An Intelligent Home Automation and Power Monitoring System Using Android Smart Phone

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Abstract- *Home automation is becoming more and more popular day by day due to its numerous advantages. This can be achieved by Bluetooth, local networking or by remote control.. This project aims at designing a basic home automation application on microcontroller through Bluetooth and controlled by android app (mobile). Result shows the efficient implementation of proposed algorithm for home automation. Electrical appliances like, bulb, fan, etc were used to indicate the switching action.*

Keywords- Home Automation, Android smart phone, Power monitoring.

I. INTRODUCTION

Home automation refers to the application of computer and information technology for control of home appliances and domestic features. Its application varies from simple remote control of lighting to complex computer/micro-controller based networks involving varying degrees of intelligence and automation. Home automation results in convenience, energy efficiency, and safety benefits leading to improved quality of life. The popularity of home automation has been increasing greatly in recent years due to simplicity and much higher affordability. Moreover, with the rapid expansion of various communication media like wireless network, Bluetooth, etc there is the potential for the remote control and monitoring of such network enabled appliances. However, the new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation through Bluetooth are yet to be explored. In our approach we are using mobile to use android app. And Bluetooth will be connected to microcontroller.

II. MOTIVATION

BUILDINGS consume more than 20% of world energy production and around 40% of US energy production. Such energy consumption means buildings are one of the major causes of greenhouse gas production as well. Due to various reasons, the energy usage in buildings has been steadily growing. And this number has been projected to further increase The largest energy consumer in buildings is Heating, Ventilation and Air Conditioning (HVAC) systems, consuming 30-50% of building energy . Now a days use of energy is increases gradually, so that energy production is less than the energy uses. And there is wastage of energy due to the human activities. So that is all the system become automated then the loss of energy is might be minimized and we can save the energy. So that this system is proposed.

III. PROPOSED SYSTEM

In the proposed system, two working units are there, one as a control unit in Android Smart Phone and the other unit as application unit kept on switching board for controlling appliances. From the first unit, instruction will be given by user to appliance. Second unit consists of Bluetooth modem, microcontroller, driver circuit and any home appliance. Bluetooth modem from 2nd unit will receive the instruction from control unit and will give it to microcontroller to switch ON or OFF any home appliances like bulb, fan, etc.

The Ad hoc network is which it does not rely on a pre existing infrastructure such as routers. Instead each node participates in routing by forwarding data for other nodes. The server in the home networking is connected to a micro controller as shown in figure: 2, which controls multiple devices. Analog to Digital (ADC) converts sensor sensed analog signals to digital signals for the server to process. Microcontroller coordinates various actions and controls the applications. The micro controller receives the signals from various electrical appliances and performs the desired actions. The Ad hoc network used in home automation does not limits the frequency range.The microcontroller which consist of relays which is used connect the several electrical appliances.

Fig. 2 System Hardware

Process:

1. Take a microcontroller(AVR) ang provide External 5v supply.
2. take 2 modules ,module 1 is of temperature sensors and module 2 is of light sensors.
3. They all combinely provided to AVR with power supply.
4. And then with the help of sensors and AVR manage the system.
5. We manages all this process by android smartphone device. For this we create a Bluetooth pairing with hardware device and then manage this system manually also.

Algorithm:

a. When Human will enter then interrupt occur to our system.
b. System will on
c. If (temp > 38) then Fan and tube on. else fan and tube off
d. If (Brightness is low) then Brightness of tube increase else decrease
e. For handling this system manually by mobile, enter password
f. If (password =true) then Bluetooth is pair
g. Connection successful
h. If (human=present) Android application activated.
i. Manage the system by android app.

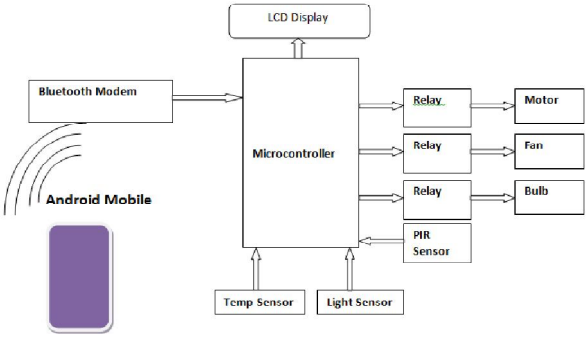

Fig. 1 System Architecture

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IV. RESULT ANALYSIS

Serial Port Communication

The Universal Synchronous and Asynchronous serial Receiver and Transmitter (USART) is a highly flexible serial communication device. The main features are:

- Full Duplex Operation (Independent Serial Receive and Transmit Registers)
- Asynchronous or Synchronous Operation
- Master or Slave Clocked Synchronous Operation
- Supports Serial Frames with 5, 6, 7, 8, or 9 Data Bits and 1 or 2 Stop Bits
- Odd or Even Parity Generation and Parity Check Supported by Hardware
- Data Overrun Detection Framing Error Detection
- Noise Filtering Includes False Start Bit Detection .
- Multi-processor Communication Mode
- Double Speed Asynchrones Communication Mode

FRAME FORMAT
St Start bit, always low.
(n) Data bits (0 to 8).
P Parity bit. Can be odd or even.
Sp Stop bit, always high

ADC

1. The ATmega16A features a 10-bit successive approximation ADC. The ADC is connected to an 8-channel Analog Multiplexer which allows 8 single-ended voltage inputs constructed from the pins of Port.
2. The single-ended voltage inputs refer to 0V (GND).
3. 7 Differential Input Channels
4. The ADC converts an analog input voltage to a 10-bit digital value through successive approximation. The minimum value represents GND and the maximum value represents the voltage.

SENSORS

1. PIR sensor: Human detection and take a count of human entries and exit.
2. Light sensor: check brightness of room and according to the light intensity send signals to the microcontroller.
3. Temperature sensors: check room temperature and send signals to the microcontroller.

i. PIR Sensor

PIR sensor is a human detection sensor. When human enters in the room ,the interrupt will occur to the system and the PIR sensor gets activated and it detects the presence of human present in the room.

ii. Light sensor

Light sensor is responsible for the detection of the brightness. When human enters the room, the interrupt will occur to the system and PIR sensor will detect the presence of human and after that if human is present in the room the light sensor will check the brightness of the room and accordingly it will turn ON or turn OFF the bulb or tube light.

iii. Temperature Sensor

Temperature sensor will first measure the room temperature and it will compare the room temperature with the threshold value and accordingly it will increase or decrease the speed of the fan.

Algorithm:

1. Initialize temperature sensor.
2. Receiving room temperature.
3. Display the values.
4. After human entry detection by PIR sensor measure the temperature again and manage the devices.

Bluetooth

1. Pairing with hardware device is done.
2. Manage the hardware by android application with the help of Bluetooth.

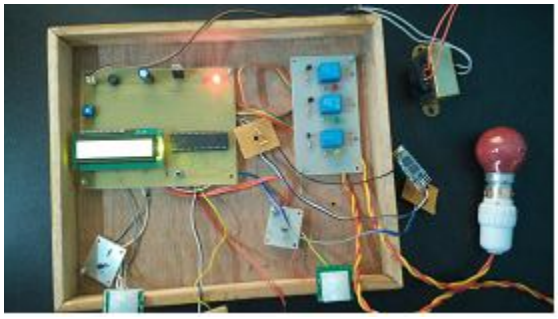

Fig. Project setup

Fig. Home page

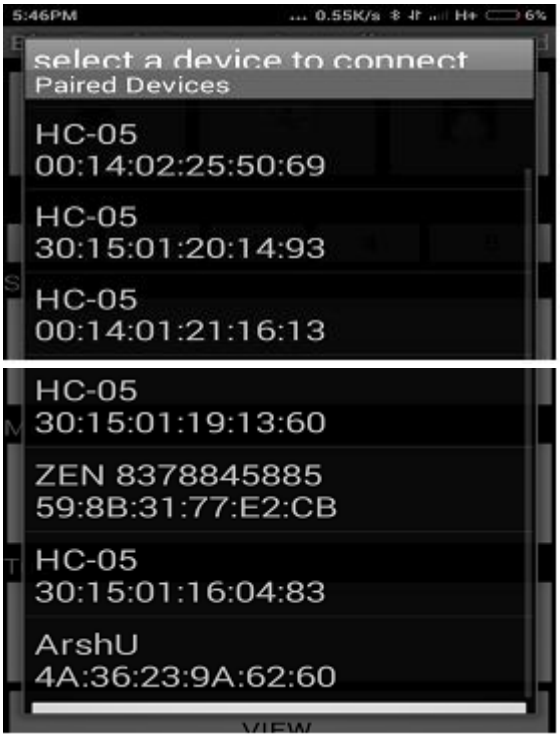

Fig. Bluetooth Pairing

V. CONCLUSION

We implement an android Smartphone Based Energy Management System with the help of Bluetooth devices. Microcontroller controls the all information coming from the sensors like light sensor, temperature sensor and PIR sensor. Collect information from these sensors and then manage all

the devices according to the inputs. With the help of Bluetooth device we control the whole system. With the help of this system we can control the loss of energy due to the human activity. In future scope we will add according to the environment changes we can collect the inputs of temperature and light brightness and according to that manage the devices.

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