

Smart Curtain Control
System Using Smart Phone
Via Bluetooth

*This project is for partial fulfillment of the degree of Bachelor of
Science
In
Electronics and Telecommunication Engineering*

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DECLARATION

We hereby declare that we carried out the work reported in this project in the Department of Electronics and Communications Engineering, East West University, under the supervision of **Dr. Md. Habibur Rahman**. We solemnly declare that to the best of our knowledge, no part of this report has been submitted elsewhere for award of a degree. All sources of knowledge used have been duly acknowledged.

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CERTIFICATE

This is to certify that the major project entitled “**Smart Curtain Control System using Smartphone via Bluetooth**” being submitted by **Riad Reza Shuvo** and **Md. Saifur Rahman Mazumder** of Electronics and Communications Engineering Department, East West University, Dhaka in partial fulfillment for the award of the degree of Bachelor of Science in Electronics and Telecommunication Engineering, is a record of major project carried out by them. They have worked under my supervision and guidance and have fulfilled the requirements which to my knowledge have reached the requisite standard for submission of this dissertation.

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ACKNOWLEDGEMENT

The completion of our project work brings with it a sense of satisfaction, but it is never complete without thanking everyone who made it possible and whose constant support has crowned our efforts with success.

Our deepest gratitude to Almighty God for helping and guiding us throughout our lives.

We would like to sincerely thank **Dr. Md. Habibur Rahman**, Professor, Dept. of Electrical and Electronics Engineering, University of Dhaka for allowing us to carry out the project and providing guidelines whenever necessary.

Our deepest regards to **Dr. M. Mofazzal Hossain**, Professor & Chairperson of Electronics and Communications Engineering Department for encouraging and inspiring us to carry out the project.

We would also like to thank all the faculty and staff members of ECE Department for providing us with the required facilities and support towards the completion of the project.

We feel extremely happy to acknowledge and express our sincere gratitude to our parents for their constant support and encouragement and last but not the least, friends and well-wishers for their help, cooperation and solutions to problems during the course of the project.

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ABSTRACT

This Paper contains the improvement of Curtain system with Bluetooth device, which is controlled by any smart phone. The motive of this project is to cope with the digital world and the betterment for the human life. We use Bluetooth device to control the whole system operated by a smartphone. A bluetooth software is installed in the phone, which name is “Blue term”.Blue term is a default software, which is available in google play store.We give a command on that software and the system works with that command.We assign the input ‘1’, ‘2’, and ‘0’ at the arduino coding for motor rotation. Command ‘1’ is for closing the curtain which means motor rotate right, command ‘2’ is for opening the curtain which means motor rotate left and command ‘0’ is for stop the curtain at any where. The Bluetooth device which is implemented to the circuit, is password protected. So we can secure the system by giving password. For the power supply of this system we use 5V adapter.The prototype has been successfully developed and it could provide an effective mechanism to make our life easier.

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Chapter-1

INTRODUCTION

Nowadays modern technology become an important part in our daily life. Modern technology has made the requirement for information flow to be quick and effective. Day by day people are become more dependent on science and technology. In this project, we have designed and developed microcontroller based, automatic rotter control using bluetooth. We can control (ON/OFF) every electronics and electrical devices (operated by 220V or more) of our home like lights, fans, AC, refrigerators, TVs, doors, windows, curtain etc without any physical touch. The main advantages of this project is we can control this system remotely at any time using bluetooth device.

1.1 Literature Survey

With the development of the electronics technology in the last two decades, a new concept called Smart Curtain Control become prevalent. In line with this concept of smart home, people have been trying to control and secure their home appliances automatically. With the recent rapidly advancing mobile communication technology and the decrease in costs has also made it possible to remotely control and secure our home appliances.

In the literature, there are few contributions proposed in recent years in machine-to-machine, mobile-to-machine, or machine-to-mobile communication. These include designing prototype integrated mobile telemedicine system interfaced with sensors to a patient's body using Bluetooth simulation. Bluetooth utilizes a radio innovation called recurrence bouncing spread range. Implementing DC motor control using bluetooth device.

Meanwhile, the system developed by wireless control via bluetooth device which communicate on a frequency of 2.45 gigahertz (actually between 2.402 GHz and 2.480 GHz, to be exact). This frequency band has been set aside by international agreement for the use of industrial, scientific and medical devices (ISM). Beside this, inside of this system we use Arduino uno to receive and transmit signal from the blue tooth device. works by Arduino uno, which is an open-source prototyping stage in view of simple to-use equipment and programming. Its sheets can read any kind of sensor input like, light on a sensor, a finger on a catch, or a Twitter message. Anyone

can advise his/her board what to do by sending an arrangement of guidelines to the microcontroller on the board.

1.2 Motivation

Modern Technologies become part of our everyday's life. We can't even imagine our life without it. It's making our life more easier day by day. So, it become part and parcel in our life. If we need to control our home appliances (bulb, microwave oven, TV, fan etc.) to switched on and switch off we can do it smartly by a smartphone through giving command in a software which installed in that smartphone.

It's not always feasible to be physically near to the home still sometimes it's very important to control the appliances for many purposes. So the remote controlling takes the control of the home beyond the home and to the hands of the people. If a 47 simple mobile phone takes the added responsibility to control the smart home then the control is reachable from almost everywhere people travels and lives on earth. Now a day's most of the people are using mobile services. So, designing a system which can control home appliances from remote places using SMS can benefit a large population which may not be possible using other services like INTERNET.

1.3 Objectives

Now a day's mobile phone is a part and parcel of our daily life. We can control every electronic device of our home like Light, Fan, AC, Refrigerator, TV, Door, Water Tank etc within shortage range by using mobile phone through bluetooth. In this project, we describe how to control and designing a smart home appliance control system which is based on microcontroller. We design a system which can turn on and off or rotate with or without any switch. We can apply this system in any big office, industry, shop or university classroom etc. It also used for secured our home or workplace.

The followings are the objectives of this project to ensure it meets the aim.

- To design a control system for smart home application using bluetooth device.
- To design a circuit that can efficiently and automatically operate different home appliances connected to the control system.
- To design a circuit that can automatically switch ON and OFF the home appliance using machine code.
- To test our designed system with a wide range of electrical and electronic equipment and troubleshoot any errors.

Chapter-2

MICROCONTROLLER

Introduction to Microcontroller

2.1 Microcontroller

A microcontroller is a small computer (SoC) on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Input and output devices include solenoids, LCD displays, relays, switches and sensors for data like humidity, temperature or light level, amongst others. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems.

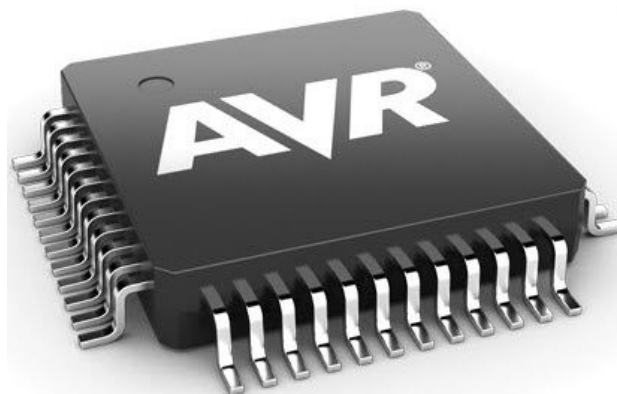


Figure 2.1: Atmel AVR Microcontroller

Microcontroller is an IC chip that takes input process data according to program written in its memory and gives output as control signal for controlling other machines and devices. Microcontroller is used to control the operation of various machines and devices according to the program or given instructions in the memory or ROM of the Microcontroller. The program that is needed for proper working of Microcontroller is called Firmware and is written in ROM (Read Only Memory).

ROM is a non-volatile memory that its contents are permanent. Some latest ROMs can be Re-Programmed, but mostly it doesn't require.

2.1.1 Types of Microcontroller

There are several different kinds of programmable microcontrollers. Microcontrollers are categorized by several parameters including Bits, Flash size, RAM size, number of input/output lines, packaging type, supply voltage and speed. Programmable microcontrollers contain general purpose input/output pins. The number of these pins varies depending on the microcontroller. So let's discuss types of microcontrollers:

● Bits:

8 bits microcontroller executes logic & arithmetic operations. Examples of 8 bits micro controller is Intel 8031/8051.

16 bits microcontroller executes with greater accuracy and performance in contrast to 8-bit. Example of 16 bit microcontroller is Intel 8096.

32 bits microcontroller is employed mainly in automatically controlled appliances such as office machines, implantable medical appliances, etc. It requires 32-bit instructions to carry out any logical or arithmetic function.

● Memory:

External Memory Microcontroller – When an embedded structure is built with a microcontroller which does not comprise of all the functioning blocks existing on a chip it is named as external memory microcontroller. For illustration- 8031 microcontroller does not have program memory on the chip.

Embedded Memory Microcontroller – When an embedded structure is built with a microcontroller which comprise of all the functioning blocks existing on a chip it is named as embedded memory microcontroller. For illustration- 8051 microcontroller has all program & data memory, counters & timers, interrupts, I/O ports and therefore its embedded memory microcontroller.

● Instruction Set:

CISC- CISC means complex instruction set computer, it allows the user to apply 1 instruction as an alternative to many simple instructions.

RISC- RISC means Reduced Instruction Set Computers. RISC reduces the operation time by shortening the clock cycle per instruction.

● Memory Architecture:

Harvard Memory Architecture Microcontroller

Princeton Memory Architecture Microcontroller

2.1.2 Applications of Microcontrollers

Programmable microcontrollers are designed to be used for embedded applications, unlike microprocessors that can be found in PCs. Microcontrollers are used in automatically controlled devices including power tools, toys, implantable medical devices, office machines, engine control systems, appliances, remote controls and other types of embedded systems. Microcontrollers are mostly used in electronic equipments such as Mobile Phones, Automobiles, CD/DVD Players, Washing Machines, Cameras, In Computers, Modems and Keyboard Controllers, Security Alarms, Electronic Measurement Instruments, Microwave Oven etc.

Application of Microcontroller in Day to Day Life Devices:

- Light sensing & controlling devices
- Temperature sensing and controlling devices
- Fire detection & safety devices
- Industrial instrumentation devices
- Process control devices

Application of Microcontroller in Industrial Control Devices:

- Industrial instrumentation devices
- Process control devices

Application of Microcontroller in Metering & Measurement Devices:

- Volt Meter
- Measuring revolving objects
- Current meter
- Hand-held metering systems

2.1.3 Advantages of Microcontroller

Microcontroller's use increased rapidly. Now these are used in almost every electronic equipment like Washing Machines, Mobile Phones and Microwave Oven.

Following are the most important facts about Microcontrollers, which causes rapid growth of their use:

- Microcontrollers act as a microcomputer without any digital parts.
- Microcontrollers are cheap and very small in size; therefore they can be embedded on any device.
- Programming of Microcontrollers is simple to learn. It's not much complicated.
- We can use simulators on Computers to see the practical results of our program. Thus we can work on an embedded project without even buying the required components and chips. Thus we can virtually see the working of our project or program.
- Usage of microcontroller is simple, easy for troubleshoot and system maintaining.
- Most of the pins are programmable by the user for performing different functions.
- Easily interface additional RAM, ROM,I/O ports.
- Low time required for performing operations.

2.1.4 The Atmel 8-bit AVR RISC-based microcontroller

The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.^[3]

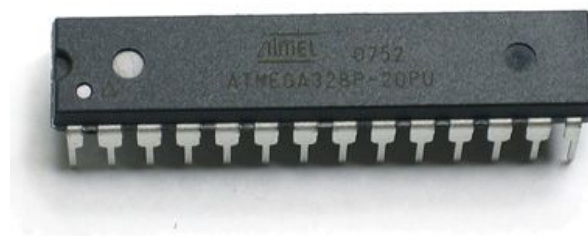


Figure 2.2: ATmega328(single-chip microcontroller)

2.2 Arduino

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. Arduino is a software company, project, and user community that designs and manufactures computer open-source hardware, open-source software, and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can interface to various expansion boards shields and other circuits. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language called Processing, which also supports the languages, C and C++.

2.2.1 History

Colombian student Hernando Barragán created the development platform *wiring* as his Master's thesis project in 2004 at the Interaction Design Institute Ivrea in Ivrea, Italy. Massimo Banzi and Casey Reas (known for his work on Processing) were supervisors for his thesis. The goal was to create low cost, simple tools for non-engineers to create digital projects. The Wiring platform consisted of a hardware PCB with an ATmega128 microcontroller, an integrated development environment (IDE) based on Processing and library functions to easily program the microcontroller. In 2005, Massimo Banzi, with David Mellis (then an IDII student) and David Cuartielles, added support for the cheaper ATmega8 microcontroller to Wiring. But instead of continuing the work on Wiring, they forked (or copied) the Wiring source code and started running it as a separate project, called Arduino. The Arduino's initial core team consisted of Massimo Banzi, David Cuartielles, Tom Igoe, Gianluca Martino, and David Mellis. The name Arduino comes from a bar in Ivrea, where some of the founders of the project used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014. Following the completion of the Wiring platform, it's lighter, lower cost versions were created and made available to the open-source community. Associated researchers, including David Cuartielles, promoted the idea. Arduino's initial core team consisted of Massimo Banzi, David Cuartielles, Tom Igoe, Gianluca Martino, and David Mellis.

2.2.2 Types of Arduino

Different boards support the use of different Arduino shields. These shields are add-ons that add features to the board. Many accessories allow extra USB connectors or screens, which most of the boards support. The original Arduino hardware was produced by the Italian company Smart Projects. Some Arduino-branded boards have been designed by the American companies SparkFun Electronics and Adafruit Industries. As of 2016, 17 versions of the Arduino hardware had been commercially produced.

2.2.3 Arduino Boards:

A. The Arduino Uno:

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

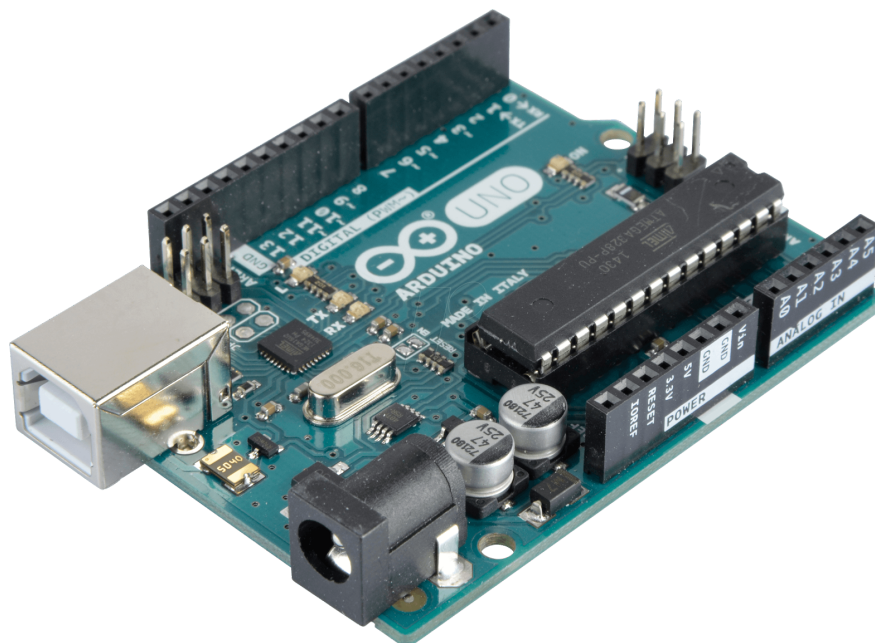


Figure 2.3: Arduino Uno (REV 3)

B. The Arduino Due

The Arduino Due is a microcontroller board based on the Atmel SAM3X8E ARM Cortex-M3 CPU. It is the first Arduino board based on a 32-bit ARM core microcontroller. It has 54 digital input/output pins (of which 12 can be used as PWM outputs), 12 analog inputs, 4 UARTs (hardware serial ports), a 84 MHz clock, an USB OTG capable connection, 2 DAC (digital to analog), 2 TWI, a power jack, an SPI header, a JTAG header, a reset button and an erase button. The Arduino Due is the second iteration of the classic Arduino and offers more features for advanced users. The Due's processor is faster, has more memory, and more I/O ports. It does not support many shields. Because of the faster CPU, the Arduino Due runs on a lower voltage: 3.3V over the Uno's 5V. This means it cannot always support the same devices.

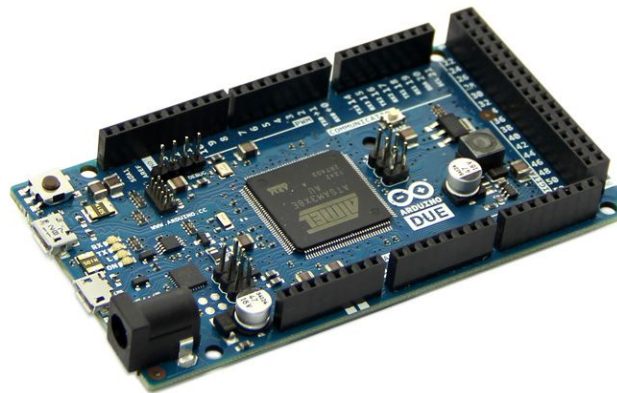


Figure 2.3: Arduino Due (Atmel SAM3X8E)

C. The Arduino Mega

The Arduino Mega is a microcontroller board based on the ATmega1280 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

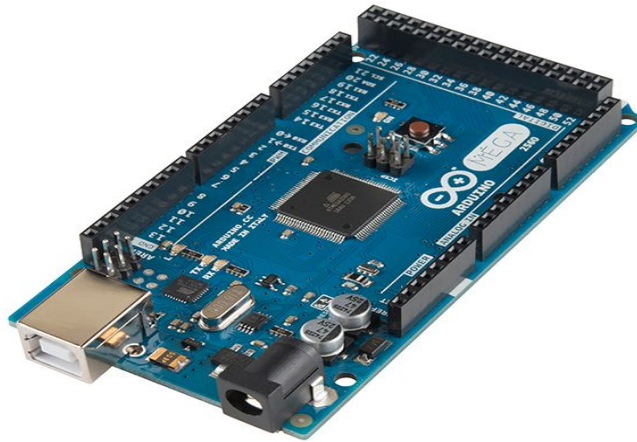


Figure 2.4: Arduino Mega (2560 R3)

D. The Arduino Leonardo

The Leonardo is not a common board, but has similar features to the Uno, including the 5V power supply and the processing power. It is a good board for those who need more input and output ports than the Arduino Uno, but do not need the horsepower or size of the Due. It uses a micro-USB adapter instead of the Uno's full-size USB port.



Figure 2.5: Arduino Leonardo (ATmega32u4)

E. The Arduino LilyPad

The LilyPad Arduino Main Board is based on the ATmega168V (the low-power version of the ATmega168) or the ATmega328V. The LilyPad Arduino was designed and developed by Leah Buechley and SparkFun Electronics.

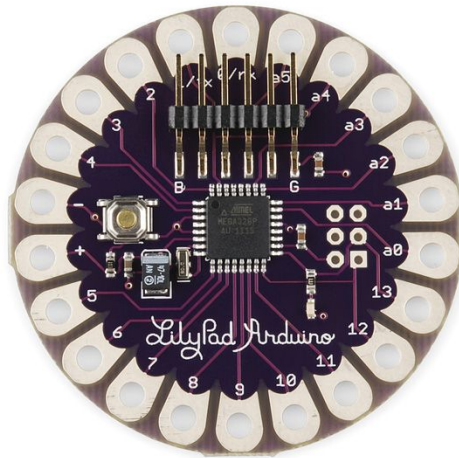


Figure 2.6: Arduino Lilypad (ATmega168V)

F. The Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x) or ATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Arduino Nano can be powered via the mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the highest voltage source. The Nano was designed and is being produced by Gravitech. It is two layers. That make it easier to hack and more affordable.

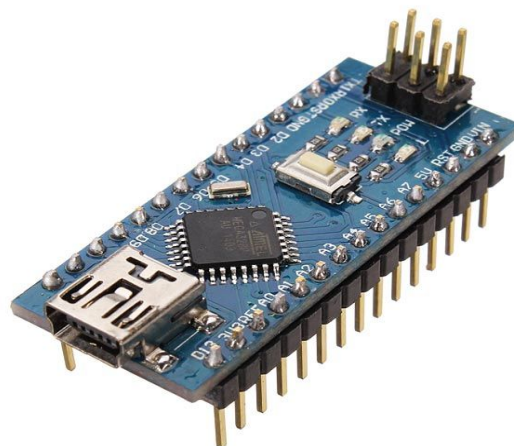


Figure 2.6: Arduino Nano (ATmega328P)

G. Arduino Yun:

The Arduino Yún is a microcontroller board based on the ATmega32u4 and the Atheros AR9331. The Atheros processor supports a Linux distribution based on OpenWrt named Open Wrt-Yun. The board has built-in Ethernet and Wi-Fi support, a USB-A port, micro-SD card slot, 20 digital input/output pins (of which 7 can be used as PWM outputs and 12 as analog inputs), a 16MHz crystal oscillator, a micro USB connection, an ICSP header, and a 3 reset buttons.

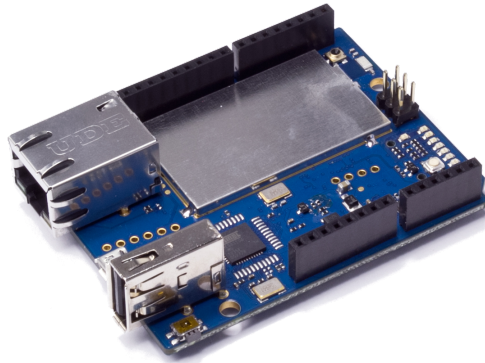


Figure 2.7:Arduino Yun (ATmega32u4 and the Atheros AR9331)

2.2.4 Advantages and Disadvantages of Arduino

In last years' the use of Arduino increases exponentially due to its readability and easiness. Arduino has some advantages and some disadvantages:

Advantages:

- Ready to Use:

The biggest advantage of Arduino is its ready to use structure. As Arduino comes in a complete package form which includes the 5V regulator, a burner, an oscillator, a micro-controller, serial communication interfaces LED and headers for the connections.

- Examples of codes:

Another big advantage of Arduino is its library of examples present inside the software of Arduino. For example if we want to measure voltage using ATmega8 microcontroller and want to display the output on computer screen then we have to go through the whole process. The process will start from learning the ADC's of

micro-controller for measurement, went through the learning of serial communication for display and will end at USB - Serial converters.

- **Effortless functions:**

During coding of Arduino, we will notice some functions which make the life so easy. Another advantage of Arduino is its automatic unit conversion capability. We can say that during debugging we don't have to worry about the units conversions.

- **Large community:**

There are many forums present on the internet in which people are talking about the Arduino. Engineers, hobbyists and professionals are making their projects through Arduino. You can easily find help about everything. Moreover the Arduino website itself explains each and every functions of Arduino.

Disadvantages:

- **Structure:**

The structure of Arduino is its disadvantage as well. During building a project you have to make its size as small as possible. But with the big structures of Arduino we have to stick with big sized PCB's. If we are working on a small microcontroller like ATmega8 we can easily make our PCB as small as possible.

- **Cost:**

The most important factor which you cannot deny is cost. This is the problem which every hobbyist, Engineer or Professional has to face. Now, we must consider that the Arduino is cost effective or not.

Chapter-3

Control Device

Introduction to Bluetooth IC

3.1 Bluetooth :

Bluetooth is a remote innovation standard for trading information over short separations utilizing short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz from settled and cell phones. Created by telecom merchant Ericsson in 1994 it was initially considered as a remote other option to RS-232 information links. It can associate a few gadgets, conquering issues of synchronization. Bluetooth is overseen by the Bluetooth Special Interest Group (SIG) which has more than 25,000 part organizations in the regions of media transmission, processing, systems administration, and purchaser gadgets. The IEEE institutionalized Bluetooth as IEEE 802.15.1, however didn't really keeps up the standard. The Bluetooth SIG administers advancement of the detail, deals with the capability program, and ensures the trademarks. A producer must make a gadget meet Bluetooth SIG guidelines to market it as a Bluetooth gadget. A system of licenses apply to the innovation, which are authorized to individual qualifying gadgets.

3.1.1 Implementation :

Bluetooth works at frequencies somewhere around 2402 and 2480 MHz, or 2400 and 2483.5 MHz including monitor groups 2 MHz wide at the base end and 3.5 MHz wide at the top. This is in the all inclusive unlicensed (however not unregulated) Industrial, Scientific and Medical (ISM) 2.4 GHz short-extend radio recurrence band. Bluetooth utilizes a radio innovation called recurrence bouncing spread range. Bluetooth isolates transmitted information into parcels, and transmits every bundle on one of 79 assigned Bluetooth channels. Every channel has a data transfer capacity of 1 MHz. It as a rule performs 800 bounces for every second, with Adaptive Frequency-Hopping (AFH) empowered. Bluetooth low vitality utilizes 2 MHz

dividing, which suits 40 channels.

Initially, Gaussian recurrence shift keying (GFSK) balance was the main tweak plan accessible. Since the presentation of Bluetooth 2.0+EDR, $\pi/4$ -DQPSK (Differential Quadrature Phase Shift Keying) and 8DPSK adjustment may likewise be utilized between good gadgets. Gadgets working with GFSK are said to work in fundamental rate (BR) mode where a momentary information rate of 1 Mbit/s is conceivable. The term Enhanced Data Rate (EDR) is utilized to depict $\pi/4$ -DPSK and 8DPSK plans, every giving 2 and 3 Mbit/s individually. The blend of these (BR and EDR) modes in Bluetooth radio innovation is delegated a "BR/EDR radio

Bluetooth is a parcel based convention with an expert slave structure. One expert may speak with up to seven slaves in a piconet. All gadgets share the expert's clock. Bundle trade depends on the essential clock, characterized by the expert, which ticks at 312.5 μ s interims. Two clock ticks make up a space of 625 μ s, and two openings make up a space pair of 1250 μ s. In the straightforward instance of single-opening parcels the expert transmits in even spaces and gets in odd spaces. The slave, alternately, gets in even openings and transmits in odd spaces. Parcels might be 1, 3 or 5 spaces in length, however in all cases the expert's transmission starts in even openings and the slave's in odd openings.

The above is legitimate for "great" BT. Bluetooth Low Energy, presented in the 4.0 particular, utilizes the same range yet to some degree in an unexpected way; see Bluetooth low vitality Radio interface.

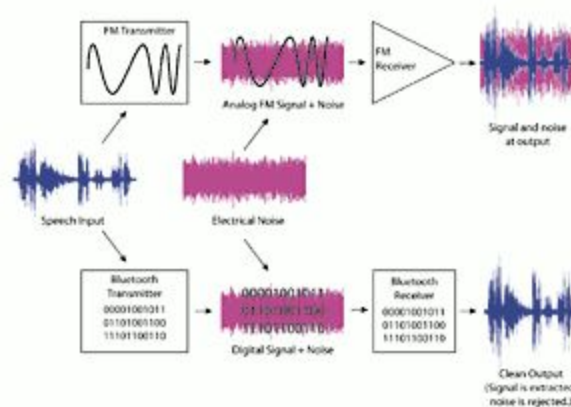


Figure 3.1: Bluetooth devices transmission technology

3.1.2 Communication and connection

An expert Bluetooth gadget can speak with a most extreme of seven gadgets in a piconet an impromptu PC system utilizing Bluetooth innovation however not all gadgets achieve this greatest. The gadgets can switch parts, by understanding, and the slave can turn into the expert (for instance, a headset starting an association with a telephone essentially starts as expert—as initiator of the association—yet may

consequently work as slave).

The Bluetooth Core Specification accommodates the association of two or more piconets to shape a scatternet, in which certain gadgets at the same time assume the expert part in one piconet and the slave part in another.

At any given time, information can be exchanged between the expert and one other gadget aside from the minimal utilized communicate mode. The expert picks which slave gadget to address ordinarily, it changes quickly starting with one gadget then onto the next in a round-robin style. Since the expert picks which slave to address, while a slave should listen in each get space, being an expert is a lighter weight than being a slave. Being an expert of seven slaves is conceivable being a slave of more than one expert is troublesome. The detail is unclear as to required conduct in scatternets.

3.1.3 Uses of Bluetooth

Bluetooth is a standard wire-trade interchanges convention principally intended for low-control utilization, with a short range in view of minimal effort handset microchips in every gadget. Since the gadgets utilize a radio communicate correspondences framework, they don't need to be in visual observable pathway of each other, however a semi optical remote way should be practical. Reach is force class-subordinate yet compelling extents change practically speaking see the table on the privilege.

Formally Class 3 radios have a scope of up to 1 meter (3 ft) Class 2, most normally found in cell phones 10 meters (33 ft) and Class 1, fundamentally for mechanical use cases, 100 meters (300 ft). Bluetooth Marketing qualifies that Class 1 territory is as a rule 20–30 meters (66–98 ft) and Class 2 territory 5–10 meters (16–33 ft).

The compelling extent changes because of spread conditions, material scope, creation test varieties, reception apparatus setups and battery conditions. Most Bluetooth applications are for indoor conditions, where constriction of dividers and sign blurring because of sign reflections make the reach far lower than indicated viewable pathway scopes of the Bluetooth items. Most Bluetooth applications are battery fueled Class 2 gadgets, with little contrast in reach whether the flip side of the connection is a Class 1 or Class 2 gadget as the lower controlled gadget tends to set as far as possible. At times the viable scope of the information connection can be amplified when a Class 2 gadget is associating with a Class 1 handset with both higher affectability and transmission power than a regular Class 2 gadget. For the most part, notwithstanding, the Class 1 gadgets have a comparable affectability to Class 2 gadgets. Associating two Class 1 gadgets with both high affectability and high power can permit ranges far in abundance of the common 100m relying upon the throughput required by the application. Some such gadgets permit open field scopes

of up to 1 km and past between two comparable gadgets without surpassing lawful discharge limits.

The Bluetooth Core Specification orders a scope of at the very least 10 meters (33 ft) yet there is no furthest farthest point on real range. Makers' executions can be tuned to give the extent expected to every case.

Bluetooth profiles

To utilize Bluetooth remote innovation a gadget must have the capacity to translate certain Bluetooth profiles which are meanings of conceivable applications and determine general practices that Bluetooth-empowered gadgets use to speak with other Bluetooth gadgets. These profiles incorporate settings to parametrize and to control the correspondence from begin. Adherence to profiles spares the ideal opportunity for transmitting the parameters once again before the bi-directional connection gets to be viable. There are an extensive variety of Bluetooth profiles that depict a wide range of sorts of uses or utilize cases for gadgets.

3.1.4 Advantages and Disadvantages of Bluetooth Advantages:

● Ready to Use:

The greatest preferred standpoint of Arduino is its prepared to utilize structure. As Arduino arrives in a complete bundle structure which incorporates the 5V controller, a burner, an oscillator, a small scale controller, serial correspondence interfaces LED and headers for the associations.

● Examples of codes:

Another enormous favorable position of Arduino is its library of illustrations present inside the product of Arduino. For instance on the off chance that we need to quantify voltage utilizing ATmega8 small scale controller and need to show the yield on PC screen then we need to experience the entire procedure. The procedure will begin from taking in the ADC's of small scale controller for estimation, experienced the learning of serial correspondence for presentation and will end at USB - Serial converters

● Effortless functions:

Amid coding of Arduino, we will see a few capacities which make the life so natural. Another favorable position of Arduino is its programmed unit transformation capacity. We can say that amid investigating we don't need to stress over the units transformations.

- **Large community:**

There are numerous gatherings present on the web in which individuals are discussing the Arduino. Designers, specialists and experts are making their tasks through Arduino. You can without much of a stretch discover help about everything. Additionally the Arduino site itself clarifies every last elements of Arduino.

Disadvantages:

- **Structure:**

The structure of Arduino is its drawback too. Amid building an undertaking you need to make its size as little as could be expected under the circumstances. Yet, with the huge structures CB as little as could be expected under the circumstances.

- **Cost:**

The most essential element which you can't deny is expense. This is the issue which each specialist, Engineer or Professional needs to confront. Presently, we should consider that the Arduino is practical or not.

3.1.5 Bluetooth IC

The PC to Arduino Bluetooth serial connection can be useful in many applications such as controlling servos, motors, and writing to LCDs. The Arduino to PC connection can be useful in applications where the Arduino reads sensors then pass their values via serial Bluetooth to a PC for processing. The distance for this transceiver is about 30 feet or so but it really depends on many other variables. This is ideal for indoors projects.

The only downside of this cheap Bluetooth transceiver is the absence of headers which means you have to solder at least 4 wires. Then there's the absence of power LED as well as no TX/RX LEDs.

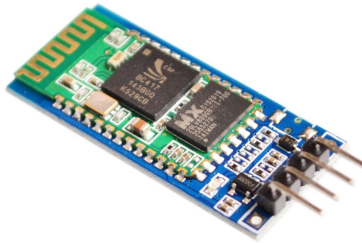


Figure 3.2: PCS/LOT HC-06 Wireless Serial 4 Pin Bluetooth RF Transceiver Module

3.1.6 Specification of Bluetooth RF Transceiver Module

- Default COM setting: 9600, N, 8,1
- Default Password/pairing code: 1234.
- Supports the AT command to modify the baud rate, device name, passkey, master/slave, etc.
- Supports baud rates 2400 -1382400.
- Based on the CSR Bluetooth chip BC417143
- Bluetooth specification v2.0 + EDR
- Power supply: +3.3VDC 50mA
- Frequency: 2.4GHz ISM band
- Modulation: GFSK(Gaussian Frequency Shift Keying)
- Emission power: ≤ 4 dBm, Class 2
- Sensitivity: ≤ -84 dBm at 0.1% BER
- Speed: Asynchronous: 2.1Mbps(Max) / 160 kbps, Synchronous: 1Mbps/1Mbps
- Security: Authentication and encryption
- Size: 26.9mm x 13mm x 2.2 mm.
- Working temperature: -20 ~ +75 Centigrade
- Dimension: 26.9mm x 13mm x 2.2 mm

Introduction to DC Motor:

3.2 DC Motor:

It is said that the innovation of the AC prompting engine was the integral element in the nineteenth Century fight amongst AC and DC. Be that as it may, the DC engine has still been with us from that point forward. Great pace torque qualities and simplicity of variable rate control are the fundamental points of interest of the utilizing DC engines over AC. With the coming of force gadgets (particularly the thyristor) in the late sixties, the utilization of squirrel pen impelling in variable velocity applications beginning developing. The squirrel confine impelling engine is powerful and for all intents and purposes upkeep free when contrasted with its DC partner which utilizes brushes. In this manner there has been a constant drive to refine the force hardware to endeavor to accomplish a DC engine execution from an AC squirrel confine incitement engine. Despite the fact that the AC incitement engine has for all intents and purposes swapped the DC engine for little and medium sized establishments, the DC engine is still utilized as a part of lifts in fast gearless applications.

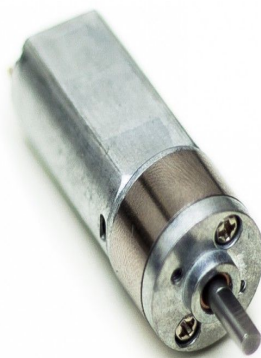


Figure 3.3: A DC Motor

3.2.1 Operation principle of a DC Motor

The DC motor works on the principle of passing a current in a conductor inside a magnetic field. A force is developed on the conductor. When a group of these conductors are fixed on a rotating armature, a resultant torque is produced from all the forces on the individual conductors.

Most power supplies are AC. Thus, in order to operate a DC motor, the AC supply has to be rectified (and possibly controlled) to provide the necessary DC voltage to feed the motor.

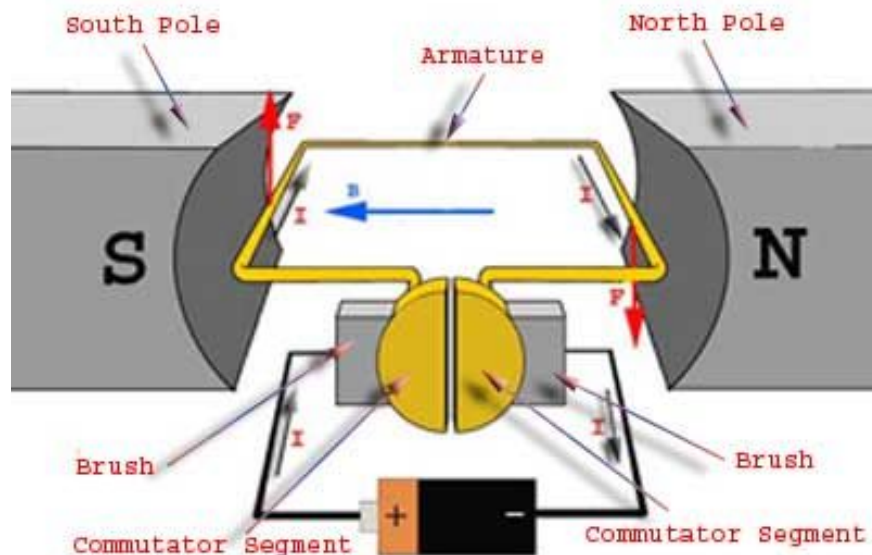


Figure 3.4: Working principle of DC Motor

3.2.2 Types Of DC Motors:

Depending on the method of field excitation, three types of dc motors are possible. These are discussed here.

A. Shunt Motor:

As the name implies, this motor has a field winding which is electrically connected in parallel to the motor, and thus is rated for the full voltage of the motor. This leads to constant field excitation, if the terminal voltage is constant. The resistance of the shunt field is usually high. Sometimes, series resistors are used to limit or control the value of field current.

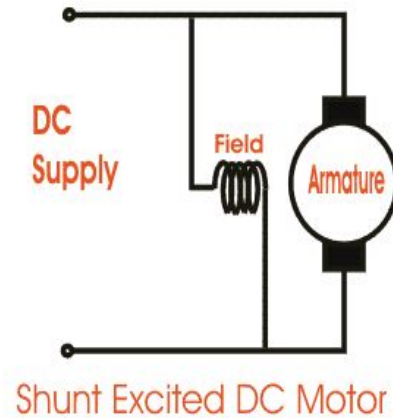


Figure 3.4: Shunt Motor

B. Series Motor:

The field excitation in a series motor is produced by a field connected in series with the armature. This is usually made of a thick wire and a few turns, as it has to carry the full armature current. At low speeds, this motor draws large current, because the back emf is small, and thus it can produce large starting torques.

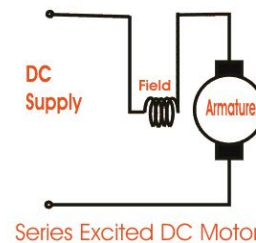
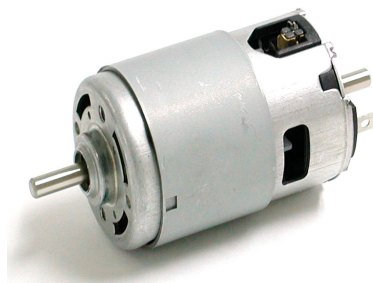


Figure 3.5: Series Motor

C. Cumulative Compound Motor:

The most widely used motor in lift applications is the cumulative compound motor. Its field excitation is provided by both a shunt field and a series field. The term cumulative refers to the fact that the two fields aid each other. The alternative would have been a differentially compound motor, in which the two fields oppose each other. However, a differentially compound DC motor can become unstable.



Figure 3.6: Cumulative Compound Motor

E. Permanent magnet motor:

Permanent magnet DC motors have excellent starting torque capability with good speed regulation. A disadvantage of permanent magnet DC motors is they are limited to the amount of load they can drive. These motors can be found on low horsepower applications. Another disadvantage is that torque is usually limited to 150% of rated torque to prevent demagnetization of the permanent magnets.



Figure 3.7: Permanent Magnet Motor

Introduction to Motor Driver:

3.3 Motor Driver IC: (L293D)

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC.

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

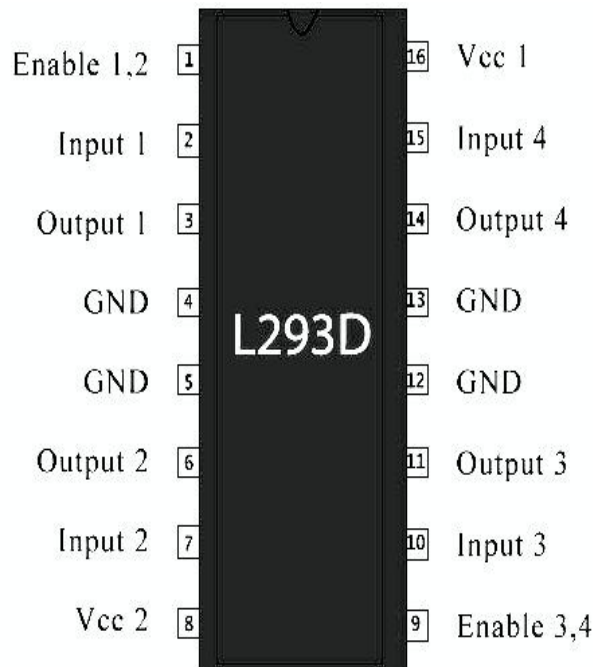


Figure 3.8: Motor Driver (L293D IC)

There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to

high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

3.3.1 Working of L293D

There are 4 input pins for l293d, pin 2,7 on the left and pin 15 ,10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1. In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor

● Logic Diagram:

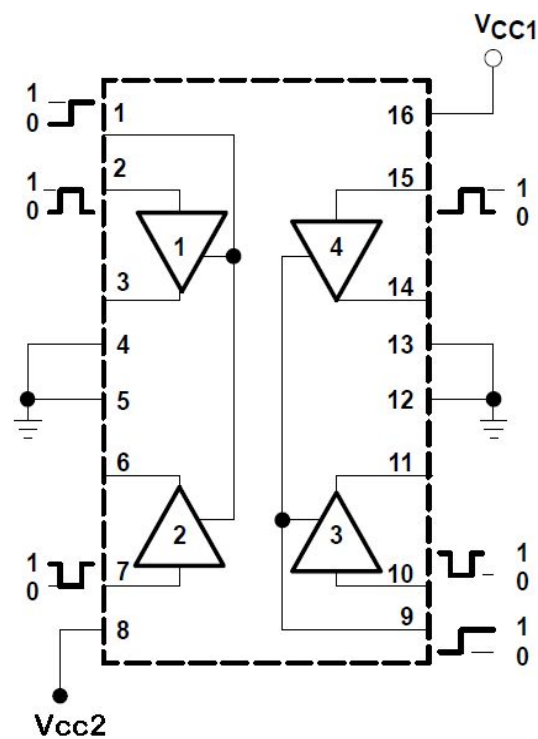


Figure 3.9: Logical Diagram of Motor Driver (L293D IC)

Chapter-4

HARDWARE & SOFTWARE

Internal Construction Of The Device

4.1 Hardware

Hardware is the physical parts or components of the system. In this project work, we've used some hardwares Arduino, GSM, Relay, switch, transformer etc.

4.1.1 Hardware Specification:

● Required Equipments:

1. Arduino UNO
2. Bluetooth
3. Dc 5V Motor
4. Motor Driver L293D
5. Bread Board
6. Some Jumpers & Wires
7. Curtain
8. Other equipments which is required to make this project (like eraser, kok-sheet, silver wire, glue, etc.

4.1.2 Arduino Uno R3 :

In This project we used Arduino uno R3, Here, It has both analog and digital I/O pin, and power pin of 3.3v and 5v. Tx and Rx pin is used for receiving or transmitting signal.

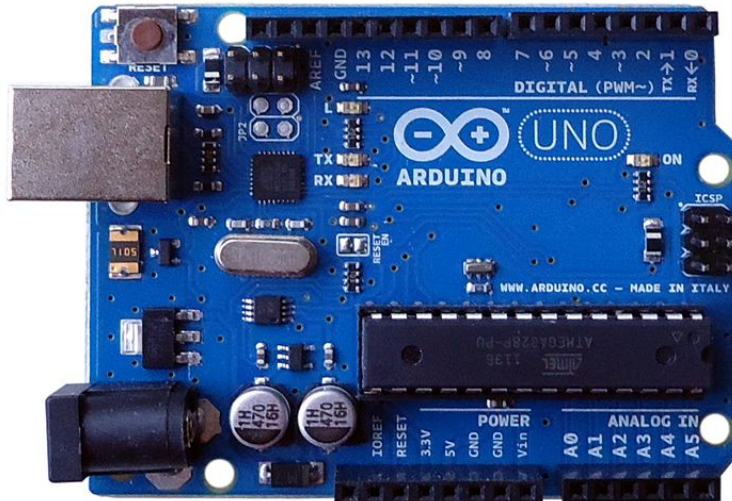


Figure 4.1: Arduino Uno (REV 3)

● Technical specs:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)

EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

● Bluetooth device:

We use bluetooth device to receiving and transmitting Signal From the smartphone.this Bluetooth device is password protected. The initial or default password of this bluetooth device is “1234”

We can also change this password for security reason. Many smartphone can be parallely connected with this device at a time.

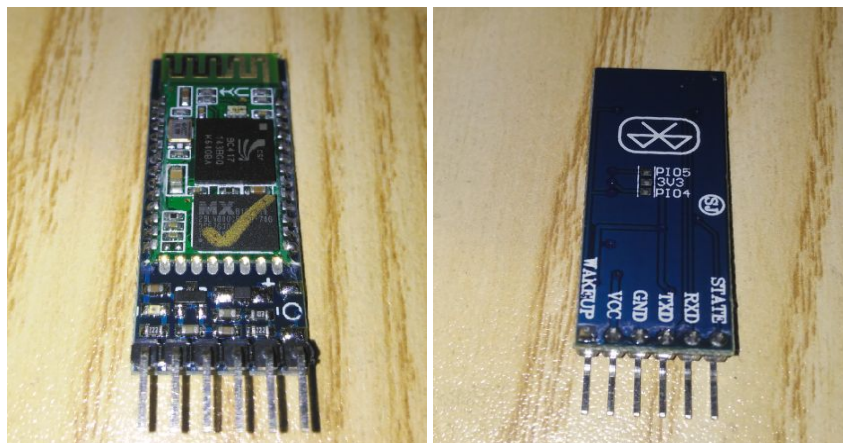


Figure 4.2: PCS/LOT HC-06 Wireless Serial 4 Pin Bluetooth RF Transceiver Module

Here we use Four pin RXD, TXD,GND and VCC

RXD is used for receiving the signal from Arduino and TXD is used for Transmitting the signal to Arduino.

● Dc motor:

In this project we use simple DC motor with 300 rpm(revolutions per minute). This is 5v DC motor which is used for pulling the curtain right or left, and stopping at any point we desire.This leads to constant field excitation, if the terminal voltage is

constant. The resistance of the shunt field is usually high. Sometimes, series resistors are used to limit or control the value of field current.



Figure 4.2: DC Motor 5V (300 rpm)

● Motor Driver IC L293D:

To Control the motor rotation we motor Driver IC L293D. This IC has four input pin and output pin. We can use two motor at a time by this driver IC. this IC maintains the direction of the motor in which direction user command.

● L293D Logic Table:

Let's consider a Motor connected on left side output pins (pin 3,6). For rotating the motor in clockwise direction the input pins has to be provided with Logic 1 and Logic 0.

- **Pin 2 = Logic 1 and Pin 7 = Logic 0** | Clockwise Direction
- **Pin 2 = Logic 0 and Pin 7 = Logic 1** | Anticlockwise Direction
- **Pin 2 = Logic 0 and Pin 7 = Logic 0** | Idle [No rotation] [Hi-Impedance state]
- **Pin 2 = Logic 1 and Pin 7 = Logic 1** | Idle [No rotation]

In a very similar way the motor can also operate across input pin 15,10 for motor on the right hand side.

4.1.3 Working Procedure :

Step- 1,

We take a breadboard then a motor driver L293D placed on it at the middle. we knew from the diagram of L293D motor driver IC, here is 4 input and 4 output pin.

In this Project, we only we two input (in-1 and in-2) and two output pin (out-1 and out-2) (as we used here only a single motor). Now, the “in-1” pin of L293D is connected with the digital(pwm) “pin 4” at Arduino uno board.

Step-2,

“in-2” of L293D pin is connected to the digital(pwm) “pin 3”.

Step-3,

Now the “en pin” of L293D is connected with the Arduino digital(pwm) “pin 5”.

Step-4,

Two output pin, “out-1” and “out-2” of L293D is connected with the motor “pin-1” and motor “pin-2”.

Step-5,

Now we placed the Bluetooth device on the breadboard.

Here,we can see TXD,RXD,GND and VCC pin.

Step-6,

We connected TXD pin with the Rx pin of the arduino uno, and RXD pin connect with the Tx arduino pin. This is an important things, the both RX and TX of bluetooth and Arduino are connected vice versa because we give command in the apps which means bluetooth transmit signal to the arduino board and Arduino receive the signal and operated according to the command.

Step-7,

Now we connected the “5v pin” with the all Vcc of bluetooth device,motor driver Ic L293D.

Step-8, Also we connected the “Gnd pin” with the All GND of Bluetooth and Motor Driver IC L293D.

4.1.5 Flow Chart of smart Curtain Control System:

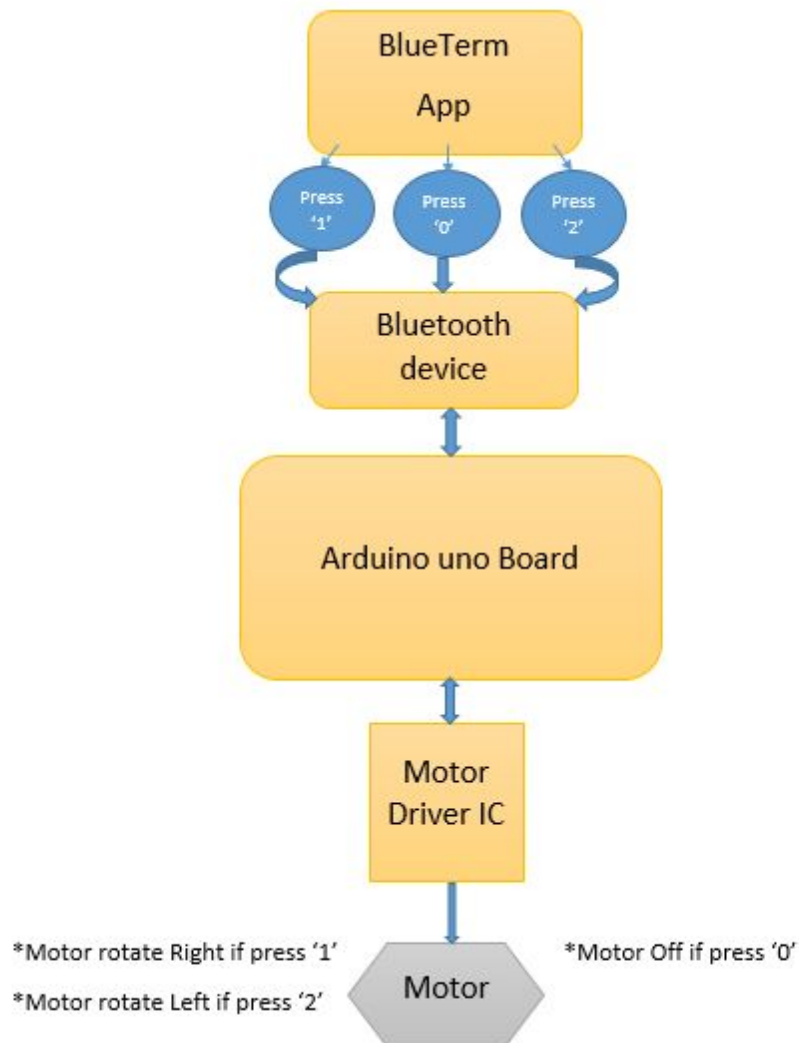
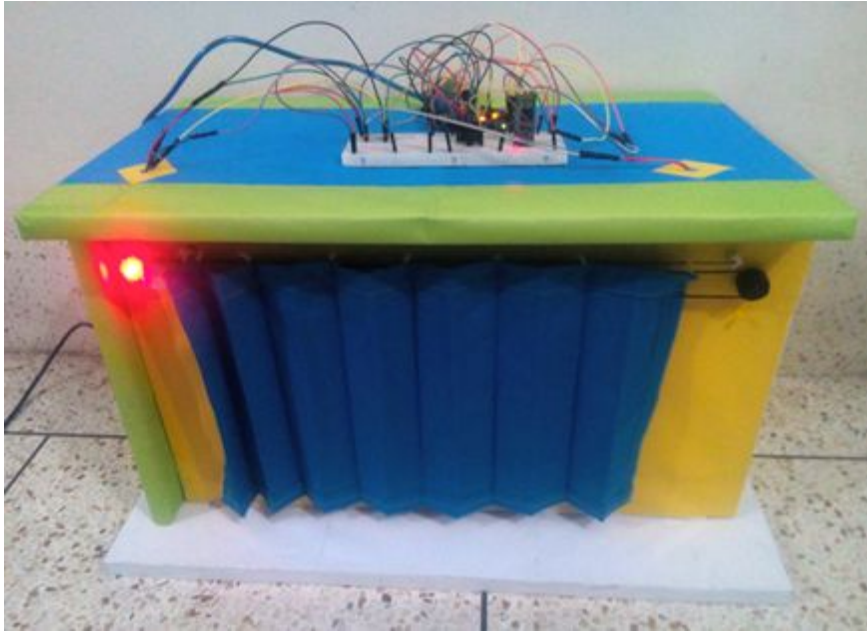


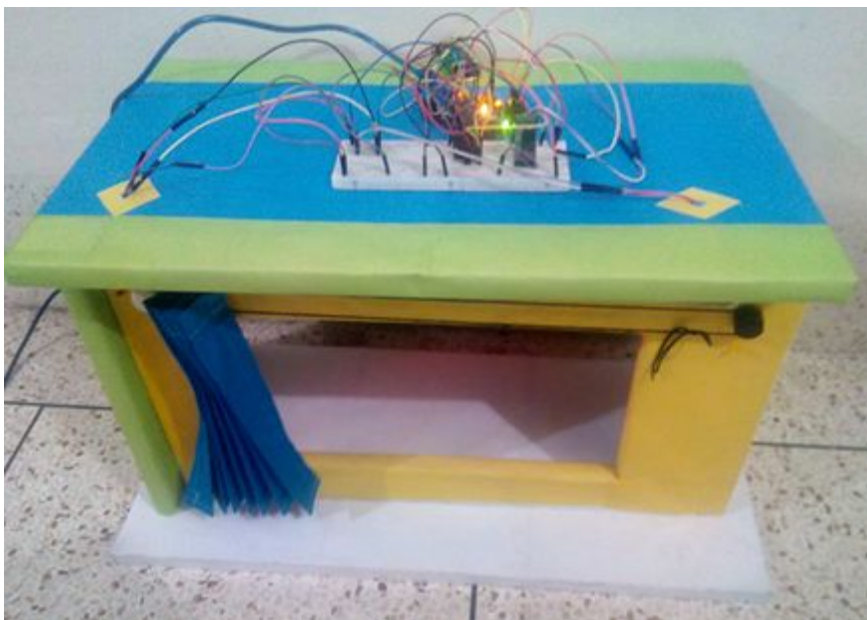
Figure 4.4: Flowchart of smart curtain control system

4.1.6 Hardware Results:

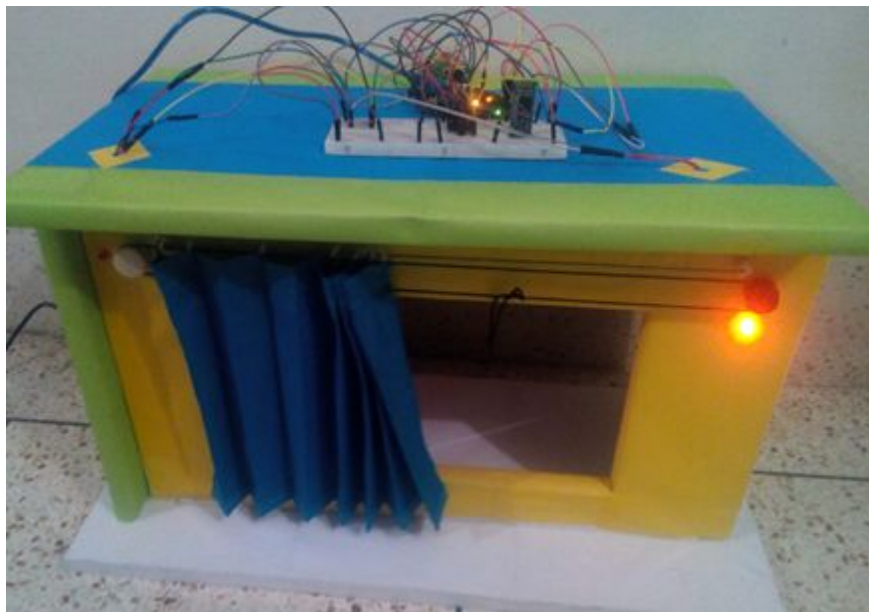
When we Press '1' at Blue term software which is installed in a smartphone, the curtain move Right and we press '0' to stop the curtain. Command 1 is used for closing the curtain.



When we press '2' then the curtain move left and press '0' to stop the curtain. Command 2 is used for opening the curtain.



Here we use 'o' to stop the curtain at middle position. We can stop the curtain at anywhere using 'o' command.



4.2 Software:

Arduino is an open-source platform used for building electronics projects. The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuine hardware to upload programs and communicate with them. The Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. The Arduino IDE uses a simplified version of C++, making it easier to learn to program. There are two types of commands – AT command and GSM library.

Arduino software: We use this software for arduino uno coding. And upload the code in the Arduino board.

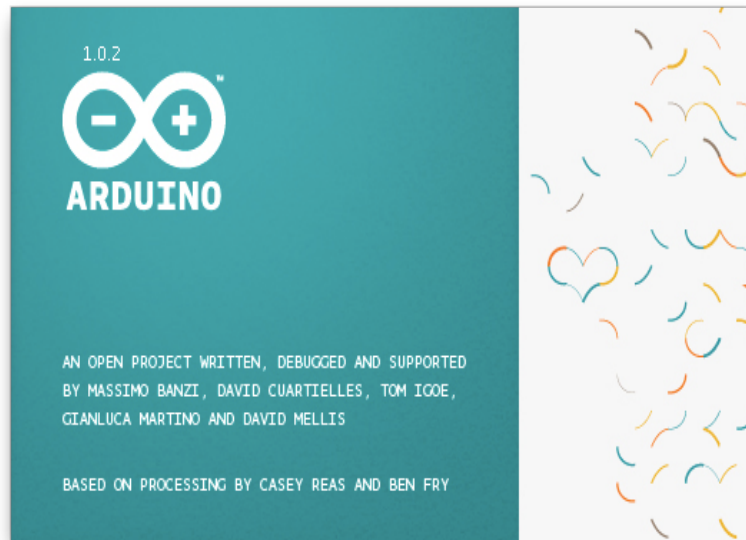


Figure 4.4: Arduino Uno (Software V1.0.2)

4.2.1 Programme Coding:

```
✓ → 📄 ⬆ ⬇
sketch $
|
/*
 * Smart Curtain Controlling System via Bluetooth
 * created by
 * Md.Saifur Rahman Mazumder And
 * Riad Reza Shuvo
 */

int motorPin1 = 3;
int motorPin2 = 4;
int enablePin = 5;
int state;
int flag=0;

void setup() {
  // sets the pins as outputs:
  pinMode(motorPin1, OUTPUT);
  pinMode(motorPin2, OUTPUT);
  pinMode(enablePin, OUTPUT);
  digitalWrite(enablePin, HIGH);
  // initialize serial communication at 9600 bits per second:
  Serial.begin(9600);
}
}
```

sketch §

```
void loop() {
  if(Serial.available() > 0){
    state = Serial.read();
    flag=0;
  }

  if (state == '0') {
    digitalWrite(motorPin1, LOW); // set pin 2 on L293D low
    digitalWrite(motorPin2, LOW); // set pin 7 on L293D low
    if(flag == 0){
      Serial.println("Motor: off");
      flag=1;
    }
  }

  else if (state == '1') {
    digitalWrite(motorPin1, LOW); // set pin 2 on L293D low
    digitalWrite(motorPin2, HIGH); // set pin 7 on L293D high
    if(flag == 0){
      Serial.println("Motor: right");
      flag=1;
    }
  }

  else if (state == '2') {
    digitalWrite(motorPin1, HIGH); // set pin 2 on L293D high
    digitalWrite(motorPin2, LOW); // set pin 7 on L293D low
    if(flag == 0){
      Serial.println("Motor: left");
      flag=1;
    }
  }
}
```

Done uploading.

Sketch uses 2,442 bytes (7%) of program storage space. Maximum is 32,256 bytes.

Before Uploading the Code to the arduino board, the connection of Bluetooth RXD pin and TXD pin with Arduino TX and RX pin must be disconnected. Otherwise the program should not be work properly.

4.2.2 Bluetooth Software: (For smartpone)

This is bluetooth controlling software. This is installed in any smart phone for giving command to the device.

By this app, we give command to the motor to move right or move left or stop.we assigned the specific number of this app as the input,in the arduino coding for the movement of the motor.

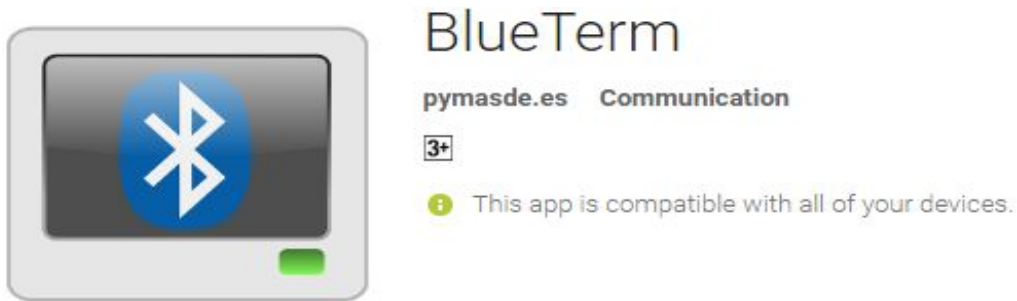


Figure 4.5: Mobile Apps (Blue Term)

Chapter-5

CONCLUSION

5.1 Conclusion

In this project a low-cost and simple approach to design an intelligent curtain using the concept of mobile-to-machine and machine-to-mobile communication is designed. We develop a general purpose electronic circuit design that can control and monitor a variety of home appliances with interface that can be plugged into Bluetooth Device. The project is successfully developed and met the stated objectives. The system can automatically switch ON and OFF the devices remotely using Bluetooth. In addition, the system is very practical when the user is away from the object; through it the user can control the electrical home appliances remotely as long as the bluetooth coverage. The whole control system is control by a simple application that is why it's very user friendly and easy to maintain.

5.1.1 Future Work Scope

Smart home technology is one of the emerging technologies in the technological world.

This project's main theme is to control the rotation of a motor. So there will be avast opportunity to control other things, such things where motor is included,also control by it.

According to our main theme of this project there are many future scope.We can use this controlling system at others home appliances

1. We can use Delay Function at arduino programming for specific time rotation,which can give more flexibility to use.
2. We can use this concept to controlling Fan by smartphone.
3. We can use it perfectly at the Door, we can close and open any door by smartphone.But addition instrument is needed.
4. Also we can apply it to light system, but here we cannot use motor driver IC But we can use the On/Off concept.
5. We can use control the whole system by GSM module in the place of Bluetooth. But this project is for shortest distance that's why we used bluetooth.
6. We can also use WiFi in the place of Bluetooth.

And In many other home Appliances we can use this concept.

5.2 Product Commercialization

After completing all the circuit and developing the control system, we connected this control system in a room and we can see that it works properly. Therefore, we can say that our designed and developing control system is ready for commercial uses. We can assure that the setup cost of this control system is reasonable.

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- <http://www.rakeshmondal.info/High-Torque-Motor-Low-RPM-Motor>
- <https://www.arduino.cc/en/Main/ArduinoBoardUno>