International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 4, Issue 6, June-2018

RESIDENCE ENERGY CONTROL SYSTEM BASED ON WIRELESS SMART SOCKET AND IoT

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Abstract:The purpose of constructing these systems and functions is amenity and energy efficiency. In fact, to save energy, a residence management system with intelligent and automatic energy control policies is required and essential. On the other hand, a smart-house developed on the basis of the Internet of Things (IoT) can save more energy, where IoT is a network system consisting of electronic devices, software, sensors and networks that connect all concerned network entities togetherto make the system more valuable and able to provide manymore services to users. Up to present, many energy control methods have beenproposed. By utilizing theIoT,developed a tablet-computerbased Home Energy Management scheme to monitor theconsumption of home energy.

1.INTRODUCTION

Most of the electronic appliance control applications utilizea lot of sensors to sense users' locations and activities.Some of them even use Open Service Gateway initiative(OSGi) or Service-Oriented Architecture (SOA) topredict user'sbehaviour in a house, with which to manage thehome appliances in this house. Some previous studiesimproved functions of sockets set up in a house and connectedwith wireless networks to control home appliances. Sensingusers' location, motion, and habits with a large number ofsensors may not be an energy efficient method since thesesensors consume considerable resources. So it would be betterfor them to be low cost and high coverage. Also, accordingto the survey on developed countries by the InternationalEnergy Agency, the energy consumed by idle appliances,called standby energy, in a house is about 3% to 11% of total energy consumed by the house

In the past decade, due to greenhouse effect, energy saving has been one of the critical issues in designing electronic appliances. Smart-houses, which are houses equipped with highly advanced automatic lighting systems, temperature control system, security control mechanisms and many other functions, can be seen everywhere in the world

2. LITERATURE SURVEY

Another system developed an integer nonlinear programming model for optimal energy use in a smart home by considering a meaningful balance between energy saving and a comfortable lifestyle. Through incorporation of a mixed objective function under different system constraints and user preferences, the algorithm presented in reduced the domestic energy usage and utility bills, and ensured an optimal task scheduling and a thermal comfort zone for its inhabitants. However, if IoT techniques can be applied to this model, the energy can be further reduced.

3. SYSTEM DEVELOPMENT PROCESS

1. Determine the requirements of the system.
2. Design the system architecture.
3. Select the operating system.
4. Choose the processor and associated peripherals.
5. Choose the development platform.
6. Code the application and optimize the code according to the code optimization technique.
7. Verify the software in the host system.
8. Verify the software on the target system.

As per the algorithm generated, formation of the project was divided among various sections. The various sections involved in the project are the IoT part and the Embedded environment. Internet of things is the major highlight of this project, so that a web server is an inevitable thing. Thus the most popular Amazon web services was choose. Also overall project control can be achieved through an embedded system. The basic requirements will be included in the components overview.

3.1 SYSTEM ARCHITECTURE

The Residence Energy control system (RECoS) consists of two control modes.

1. Automatic control mode(AC)
2. User control mode(UC)

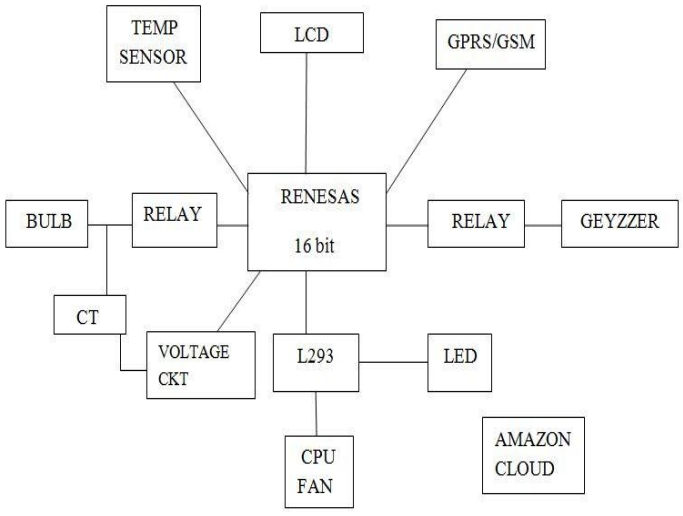

Fig 3.1 Block diagram of RECoS system

- In user control mode, it monitor the home appliances like CPU fan, LED and load through amazon local server.
- Based on the requirement of the user they (LED/fan) are turned on/off.
- By sending the corresponding command from local server to the gprs.
- For automatic control mode, it use the overload concept, which contains CT and relay and bulb combination. When the load in the home exceeds the optimum level, load will automatically turned off.
- If the temperature increased beyond the room temperature or overload may occur, the geyser will automatically turned off.
- The conditions will already created in the amazon web server.
- By using WiFi or 3G/4G data it can access the amazon server, and amazon can in turn communicate via microcontroller through GPRS module.
- The LCD will displays all the data regarding temperature, status of geyser, bulb, LED, load and fan. Also it shows all the information regarding IP address, send and receive status of GPRS and AT commands.

3.2 DEVELOPMENT PLATFORM

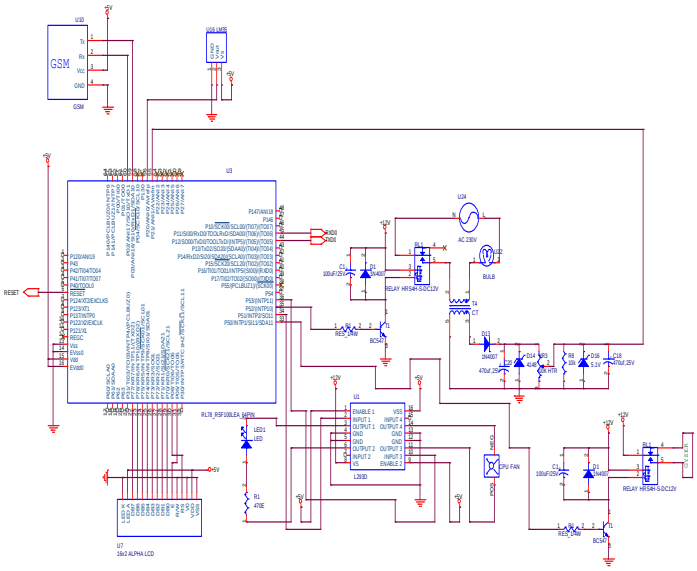

Fig 3.2 Overall schematic diagram

In the software development process, programming is done. As per the conditions should met in the project programming get wrote. Cube suite language is used since it bundles all the commands for programming Renesas. Also ease of its user friendly behavior and simplicity to anew learner. And the programming is dumped to the controller using Renesas flash programming language.

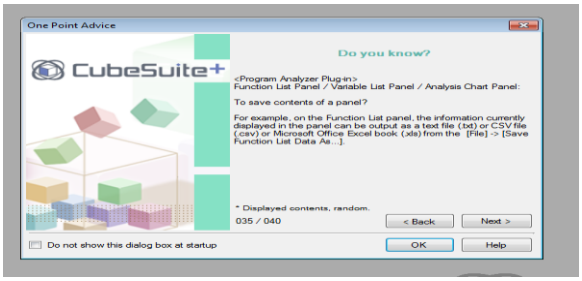

Fig 3.3 Program development in cube suite+

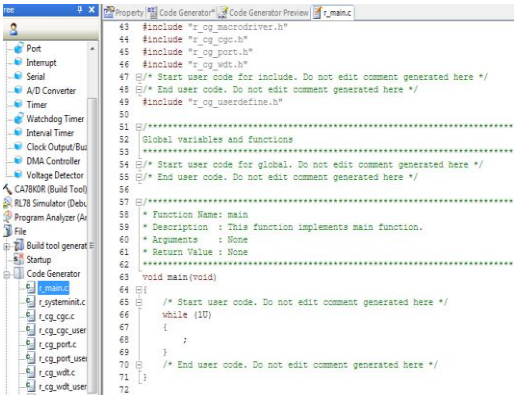

Fig 3.4 Files generated in cube suite+

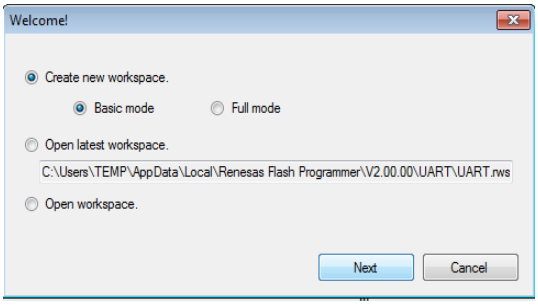

Fig 3.5 Flash programming

3.3WORKING

After dumping the program on microcontroller and soldering the components, the RECoS system was finished. After giving power supply to the system, it get ready for working. As the microcontroller is embedded with all the commands, the devices connected to the system get initialized. Then the GPRS module get start waiting for the network. And the message “waiting for the network” will be displayed on the LCD screen. Certain AT commands will be displayed on the screen. These AT commands are used to check whether the SIM is blocked or not, to shut down all the previously used IP sections, to view the address of the service provider, used to set the wireless connections, and to get the local IP address. Then the GPRS get initialized and it getactivated. Then the values corresponding to the room temperature, geyser threshold value and the voltage will be displayed on the screen. Moving to the user control mode, it is possible to control the various home appliances. The devices controlled are fan, LED, bulb and the geyser. The main advantage of the user control mode is that, it is possible to control the devices even if the user is at a distance through the Amazon cloud. The devices are controlled by sending commands through the GPRS module by using the server. While sending and receiving the commands the controller will give an acknowledgement to the user on the screen.

In the automatic control mode, device will be automatically regulated. The main highlight of the project is automatic control mode since there is no manual operation is required. The two concepts includes are overload and temperature control. During the overload condition the device will be automatically turned off. When the temperature exceeds room temperature the device will be turned off.

4.RESULT

1) Automatic control mode

In this control mode, whenever overload and the temperature exceeds above room temperature occurs the devices will automatically turned off. That is the geyser and the relay bulb. Here is no need of networking availability, since the controller itself monitors the variations as per the programming

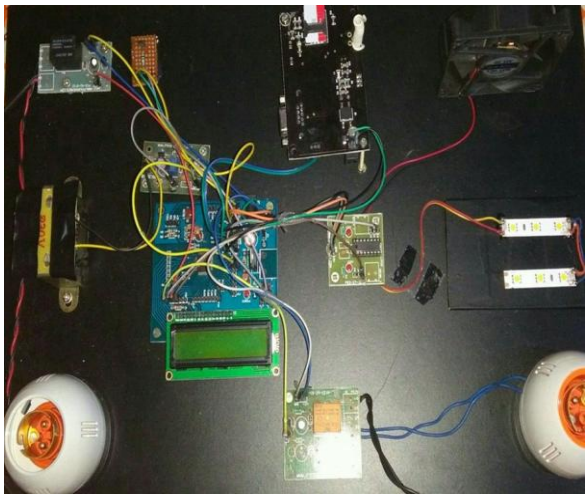

Fig 4.1 Overall Circuit board

2) User control mode

In this mode, on/off state of the appliances can be controlled through the web server with the aid of GPRS module. Different conditions regarding the status of each appliances would be already created in the amazon web server. According to our need we can control thedevices be access in internet(IoT).

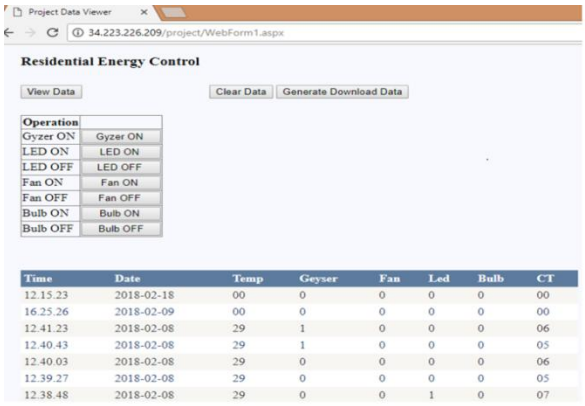

Fig 4.2 Data saved in web server

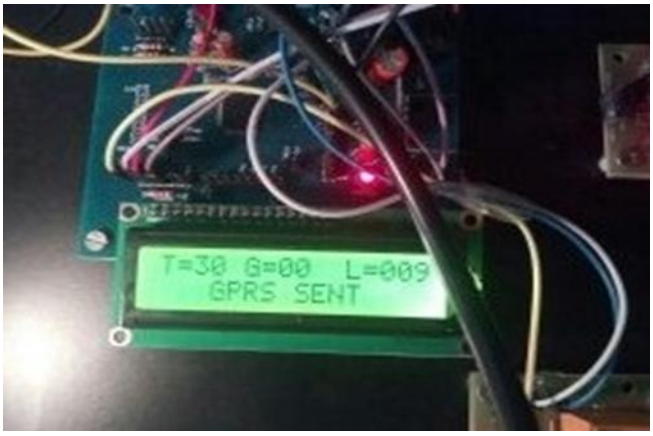

Fig 4.3 Message displayed on LCD

Fig 7.2 shows the data saved in the cloud by which the user can access various devices inside the home. The devices controlled in the system are set of LEDs, bulb, Geyser and CPU fan. By giving commands on the cloud user can access the devices without the aid of hands. So the method allows control of the devices even if the user is at a distance. Thus energy saving can be done more efficiently.

Fig 7.3 shows the messages displayed on the LCD while sending commands through the Amazon cloud.

5.ADVANTAGES & DISADVANTAGES

5.1 ADVANTAGES

- It saves the energy.
- Cost minimization/tariff on electricity.
- Manual operation has been reduced to major extent.
- Less man power required.
- Easy to use.
- Efficient and reliable.
- Eliminates the paper based records using smart phone

5.2 DISADVANTAGES

- Initial investment is high.
- Internet is mandatory.

6.CONCLUSION

Energy saving has become one of the key issues in our daily lives. Energy control for some appliances is an effective method to save energy at home, since it prevents users from consuming too much energy.Even though there are numerous commercial energy effective products that are helpful in energy saving for particular appliances. The purpose of constructing smart homes is amenity and energy efficiency. Residence energy control system based on wireless sensors and IoT can be able to reduce the power consumption in residence. It can be able to control the on/off states of the home appliances connected to the sockets. The RECoS can be implemented without using sensors and can be applied to outdated appliances.

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