5, pp.43-48, October 2018.

[10] RaisulAlam et al, Mamun Bin IbneReaz and Mohd Alauddin Mohd Ali, “ A Review of Smart Homes-Past, Present, future”, in the proc. on Systems, Man and Cybernetics- Part C Application on Review, Vol.42, Issue.6, pp.43-48, November 2012.

**Figures**

![Diagram of Home Automation System](image-url)
Figure 1

Simplified Block diagram of Home Automation

Start

Static IP address

Enter User name Enter Password cayenne mobile application

Wi-Fi Module Connected to Cloud Network

Check PHP is Open

Wi-Fi modules receive signal from cloud to Microcontroller

PHP is opened

Switch ON/OFF home Appliance from mobile App

Relay is ON/OFF

Home appliance device is ON/OFF

Home appliance status View in a cayenne Mobile App

End

Figure 2

Framework of the proposed system
Figure 3

Wi-Fi based control and monitoring system when Device 1 is ON

Figure 4
Wi-Fi based control and monitoring system when Device 1 is ON

Figure 5

Wi-Fi based control and monitoring system when Device 3 is ON

Figure 6

Wi-Fi based control and monitoring system when Device 4 is ON
Figure 7

Wi-Fi based control and monitoring system when Device 1 to Device 4 is ON

Figure 8

HAS for the device 1
Figure 9

HAS for the device 2

Figure 10

HAS for the device 3
Figure 11

HAS for the device 4

Figure 12

HAS for the device 1 to Device 4