

BASED ON THE WIRELESS BLUETOOTH MICROCONTROLLER CONTROLLING HOME APPLIANCES

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Abstract— This paper presents the electronic home Appliances such as a Light, Television and Fan control through Android mobile with the help of Wireless micro controller. This is possible by using mobile technology this will be beneficial to our society. The main objective of this system is to satisfy the needs of elderly and physically challenged people. We have many ways to control the home appliances; they may depend on some variables like mechanical, electrical or electronic. The most common ways are direct and remote control which can be automatic or manual. Automated process provides comfort for operates, decreases risks and increases productivity. In the development of remote systems, the telecommunications electronics and control concepts gives it possible to access and control the strategy, system or interface from a computer, mobile android devices with highly user friendly interface. Now a days the tablets and smartphone are becoming very powerful with new and useful characteristics. This helps to develop control systems. The main concept of this project to introduce an android OS based application smart that communication with home appliances via mobile device continuously to operate the electronic appliances. The Wireless platform plays a vital role to holds a maximum number of uses when compared to all other platform.

Index Terms— Android Debug Bridge, Arduino, CMOS, Darlington transistor, IOREF pins.

I. INTRODUCTION

Now a days the popularity of controlling electrical home appliances through phone has been increasing due to high performance and reduce work by connecting via smartphone which is very useful for elderly and physically disable people, who can easily access and control the home appliances by staying at particular place and access them remotely without the help of other people. This technology can increase the Life quality of them. Wireless technology is increasing day by day, many different connections are introduced such as WIFI, Bluetooth and GSM. Bluetooth with frequencies of 2400 HZ is able to provide connectivity up to 100 meters with speed up to 3 Mbps. Based on microcontroller, we may send and receive data between the mobile device, and hardware is possible.

II. LITERATURE SURVEY

Smart Home appliances system has become very common in this recent years of technology especially with fast development in internet. Various smart home systems with improved technologies have been implemented. Most of the technologies are based on controlling home automation systems in android application which gives user interface for monitoring and controlling their home electronic appliances remotely or directly. Previous method based on the Smart Home implementation includes the use of android application, that communicates to an ARM based processes through GSM (Global System for Mobile Communication) network and control the electric appliances at home through radio frequency. There is also an Arduino based system that uses Wireless Zigbee and Wired X10 technologies[1]. The system which is based on the dual tone multifrequency (DTMF) signals that could be sent through a loop of wires to switch ON/OFF various appliances through a personal computer (PC). The software and hardware system are designed based on the telephone standards[2]. Most of the appliances manufacturers focus on the development of intelligent (or information) appliances to be integrated into a complete HA system for monitoring and controlling the Home appliances. Due to the implementation of advanced Computer and wideband network, the Personal Computer-based environment is very suitable platform for the system integration[3]. By using a Touch- tone telephone, we can remotely check or control the Household devices. This proves that any house can be controlled from any location where there is a Touch-tone telephone is available[4]. Base on the Bluetooth technology, Home automation and networking environment proposes a network, which contains a remote, mobile host controller and several client modules (Home appliances) [5]. We can eliminate extensive programming using high-level languages, such as Java programming to achieve remote connectivity and focus on the primary task of implementing control algorithms[6]. Home automation system which based on Android, that allows multiple user to control the appliances by an android application or through a website is presented. The system which has three hardware components: a local device to home appliances to transfer signals, a web server to store customer records and support services to the other components and a mobile smart device running Android application[7]. The realization of the Wireless module devices driver, the difficulty in supplying the appropriate low-voltage Dc for Microcontroller and Wireless module just by a Single live wire. The system has the features like easy installation and low cost, the software and hardware can be customized and easily extended[8]. Android based user interface for controlling home appliances via connection to the smart living system can be

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made from the designed app through Bluetooth or internet connection, which integrates home security and alert system[9]. Smart home control system which based on Cortex -As and Zigbee system consists of three parts include user intelligent control terminal, home Zigbee wireless network and embedded home gateway. This system can perform functions such as safety and alarm, the indoor environment testing, intelligent lighting and house hold electrical appliances control and other functions[10].

The input has been captured by the android and sent to Arduino Uno. Arduino Uno will receive the signal by Bluetooth module and process the input signal to control the home appliances[11]. System implementing LAN(Local Area Network) and WAN (Wireless Area Network) which uses private IP (Internet Protocol) and DNNS (Dynamic Domain Name Server) respectively. The main purpose of the designed system is to provide a Smart Home System which is affordable by most of people without comprising the common features of a smart home system. The system must be convenient to be used by all age groups. This system basically has three sensors, a LM35 temperature sensor, a PIR (Passive Infrared) motion sensor and an LDR (Light Dependent Resistor) which will be responsible to control and automate an alarm, outdoor light and fan resp. These sensors can be enabled or disabled and the status of the alarm, outdoor light and the fan can be monitored using android app[12]. Software app will control the electrical appliances switches Wirelessly. This is used in hospital, home care for elderly and facilities for disabled users[13]. Home appliances can be controlled by directly transferring the control message using PLC rather than WSNs[14]. Android based home monitoring system will detect the threshold violation in power usage. This will produce appropriate signal to take remedial action[15]. The design which is based on Wireless Communication includes Bluetooth technology and Internet. Internet can be used when they are far away from home and Bluetooth tech will allow the user to manage the Smart house while they are at home[16].

II. EXISTING SYSTEM

Monitoring and controlling the house hold appliances from a computer or a Smart phone was invented in existing system there was used to control only ON and OFF process. The existing technologies we may use infrared, GSM and Wi-Fi. It takes more time to configure and managing the appliances. It will cover large areas but produces more interface while using GSM in order to connect with mobile internet. It involves some drawbacks.

A. Drawbacks

Interference problem, less reliability, cost effective, more time consumption and Data connection required.

III. PROPOSED SYSTEM

Bluetooth technology in the modern home automation which operates over 2.4 GHz frequency is the gift forces. Bluetooth facility will link the digital devices within a range of 10m to 100m with the speed of up to 3 Mbps depending on that particular Bluetooth device. The proposed system is used to control the speed variation and

adjust the speed of the FAN using android technology. This designed system involves advantages.

A. Advantages

More useful for elders and physically challenged people, Transmission is faster, less connections, Reliability is more, reduced Wiring and no interference problem.

The Arduino Uno can be powered within an external power supply or by the USB. The external power can be transferred from an AC to DC adapter. The adapter can be linked by plugging a 2.1mm plug into the board's power socket. The battery that contains leads which is inserted in the Gnd and Vin pin headers of the POWER connector. The board operates with an external supply of 6 to 20 volts. If the board is supplied with less than 7v, the 5v pin may supply less than 5 volts and the board may be unstable. If the operating voltage exceeds 12v, the voltage regulator may get overheated, and the board gets damage. So, the preferable range is from 7 to 12 volts.

B. Digital pins

These digital pins which is used on the Arduino board for the general purpose input and output through the pin mode(), digital write() and digital read() commands. This Arduino board contains 14 pins. These 14 pins has internal pull up resistor, that can be turned ON and OFF by digital write() when the pin is configured as an input. We can supply the maximum current per pin is 40mA. The external pin 2 and 3 which is used to trigger an interrupt on a low value, a rising or falling edge or a change in value. In this digital pins 3,5,6,9,10 and 11 are the PWM pins which is used to provide 8 bit PWM output with analog write() function. We can reset the Bluetooth through the pin 7, this Bluetooth is connected to the reset line of the Bluetooth module. The pin 10(SPI), 11(MOSI), 12(MISO), 13(SCK) is supporting the SPI communication, which gave by the corresponding hardware is not currently built in Arduino language. The pin 13 which is built in LED. When pin is HIGH, the LED is ON, when the pin is LOW, the LED is OFF.

C. Analog pins

The analog input pins which will convert 10 bit analog to digital signal through analog Read() function. The analog pins can also be used as the digital pins. For example, Analog input 0 is used as the digital pin 14 through analog input 5 as digital pin 19. But analog inputs 6 and 7 cannot be used as digital pins. The microcontroller receives the analog input signal and it is converted to digital signal by using ADC [Analog to Digital Converter] and finally send it to the rider IC.

D. Power LED

A fixed LED is attached to the digital pin B. When the pin is Low, the LED is OFF, when the pin is HIGH, the LED is ON. The Uno contains 6 analog inputs, each of which analog inputs provides 10 bits of resolution. They calculate from ground to 5 volts by default, even though it is possible to change the higher end of their range using the AREF pin.

E. External power supply

We can supply the external power from 6 to 20 volts to operate the board. If the supplied power is less than 7 volts, however, the 5v pin may supply lesser than 5 volts and the

board may become unstable. If supplied power exceeds 12v, the voltage regulator may get overheated and may cause damage on the board. Hence the recommended range is 7v to 12v.

F. Vin

The input voltage is given from the external power source (as opposed to 5volts from USB connection or regulated power source) to the Uno board. This may supply voltage through this pin or if supplying voltage via the power jack, access it through this pin.

G. 5V

This pin gives output as a regulated 5v from the regulator on the board. We can supply power to the board, either from the USB connector (5v), the pin of the board (7v to 12v) or the DC power jack (7v to 12v), supplying voltage via the 5v or 3.3v pins by passes the regulator and may damage the board. Board regulator can generate a 3.3v supply. Maximum current draw is 50mA.

H. Reset

Reset is an automatic button which is presented in microcontroller. The UNO board is designed in a way that allows, it to be rearrange by software presently running on a computer, rather than requiring a physical press of the reset button before an upload. ATmega 8U2 contains the hardware flow control lines, which is connected to the reset line of the ATmega328 through a 100 Nano farad capacitor. If this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software utilizes this capability to allow us to upload the code by pressing the upload button in the interface. This explains that the boot loader can have a shorter time out, as the lowering of DTR can be well co-ordinates with the start of the upload.

I. USB Interface

This is a easy USB interface. It allows the USB interface like a serial device. The chip on the board which plugs directly into the USB port as a virtual serial port. The main favour of this setup is that serial communication, which is really easy protocol that is time tested and USB makes it very comfortable.

J. ICSP Header

ICSP header is basically in the circuit serial programming that allows user to upload software to microcontroller without having to pull it out every time. Inorder to connect the pins into the ICSP port, a connector 2x3 is used. Finally user can upload the software to the Microcontroller.

K. IOREF

IOREF is a pin on the Uno board which provides the voltage, the voltage references with the microcontroller operates. Only a properly designed shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the output to work with the 5v or 3.3 v.

L. AC to DC Converter

It is a mechanism which is used for converting analog signal into digital signal with help of the full wave rectifier. Half wave rectifier it allows only positive current at a time. It receives 230 power supply and convert into digital signal with the help of ADC (Analog to Digital Converter) and

finally sends DC signal to the Microcontroller. AC to DC converter is shown in Fig. 1

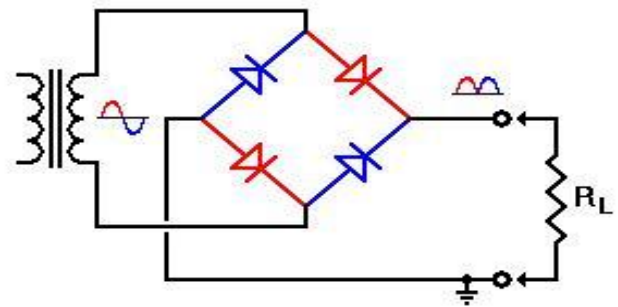
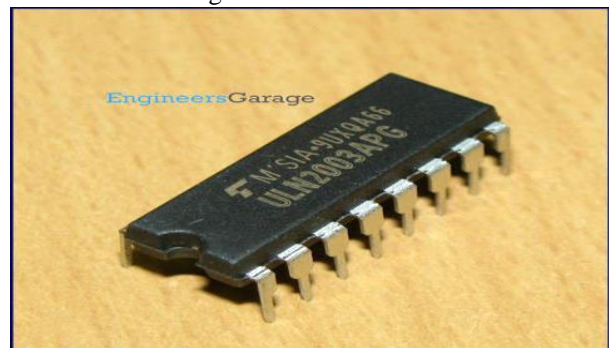


Fig. 1 AC to DC converter

M. IC- ULN2003 APG

The ULN2003 is a monolithic high voltage and high current Darlington transistor array. It contains seven NPN Darlington pairs and high voltage outputs. These outputs have common-cathode clamp diode for switching inductive loads. The collector current ranking of a single darlington is 500mA. Inorder to avail the higher current ability, the darlington pairs can be paralleled. Applications may include hammer drivers, relay drivers, display drivers, lamp drivers, line drivers and logic buffers. ULN2003 APG has a 2.7k ohm series base resistor for each and every Darlington pair for operation directly with TTL or 5v CMOS devices. ULN2003 APG is shown in Fig. 2

Fig. 2 IC- ULN2003 APG



N. Relay

It is usually an electromechanical device which is actuated by an electrical current. The current flowing in one circuit causes the opening or closing of another circuit. If the current or voltage exceed a threshold value, the coil activates the armature, this will operate either to close the open contacts or to open the close contacts. When power supply is given to coil, it generates the magnetic force which force to do the switch mechanism.

O. Fan

There are two capacitors used in a ceiling fan motor, one is the run capacitor and the other is the start capacitor. An AC motor that needs a magnetic field is order to turn the fan blades and it is done by applying voltage with different phase's and windings. In the Single phase system there is only one voltage phase and the capacitor is used to provide a phase shift in the winding of the motor, making it appear like

the motor is operating in a multiphase system. Fan is shown in the Fig. 3



Fig. 3: Fan

P. Bluetooth Module

Bluetooth is a Wireless technology to exchange data over short distances. If the distance exceeds a particular level, it cannot work. The range of the Bluetooth is 30 feet. The Bluetooth module HC-05 module is easy to use Bluetooth serial port.

Protocol module, which is designed for translucent Wireless serial connection setup. The serial port Bluetooth module is a qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps modulation with entire 2.4 GHz radio transceiver and baseband.

It has the footprint as small as 12.7mm x 27mm, This uses CSR BlueCore 04- External single chip Bluetooth system, which AHF (Adaptive Frequency Hopping feature) and CMOS technology. Bluetooth Module is shown in the Fig. 4



Fig. 4: Bluetooth Module

IV. BLOCK DIAGRAM

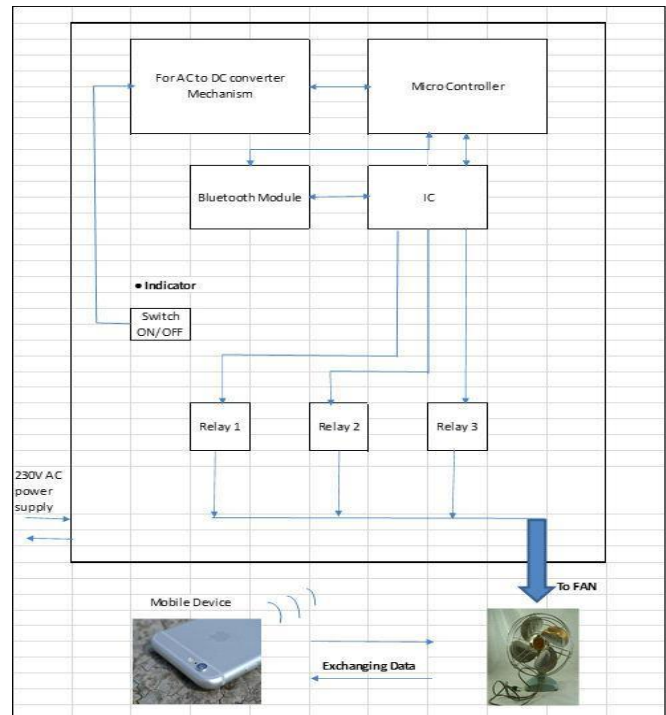


Fig. 5: Block Diagram

V. SOFTWARE DESCRIPTION

A. Advantages

Android is a mobile OS based on the Linux kernel, which is currently developed by Google.

Android is designed with a user interface based on direct manipulation for the mobile devices such as smart phones and tablet computers, with an effective user interface for televisions such as Android TV, Android Auto, Android wrist watches and cars.

Android encouraged a large community of developers as a foundation for community-driven projects, which add new features for advanced users, bring Android to the devices which were officially released running other operating systems.

B. Android open source project

This project is led by Google and is tasked with the maintenance and enhancement of Android.

The compatibility program is the Android Open Source Project, which is also effective and free of charge. Within the compatibility test suite, there is also a free and open source.

C. Privacy

Android mobile phones have the ability to report the location of Wi-Fi access points in order to build a database which contains the physical locations of hundreds of millions of such access points. TaintDroid, a third-party software, an academic research-funded project, in some cases, detects when personal data is being sent from the application to the remote servers.

We are taking another look at this and adding permission for the application to access images.

D. Security

Android applications can run in a sandbox, a particular area of the operating system, that does not have access to the rest of the system resources, if not access permissions are given by the user when application is installed.

Before installing an application, play store displays all necessary permissions. A game may enable vibration for instance, it should not need to read useful messages or access the contacts. The user can decide whether to further install the application after receiving these permissions.

E. Android studio

This Android studio offers; code templates to help you build common app features and Flexible grade-based build system. It helps to build varianty and multiple apk file generation.

It provides rich layout editor with the support for drag and drop theme editing and built in support for Google cloud platform, in order to integrate Google cloud messaging and AOP engine easily.

F. Android SDK

Using the Android software development kit, application are development in Java. The android SDK includes a complete set of development tools. In March 2015, the software development kit is not obtainable on Android itself, but the software is developed by using the specialized Android applications.

Developers may use any of the platform to perform Java and HML files, then use command line tools to create, build and debug Android applications and able to control the attached Android devices.

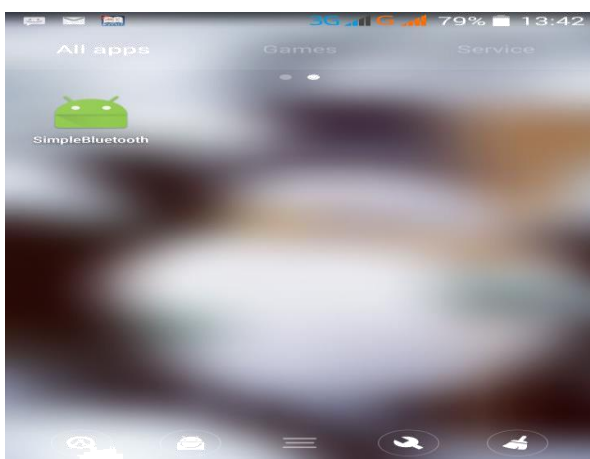
G. Android debug bridge

It is a tool which is built-in in the Android software development kit package, consists of client and server side programs that communicate with each other.

The Android debug Bridge is used through the command line interface, eventhough numerous graphical user interfaces subsist to control ADB.

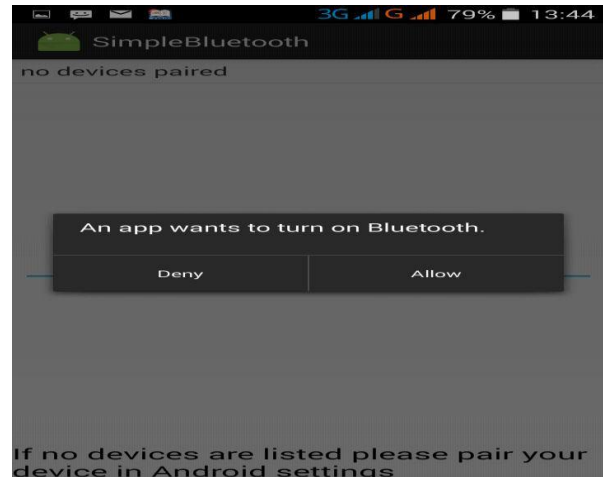
VI. MODEL OUTPUT

A. Step 1



Simple Bluetooth application

B. Step 2



Response by the user

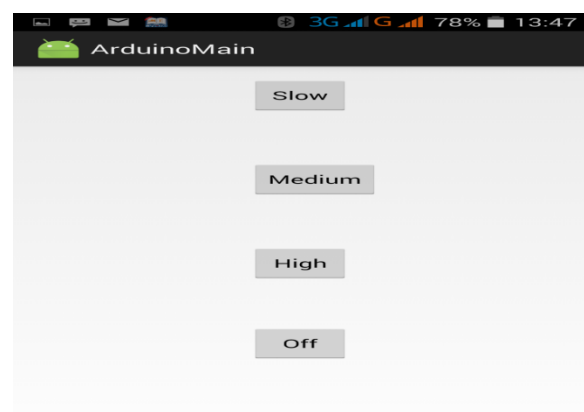
C. Step 3



If no devices are listed please pair your device in Android settings

Select the Bluetooth device

D. Step 4



Select the operation

VII. SIMULATION OUTPUT

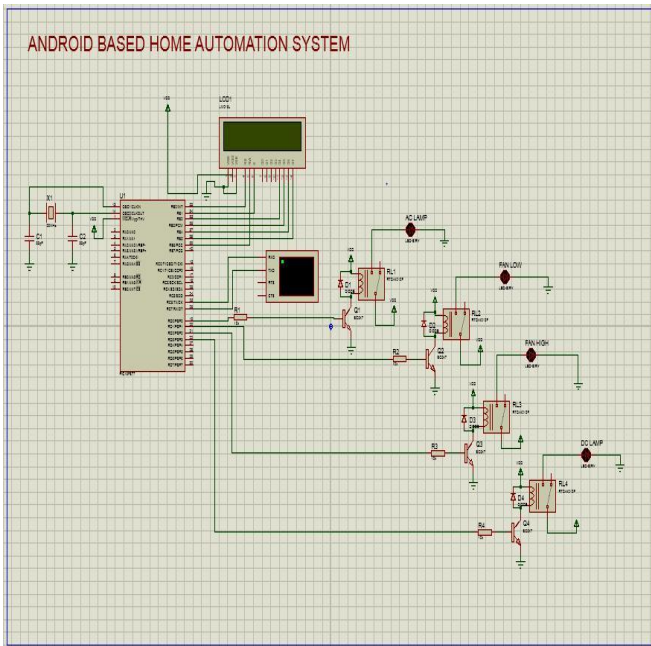


Fig. 6: Simulation Output

VIII. CONCLUSION

The proposed system is designed at low cost and this is used to improve the standard of living at home. This is very reliable and efficient in finding solutions to high-order non-linear equations. Algorithm of this proposed system can easily solve the non-linear transcendental equations with a much simpler formulation. This android device with wireless connectivity provides help to the people especially to elderly and physically challenged people. The system can be used for any number of voltage levels without complex analytical calculations. The simulations which are based on the 11-level cascade H-bridge inverter can give us the verification of the variety of the proposed algorithm.

This system is easy to install by the implementation of the Bluetooth connection in the control board, this board can be directly installed beside the electrical switches. The usage of wires to connect the electronic equipment can be greatly reduced. This device can be controlled faster and easier compared with other technologies by using Bluetooth.

ACKNOWLEDGEMENT

The Android application will be implemented with recognition of the speech signals in the android smart phone and controlling appliances with voice commands in the future work. The input voice signals are given to the android device and it can transmit to the main control board after the processed signal. In order to reduce the board design, we can reduce the size of the board to fit with the switch board itself and use as a handheld device. We can calculate the power consumption using sensors to save the cost of power.

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