Home Automation System
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Abstract:
This paper helps to control the electrical loads with the help of android application. The electrical loads are controlled based on Bluetooth input signal. This input signal is received from the android device. Many times it becomes too tiring to operate the electrical switches manually every now and then. This is a big problem especially in case of aged or handicapped people. This system solves the issue by interfacing a unit with home appliances that switches these loads based on the input received from android device. The android device may be any android based phone or tab having an android OS. The app also provides an effective GUI for providing this functionality. An 8051 microcontroller is used in this system. The Bluetooth receiver is interfaced with microcontroller in order to accept the commands and then react accordingly. It operates the loads through a set of relays using a relay driver IC. Relays are used between loads and the control unit. This system proves to be very beneficial for controlling various domestic applications and in industrial setups. The power supply setup of the system contains a step down transformer of 230/12V, used to step down the voltage to 12VAC. To convert it to DC, a bridge rectifier is used. In order to remove the ripples, a capacitive filter is used and it makes use of 7805 voltage regulator to regulate it to +5V that will be needed for microcontroller and other components operation.

Keywords: Home Automation System, Android, Microcontroller, Bluetooth, Mobile Phone, Appliance.

I. INTRODUCTION:
An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market. An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Personal Digital Assistant and Mobile phones etc.Lower end embedded systems - Generally 8,16 Bit Controllers used with an minimal operating systems and hardware layout designed for the specific purpose. Examples Small controllers and devices in our everyday life like Washing Machine, Microwave Ovens, where they are embedded in.

II. SYSTEM DESIGN CALLS:

Characteristics of Embedded System:-
1) An embedded system is any computer system hidden inside a product other than a computer.
2) They will encounter a number of difficulties when writing embedded system software in addition to those we encounter when we write applications.
3) Throughput – Our system may need to handle a lot of data in a short period of time.
4) Response–Our system may need to react to events quickly.
5) Testability–Setting up equipment to test embedded software can be difficult.
6) Debugability–Without a screen or a keyboard, finding out what the software is doing wrong (other than not working) is a troublesome problem.
7) Reliability – embedded systems must be able to handle any situation without human intervention.

III. BLOCK DIAGRAM:-
A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), current that flows in only one direction, a process known as rectification. Rectifiers have many uses including as components of power supplies and as detectors of radio signals. Rectifiers may be made of solid state diodes, vacuum tube diodes, mercury arc valves, and other components. Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore a regulator is applied at the output stage. A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically but other operating principles are also used. 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.

IV. HARDWARE COMPONENTS:

1. VOLTAGE REGULATOR (LM 7805)
2. RECTIFIER
3. FILTER
4. MICROCONTROLLER (AT89S52/AT89C51)
5. PUSH BUTTON
6. RELAY
7. ULN 2003
8. 1N4007
9. LED
10. RESISTORS
11. CAPACITORS

V. WHAT IS ANDROID?

Android is a Linux-based operating system designed primarily for touch screen mobile devices such as smart phones and tablet computers. Initially developed by Android, Inc., which Google backed financially and later bought in 2005, Android was unveiled in 2007 along with the founding of the Open Handset Alliance: a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices. The first Android-powered phone was sold in October 2008.

Figure.3. Android module

V.I FACTORS THAT LED ANDROID TO BECOME WORLD’S MOST POPULAR OS:-

Android is open source and Google releases the code under the Apache License. This open-source code and permissive licensing allows the software to be freely modified and distributed by device manufacturers, wireless carriers and enthusiast developers. Additionally, Android has a large community of developers writing applications (“apps”) that extend the functionality of devices, written primarily in a customized version of the Java programming language. In October 2012, there were approximately 700,000 apps available for Android, and the estimated number of applications downloaded from Google Play, Android's primary app store, was 25 billion.

V.II MARKET SHARE OF ANDROID BASED SMART PHONES:-

Research Company Canals estimated in the second quarter of 2009 that Android had a 2.8% share of worldwide Smartphone shipments. By the fourth quarter of 2010 this had grown to 33% of the market, becoming the top-selling Smartphone platform. By the third quarter of 2011 Gartner estimated that more than half (52.5%) of the Smartphone market belongs to Android. By the third quarter of 2012 Android had a 75% share of the global Smartphone market according to the research firm IDC.

VI. CIRCUIT DIAGRAM:-

Figure.4. Circuit Diagram

VI.I DESCRIPTION:-

The circuit uses standard power supply comprising of a step-down transformer from 230V to 12V and 4 diodes forming a bridge rectifier that delivers pulsating dc which is then filtered by an electrolytic capacitor of about 470µF to 1000µF. The filtered dc being unregulated, IC LM7805 is used to get 5V DC constant at its pin no 3 irrespective of input DC varying from 7V to 15V. The input dc shall be varying in the event of input ac at 230volts section varies from 160V to 270V in the ratio of the transformer primary voltage \( V_1 \) to secondary voltage \( V_2 \) governed by the formula \( V_1/V_2= N_1/N_2 \). As \( N_1/N_2 \) i.e. no. of turns in the primary to the no. of turns in the secondary remains unchanged \( V_2 \) is directly proportional to \( V_1 \). Thus if the transformer delivers 12V at 220V input it will give 8.72V at 160V. Similarly at 270V it will give 14.72V. Thus the dc voltage at the input of the regulator changes from about 8V to 15V because of A.C voltage variation from 160V to 270V.
to 270V the regulator output will remain constant at 5V. This project is designed to work for a specific operation such as switching operation of loads. Five loads are used independently from the contacts of four relays driven by a relay driver IC ULN2003 as explained above. Selecting mode is by A to D for ON and, push button E to H can be used to switch OFF the load through the relay if required. All standard items like power supply, accessories to controller, are used as per the circuit. One blue tooth module is used after being powered from a Zennor diode D1 for 3 volts and its Rx TX are duly interfaced to the microcontroller for bidirectional data flow while the program is executed for developing the trigger for the relay driver IC as per the command received. The android application from any smart phone communicates though the inbuilt blue tooth of the phone to the above blue tooth module for operations as required. The smart phone screen having alphabets A B C D E F G H are used for sending commands. A for switching on first load and E for switching off the same load. Similarly for others are followed. All on is by left symbol and all off is by right button.

VII. SETTING UP BLUETOOTH:-

![Figure 5. Setting of Bluetooth](image)

Before your application can communicate over Bluetooth, you need to verify that Bluetooth is supported on the device, and if so, ensure that it is enabled. If Bluetooth is not supported, then you should gracefully disable any Bluetooth features. If Bluetooth is supported, but disabled, then you can request that the user enable Bluetooth without leaving your application.

VII. FEATURES OF BLUETOOTH:-

- Super simple and easy way to interface using Bluetooth stack.
- Bluetooth Stack 2.0 compatible.
- Bluetooth Class 2 device, Has a built-in 2.4GHz antenna.
- Has the external 8Mbit FLASH.
- 3.3V Device, Should not be used with 5V power supplies, device will work for some time but become hot.
- All the programmable Input/output pins are available for tinking.
- Can also supports USB protocol is Full Speed USB1.1, and compliant with 2.0. Pins are made available.
- Can also support SPI Protocol, pins are made available.
- Low power consumption.

VII. ADVANTAGES:-

- **Safety:-** The ability to control small appliances and lighting with your fingertips anywhere you are will add safety in your home.
- **Security:-** The ability to lock the door through your phone is one of the greatest benefits of home automation.
- **Convenience:-** The ability to control everything with your fingertips is very convenient.
- **Save Time:-** Since we are living in a very fast-paced environment, we don’t even have time to worry about our home.
- **Save Money:-** This is the biggest advantage of home automation. With the ability to control the light, whether dimming or turning on/off on specific time will saves homeowner a great ton of money.

IX. DISADVANTAGES:-

- **Equipment and installation costs:** Automation of the home is widely related to the financial costs.
- **System crashes due to any damage in the interconnection:** If there is any damage due to rupturing of cables or the fibers the entire system gets crashed.
- **Human errors:** If the human does not handle the kit safely or if he/she does not use the correct keys to perform the operations, human errors may occur. Human errors also lead to destructions of the machine. Then there will be a huge system crash.

X. APPLICATIONS:-

- An android app is meant for phones with an android based operating systems. They can be downloaded from the android app Market which is pre-loaded on every android phone.
- Blue control APP and Bluetooth Spp APP are some examples.

XI. CONCLUSION:-

Survey of different home automation system shows that there are various kinds of technologies used to implement this type of system. All the proposed systems have been Presented and compared in this paper which reveals some Merits and
demerits of the systems. This review explained Different home automation system e.g. Web based, Bluetooth-Based, mobile-based, SMS based, Zig Bee-based, Arduino microcontroller based, Android app based, IOT based and cloud-based. Due to its performance, simplicity, low cost and reliability home automation system is making its position in global market, that day is not so far when every home will be the smart home. Special thanks to Mr. Mashalkar Y.S. sir who helps me to publish a paper.

XII. REFERENCES:–

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