

Smart Energy Monitoring System

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ABSTRACT: - The world is moving fastly towards automation. People have less time to handle any work so automation is simple way to handle any device or machine will work to our desire. This paper aim is to develop and design a Home automation using Arduino with Bluetooth module. Home automation system gives a simple and reliable technology with Android application. Home appliances like fan, Bulb, AC, automatic door lock are controlled by Home automation system using Arduino Uno with Bluetooth module. The paper mainly focuses on the monitor and control of smart home by Andorid phone and provide a security based smart home, when the people does not present at home. This paper motive is controlled home appliances in smart home with user friendly, design at low cost, simple installation.

KEYWORDS: - Arduino, Home automation, Bluetooth, Smart phone, Security

I. INTRODUCTION

Now days everyone has smart phone and wants to control everything from smart phone. Everyone knows how to control mobile phone so it easy to use and understand. Lights, fan , switches , refrigerator are controlled through Bluetooth based remote using arduino. The designing of home automation are going to become simpler and more popular because most of people uses smart phone now days. In this device we are using Arduino which is most commonly used device for automation. Arduino is a hardware which is used to connect computer and the project model so that we can control it by using Arduino code accordingly. Ardiuno is a microcontroller it is just like human brain it processes information and then it perform some Logical and mathematical operation on that information. Arduino is connected with the Bluetooth module which receives the information from user. Arduino also connected relay, which receives information from Arduino and perform the operation as switch. Bluetooth technology is Wireless radio transmissions in a short distance providing a necessary technology to create intelligence and controllability. This generates personal area network in home environment, where all these appliances can be interconnected and monitored using a microcontroller with Arduino using smart phone. Home automation involves a degree of computerized or automatic control to certain electrical and electronic systems in a building.

II. METHODOLOGY

Home automation describes a system of networked, controllable device that work together to make your home more comfortable, customized, efficient and secure. In this device there are five main parts Arduino, Bluetooth module, Relay drivers, android application and step down transformer. Firstly we provide power to the step down transformer, it step down the input voltage and given to the arduino with VIN pin. The Bluetooth module is also connected with arduino to Rx and Tx pin that provides the information to the microcontroller. Microcontroller reads the information and send to the relay drivers which work as switch. In Arduino we upload the program as per requirement then it performs some mathematical and logical operation to control the relay drivers. Those all parts are connected as shown in figure 2(a).

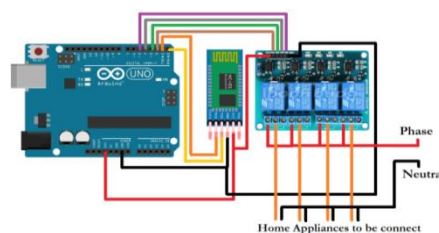


Fig2(a)-circuit diagram of home automation.

Android application are connected to the arduino Bluetooth (HC-05). In the figure 2(b) there are four switches which is connected to relay drivers and four relay are connected to the home appliances.

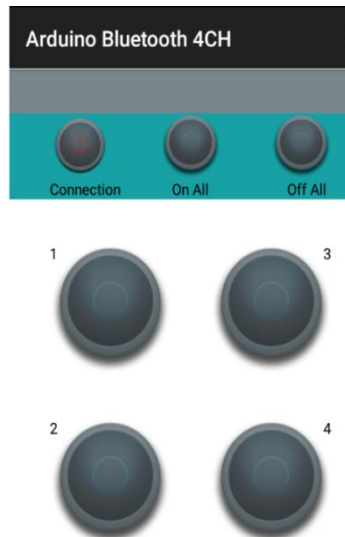


Fig.2(b)-Mobile android application.

III. HARDWARE

a) Microcontroller PIC 16 F877P

The microcontroller unit used here is a PIC16f877A . The core controller is a mid-range family having a built-in SPI master. 16F877A have enough I/O lines for current need. It is capable of initiating all intersystem communications. The master controller controls each functions of the system with a supporting device. The PIC16F877A features 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI) or the 2-wire InterIntegrated Circuit (IC) bus and a Universal Asynchronous Receiver Transmitter (USART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.

b) 16x2 Character LCD

liquid crystal display (LCD) is a at panel display, electronic visual display, video display that uses the light modulating properties of liquid crystals(LCs). LCs do not emit light directly. Each pixel of an LCD typically consists of a layer of molecules aligned between two transparent electrodes, and two polarizing filters, the axes of transmission of which are (in most of the cases) perpendicular to each other. With no actual liquid crystal between the polarizing filters, light passing through the first filter would be blocked by the second (crossed) polarizer. In most of the cases the liquid crystal has double refraction. The surface of the electrodes that are in contact with the liquid crystal material are treated so as to align the liquid crystal molecules in a particular direction. This treatment typically consists of a thin polymer layer that is uni-directionally rubbed using, for example, a cloth. The direction of the liquid crystal alignment is then defined by the direction of rubbing. Electrodes are made of a transparent conductor called Indium Tin Oxide (ITO).

c) GSM Module

A GSM modem is a specialized type of modem which accepts a SIM card and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, (here we use serial connection) or it may be a mobile phone that provides GSM modem capabilities. A GSM modem exposes an interface that allows applications such as SMS to send and receive over the modem interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a GSM modem must support an "extended AT command set" for sending/receiving SMS messages. A GSM

modem could also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on your computer. Any phone that supports the "extended AT command set" for sending/receiving SMS messages can be supported by the Now SMS/MMS Gateway. Note that not all mobile phones support this modem interface.

d) MAX 232

The MAX 232 IC is used in this project to make interface between microcontroller and GSM modem. This IC is a dual driver/receiver includes a capacitive voltage generator to supply TIA/EIA-232-F voltage levels from a single 5-V supply. Each receiver converts TIA/EIA-232-F inputs to 5- TTL/CMOS levels. These receivers have a typical threshold of 1.3 V, a typical hysteresis of 0.5 V, and can accept ± 30 -V inputs. Each driver converts TTL/CMOS input levels into TIA/EIA-232-F levels. The driver, receiver, and voltagegenerator functions are available as cells in the Texas Instruments Lin ASIC library.

e) Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

f) Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. It is used for beep an alarm during overload.



Fig.3 Hardware of energy meter

IV. CONCLUSIONS

The complete working model of a smart energy meter was built which uses existing GSM system. The model satisfactorily worked with a two lamp load. Automatic meter reading and billing can be explained well using the system. Financial losses of electricity board can be minimized. Labour charges and effort can be reduced. The error, time delay that occurs due to manual metering can be avoided to a great extent. Electrical line fault detection has been

made easy for the electricity board. Finally but not the least this type of meter supports remote metering which is the future of energy meters.

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