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APP/BLEETOOTH BASED HOME AUTOMATION

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Abstract— Technology is a never ending process. To be able to design a product using the current technology that will be beneficial to the lives of others is a huge contribution to the community. The design and implementation of a low cost but yet flexible and secure App/Bluetooth based Home Automation system. The design is based on a stand alone Arduino BT board and the home appliances are connected to the input/ output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. Password protection is being used to only allow authorized users from accessing the appliances at home. There has been rising demand for secure system that must be dependable and quick respond for the industries and company. RFID (Radio Frequency Identification) is one of the consistent and fast means of identify the material object. Long back the barcodes are more preferable as compared to RFID because of their cost but nowadays RFID are easily available and are more convenient to use. Research has made some drastic changes which makes it programming a lot shorter and easier because of replacing Microcontroller with Arduino. Arduino makes the circuit and programming a lot easier to understand. Every RFID tag has unique ID. This UID is used for security purpose to unlock the door. If same RFID card swaps more than four times which is denied by system then message will be sent to authorized person via GSM model for alert as unauthorized access. Here we have used LED to indicate if the appliance is On/Off. That will indicate whether the particular system is being used or no.

Keywords: Bluetooth Module HC05, Microcontroller, LED, Relay, IC, Capacitor, Adapter.

I. INTRODUCTION

Wireless technologies are becoming more popular around the world and the consumers appreciate this wireless lifestyle which gives them relief of the well-known “cable chaos” that tends to grow under their desk. Now with the embedded Bluetooth technology,

digital devices form a network in which the appliances and devices can communicate with each other. Today, home automation is one of the major applications of Bluetooth technology.

Operating over unlicensed, globally available frequency of 2.4GHz, it can link digital devices within a range of 10m to 100m at the speed of up to 3Mbps depending on the Bluetooth device class. With this capability of Bluetooth; we propose a home automation system based on Bluetooth technology.

This existing system has following drawbacks:

- Excessive Power consumption.
- Heating up of the Appliances.
- Fire problems are not detected immediately.

The proposed method presents the design and implementation of a robust, low cost and user friendly home automation system using Bluetooth technology. The design of proposed method is based on Arduino board, Bluetooth module, sensors and smartphone application. Bluetooth module HC-06 is interfaced with Arduino board and home appliances are connected with Arduino board via relay. Smartphone application is used for serial communication between smartphone and Bluetooth module which is further connected with Arduino board. Proposed method has ability to not only remotely control the appliances but it also monitors the sensors. Nowadays most of conventional home automation systems are designed for elderly, handicapped people or for any special purpose. The proposed method is not only suitable for elderly and handicapped people but it also provides a general purpose home automation system, which can easily implement in existing home. An ultrasonic sensor is used for water level detection and soil moisture sensor is used for automatic irrigation system to provide more ease and facilities to users..

A. Problem Definition:

Bluetooth Technology makes the system to be used within 100 m and not above that. Speed of the Internet should be there so that the system is fast. .

In this project, Microcontroller are employed for transmitting the data received from mobile that is whether to switch it on/off. time pause between the app as well as the system is

accordingly produced by appropriate Bluetooth speed of the model.

II. LITERATURE REVIEW

Several remote controlled home automation systems have been studied. It provided full functionality to remotely control home appliances via wireless communication between the Arduino BT and cell phone using Bluetooth technology. Arduino BT board was connected with home appliance and it was controlled by a Symbian OS cell phone application. Symbian OS cell phone can only support the python language scripts and this system failed to support Java based application, nowadays mostly smartphone applications are developed in Java.

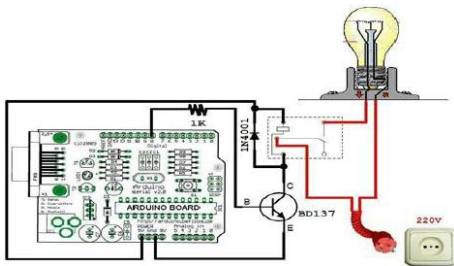
In this paper we present a low cost secure cell phone based, flexible home automation system. Appliances at home are connected to the Arduino BT board. The communication between the cell phone and the Arduino BT board is wireless. Additional devices can be connected into the system with little modifications. Since the cell phone script is written in Python, it is portable and can run on any Symbian Operating System platform. Figure shows the block diagram of the overall systems architecture.

The proposed system has two main parts hardware and software. The hardware part consists of three main hardware components smartphone, Arduino board and Bluetooth module. Software part consist of Arduino integrated development environment (IDE) and Bluetooth terminal smartphone application which is used for wireless communication between smartphone and Arduino board. Ultrasonic and soil moisture sensor are also used in this method to provide more ease and facilities to the users.

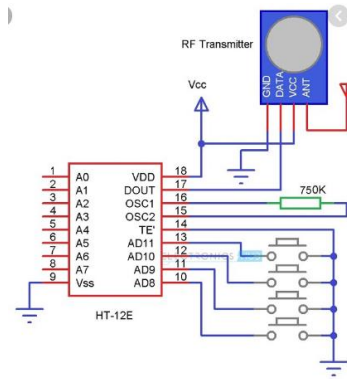
Features of system

Managing all of your home devices from one place. The convenience factor here is enormous. Flexibility for new devices and appliances. Maximizing home security. Remote control of home functions. Increased energy efficiency. Improved appliance functionality. Home management insights.

Working:

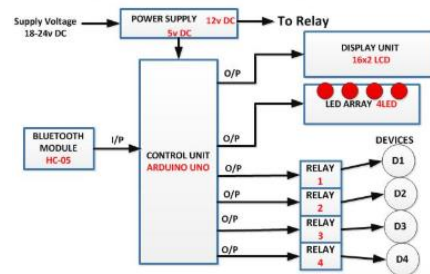


(Block Diagram of Project)



In this flowchart, on door there is RFID reader when we will show reader to it, on led display it will display valid or not means if data inside the RFID reader matches with data inside RFID card then card is valid and door will become open. If card is not valid and it is shown three times to the reader then buzzer will buzz and call will go to lab assistant, door will not become open.

Working of Bluetooth app:



In this, there is Bluetooth app which controls all the electrical appliances in the lab. As app interface contains search Bluetooth enable devices, list of devices, connected devices, status means on or off, we will first open the Bluetooth app and we will pair it with Bluetooth module HC05 after pairing it will show Bluetooth HC05 connected, we will set button preference in the setting which button has light which has light 2 and so on. We will do this as we have how many devices depend on that then we will go back and in app we will see down button light 1, light 2, fan 1, fan 2 and we can click on that accordingly it will become on and off. It is preferable to use bluetooth because nowadays people have their smartphones with them all the time, since the smartphones have bluetooth facility in them, thus it's better to use bluetooth rather than using RF remotes or IR remotes. Have you ever seen people carrying remotes...

Using bluetooth has many of its own advantages :

1. It's secure.
2. Easy to use.
3. It works in short distance range(i.e. upto 10mtrs.)
4. Anyone can find free bluetooth apps on android and many more.

1) Fixed Automation

The economic justification for fixed automation is found in products with very high demand rates and volumes. The high initial cost of the equipment can be spread over a very large number of units, thus making the unit cost attractive compared to alternative methods of production. Examples of fixed automation include mechanized assembly and machining transfer lines..

The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as outputs), 16 analog inputs, 4 UART's (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ISCP header and a reset button.



Relay:

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. When a relay contact is normally open (NO), there is an open contact when the relay is not energized.



Microcontroller

A microcontroller is a single chip microcomputer made through VLSI fabrication. A microcontroller also called an embedded controller because the microcontroller and its support circuits are often built into, or embedded in, the devices they control. A microcontroller is available in different word lengths like microprocessors (4bit,8bit,16bit,32bit,64bit and 128-bit microcontrollers are available today).

A microcontroller basically contains one or more following components:

1. Central processing unit(CPU)
2. Random Access Memory)(RAM)
3. Read Only Memory(ROM)

4. Input/output ports
5. Timers and Counters
6. Interrupt Controls
7. Analog to digital converters
8. Digital analog converters
9. Serial interfacing ports



Features:

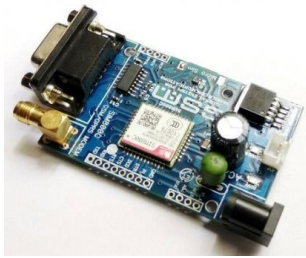
- Compatible with MCS®-51Products
- 2K Bytes of Reprogrammable Flash Memory – Endurance: 10,000 Write/Erase Cycles
- 2.7V to 6V Operating Range
- Fully Static Operation: 0 Hz to 24 MHz
- Two-level Program Memory Lock
- 128 x 8-bit Internal RAM
- 15 Programmable I/O Lines
- Two 16-bit Timer/Counters
- Six Interrupt Sources
- Programmable Serial UART Channel
- Direct LED Drive Outputs
- On-chip Analog Comparator
- Low-power Idle and Power-down Modes
- Green (Pb/Halide-free) Packaging Option

The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2K bytes of Flash programmable and erasable read-only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C2051 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89C2051 provides the following standard features: 2K bytes of Flash, 128 bytes of RAM, 15 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, a precision analog comparator, on-chip oscillator and clock circuitry. In addition, the AT89C2051 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The power-down mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset.

GSM Module

GSM is a mobile communication modem; it stands for global system for mobile communication (GSM). A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot.



LCD Display

Liquid crystal display technology works by blocking light. Specifically, an LCD is made of two pieces of polarized glass (also called substrate) that contain a liquid crystal material between them. A backlight creates light that passes through the first substrate. Liquid crystal display (LCD) screens are manufactured by assembling a sandwich of two thin sheets of glass. On one of the sheets are transistor “cells” formed by first depositing a layer of indium tin oxide (ITO), an usual metal alloy that you can actually see through.



RFID cards:

RFID tags are affixed to items in order to track them using an RFID reader and antenna. RFID tags transmit data about an item through radio waves to the antenna/reader combination. When the tag receives the transmission from the reader/antenna, the energy runs through the internal antenna to the tag's chip



RFID Reader

A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. RFID is a technology similar in theory to bar codes. However, the RFID tag does not have to be scanned directly, nor does it require line-of-sight to a reader. RFID tags are affixed to items in order to track them using an RFID reader and antenna. RFID

tags transmit data about an item through radio waves to the antenna/reader combination. When the tag receives the transmission from the reader/antenna, the energy runs through the internal antenna to the tag's chip.

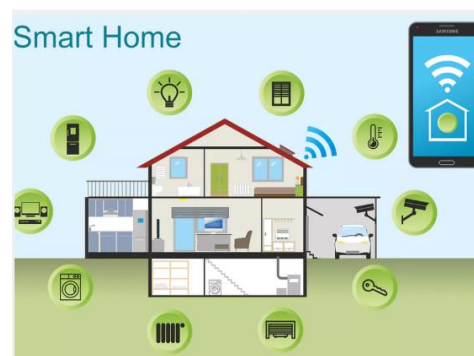


Unlike the voltage or power transformer looked at previously, the current transformer consists of only one or very few turns as its primary winding. This primary winding can be of either a single flat turn, a coil of heavy-duty wire wrapped around the core or just a conductor or bus bar placed through a central hole as shown.

Due to this type of arrangement, the current transformer is often referred to as a “series transformer” as the primary winding, which never has more than a very few turns, is in series with the current carrying conductor supplying a load.

Mobile

Availability of high speed mobile networks like 3G and Long Term Evolution(LTE) coupled with cheaper and accessible smart phones, mobile industry has seen a tremendous growth in terms of providing various services and applications at the finger tips of the citizens. Internet of Things (IoT) is one of the promising technologies which can be used for connecting, controlling and managing intelligent objects which are connected to Internet through an IP address. Applications ranging from smart governance, smart education, smart agriculture, smart health care, smart homes etc can use IoT for effective delivery of services with out manual intervention in a more effective manner.



Graphical User Interface (GUI) Module

The most important feature of our application is to hide several processes from the user while allowing some degree of interaction with the application. By using the GUI package, we

were able to customize the application to include a variety of user interface elements such as text boxes, choice groups, alert messages, lists and command buttons.



IN4007/IN4148 Diode & Resistors:

Diode:

The 1N400x (or 1N4001 or 1N4000) series is a family of popular 1 A general-purpose silicon rectifier diodes commonly used in AC adapters for common household appliances. Its blocking voltage varies from 50 volts (1N4001) to 1000 volts (1N4007).

This JEDEC device number series is available in the DO-41 axial package and similar diodes are available in SMA and MELF surface mount packages (in other part number series)

The 1N540x (or 1N5400) series is a similarly popular family of diodes for higher-current 3 A applications. These diodes are typically available in the larger DO-201AD axial package to dissipate heat better

Resistors:

When a Transformer Steps Down Voltage from 220V to 12 V Later the Diodes Convert 12V AC into 12V DC the Output from the Transformer and Rectifier (Diode Assembly) Sometime are a bit Different and Not Accurate in the Output hence Some Diodes are arranged in the Circuit to Give the Accurate 12V for the 12V Device.

CONCLUSION

It can be concluded that HOME AUTOMATION SYSTEM USING ARDUINO was a success. This system consists of an Arduino-Uno board, a Bluetooth Module, an Android phone, power sockets, home appliances and an android Application (Android). It is user friendly and cost effective. Also it can be concluded that the objectives of this project has been successfully met and they are as follows: Constructed a wireless home automation system controlled by a smartphone specifically an android device. Designed and implement cost effective home automation system yet an efficient one. Designed a user friendly and a safe system to control home appliances especially aimed to aid the elders and handicapped. Bluetooth Terminal application was installed in smartphone and a Bluetooth wireless connection was established between smartphone and Arduino Uno. Password protection was used for pairing of smartphone with Bluetooth Module HC-06 to only allow authorized user

B. Future Work

1. The Internet of Things:

This refers to the wireless connection of your devices and their abilities to send data. With the further development of how our devices can connect to each other remotely, we will see the possibilities for home automation continue to increase more rapidly.

2. Open Source Automation:

Open Source Automation allows you to continue to add to your current home automation system. This means that it will be easier for households to have increasingly more complex and interconnected solutions.

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