ROBOTIC ARM

A

THIRD YEAR PROJECT REPORT

Submitted by

DIKSHANT KOTLA -169108045

HARSHAD AJITSARIA-169107061

ANKITA DODDIHAL-169107023

GINNI GUPTA- 169107052

HAMID HASSAN KANGO- 169107057

KESHAV ANAND- 169107085

K. ASHOK-169107034

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS & COMMUNICATION ENGINEERING

Under the Guidance of

Dr. AMIT RATHI

(ASSOCIATE PROFESSOR,

ECE DEPARTMENT)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

CERTIFICATE

This is to Certify that this project report on "**ROBOTIC ARM**" is submitted by **DIKSHANT KOTLA (169108045), HARSHAD AJITSARIA (169107061), ANKITA DODDIHAL (169107023), GINNI GUPTA (169107052), HAMID HASSAN KANGO (169107057), KESHAV ANAND (169107085), K. ASHOK (169107034)**, who carried out the project work under my supervision "Dr. AMIT RATHI". I approve this project for submission of the Third Year Bachelor of Technology in the Department of Electronics & Communication Engineering, SEEC, Manipal University Jaipur(Rajasthan).

Name and Signature of Supervisor

INTRODUCTION

A **robotic arm** is a type of mechanical arm, usually programmable, with similar functions to a human arm. The arm may be the sum total of the mechanism or may be part of a more complex robot. The links of such a manipulator are connected by joints allowing either rotational motion (such as in an articulated robot) or translational (linear) displacement. The links of the manipulator can be considered to form a kinematic chain. The terminus of the kinematic chain of the manipulator is called the end effector and it is analogous to the human hand.

The end effector, or robotic hand, can be designed to perform any desired task such as gripping, spinning etc., depending on the application. For example, robot arms in automotive assembly perform a variety of tasks such as welding and parts rotation and placement during assembly. In some circumstances, close emulation of the human hand is desired.

Robotic hands may take inputs directly form a human hand by mimicking action or from an algorithm.

ABSTRACT

Thanks to the rapid technological development, robot usage in human life increases day by day. Various kinds of robots that are designed for different tasks aim to increase the quality of human life by replacing or reducing required human power in related areas.

Being able to interact robots from a distance by using wireless communication not only provide mobility and ease of use to the user but also promote the usage of robots into various areas. Considering these, this study aims to design a lower degrees of freedom robotic hand with respect to the natural anatomy of the hand and control it by the help of wireless communication protocols.

Control of robotic hand was provided with 3 flexible sensors, which were sewn on the glove on each finger. In this thesis, for the first time, characterization studies about flexible sensor was carried out and before starting to control the robotic hand, calibration was made according to the working principle of the flexible sensors. In addition, the robotic hand fingers were kept in the same position with the fingers of the human hand by using of servo motors. Control of the robotic hand was decided to be carried out by using Arduino platform and nRF24L01 module.

Future works related with this study was also discussed and listed in conclusion part.

ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the completion of my project. All that I have done is only due to such supervision and assistance and I would not forget to thank them.

I respect and thank Dr. Amit Rathi, for providing me an opportunity to do the project work and giving us all support and guidance which made me complete the project duly. I am extremely thankful to him for providing such a nice support and guidance, although he had busy schedule managing the corporate affairs.

I owe my deep gratitude to our project guide Associate Professor Dr. Amit Rathi, who took keen interest on our project work and guided us all along, till the completion of our project work by providing all the necessary information for developing a good system.

I am thankful to and fortunate enough to get constant encouragement, support and guidance from the Teaching staff of Electronics and Communication Department which helped us in successfully completing our project work. Also, I would like to extend our sincere esteems to all staff in the lab for their timely support.

Dikshant Kotla
Ankita Doddihal
Ginni Gupta
Hamid Hasan Kango
Harshad Ajitsaria
Keshav Anand
K. Ashok

Appendix 1

TABLE OF CONTENTS

Chapter – I

Introduction

CHAPTER 1

The human hand is able to perform a complex repertoire of sophisticated movements that enables us to interact with our environment and communicate with one another. The opposable thumb, a rarity in nature, has helped us achieve high levels of dexterity allowing our evolution to proceed

1.1 What is a robotic arm?

A **robotic arm** is a type of mechanical arm, usually programmable, with similar functions to a human arm; the arm may be the sum total of the mechanism or may be part of a more complex robot. The links of such a manipulator are connected by joints allowing either rotational motion (such as in an articulated robot) or translational (linear) displacement. The links of the manipulator can be considered to form a kinematic chain. The terminus of the kinematic chain of the manipulator is called the end effector and it is analogous to the human hand.

1.2 Types

- **Cartesian robot / Gantry robot**: Used for pick and place work, application of sealant, assembly operations, handling machine tools and arc welding. It's a robot whose arm has three prismatic joints; whose axes are coincident with a Cartesian coordinator.
- **Cylindrical robot**: Used for assembly operations, handling at machine tools, spot welding, and handling at die-casting machines. It's a robot whose axes form a cylindrical coordinate system.
- **Spherical robot / Polar robot** Used for handling machine tools, spot welding, die casting, fettling machines, gas welding and arc welding. It's a robot whose axes form a polar coordinate system.
- **SCARA robot**: Used for pick and place work, application of sealant, assembly operations and handling machine tools. This robot features two parallel rotary joints to provide compliance in a plane.
- **Articulated robot**: Used for assembly operations, die casting, fettling machines, gas welding, arc welding and spray painting. It's a robot whose arm has at least three rotary joints
- **Parallel robot**: One use is a mobile platform handling cockpit flight simulators. It's a robot whose arms have concurrent prismatic or rotary joints

- **Anthropomorphic robot**: It is shaped in a way that resembles a human hand, i.e. with independent fingers and thumbs

1.3 Aim and Possibilities

The goal of this project is to take the motion of a human hand and simulate it by a robotic hand. This will hopefully help us later to develop a hand rehabilitation device for those who have hand injuries. Strokes, osteoarthritis and tendinitis can lead to hand disabilities in adults. A significant amount of stroke survivors suffers from weakness on one side of the body, leaving them with impaired hand function. By replicating the motion of a human hand with a robotic hand, one can take principals of this design and apply the ideas to a hand rehabilitation device.

The wireless robotic hand could also potentially be used as a surgical device. The surgeon will be able to control its movement using the glove, and the robotic hand performs surgery on the patient. Precisely the robotic hand replicates every movement the surgeon makes. The robotic hand can be built in a microscopic size where it can easily fit through very small incisions, which can potentially minimize scarring, of the patient. Furthermore, it can provide the surgeon with unprecedented control in a minimally invasive environment, and is more hygienic and thus reduces the chances of postoperative infections.

Additionally, the wireless robotic hand could be found useful in environments where it is dangerous for humans. In space or places such as hazardous radioactive environments are where the robotic hand would be useful.

Chapter – II

Literature Review

TITLE	AUTHOR	AREA	OUTCOME	REMARK
MR999-E Wireless Robotic Arm	Mastura binti Muhammed, Siti Zarina binti Mohd. Muji, Siti Rozaini Zakaria, Mohd Zarar bin Mohd. Jenu	MR-999-E is a robotic arm that has five separate movements to grab or release, lift or lower, rotate wrist and pivot sideways controlled by five servo motors. For the time being it has been used as a trainer in the university lab.	The MR 999-E robotic arm is a successful development. Going to wireless from wired is much easier with less hassle. PIC microcontroller is used to control the transmitting and receiving process. GUI is important for the user to communicate with the system. In conclusion, this project helps the user to choose the movement of the arm robot.	Technology grows, the selection of the type of wireless system must be studied to see their ability when the robot is out of range. If a robot has GPS or another positioning technology, it might even build up a map of signal strength to identify network weak spots
Wireless mobile robotic arm	KSM Kader Ibrahim, Babul Salam and S amin , Reza Ezuan and K amaril Yusoff, Mohd Ashiq	The increase usage of wireless application, the demand for a system that could easily connect devices for	Analysis such as speed, distance, load that can be lifted of the robot has been done in order to know its performance. Finally, this prototype of the	This paper presents the development of a wireless mobile robot arm. A mobile robot that functional to do pick and place

		transfer of data over a long distance - without cables, grew stronger.	robot is expected to overcome the problem such as placing or picking object that far away from the user, pick and place hazardous object in the fastest and easiest way.	operation and be controlled by using wireless PS2 controller. It can move forward, reverse, turn right and left for a specific distance according to the controller specification. The development of this robot is based on Arduino Mega platform that will be interfaced with the wireless controller to the mobile robotic arm.
Design, Analysis and Implementation of a Robotic Arm- The Animator	Md. Anisur Rahman , Alimul Haque Khan , Dr. Tofayel Ahmed , Md. Mohsin Sajjad	A humanoid robotics is a new challenging field. To co-operate with human beings, humanoid robots not only have to feature human	The generation of the human-like manipulation motions has been implemented and also tested successfully for the 4 degrees of freedom (DOF) arm of the humanoid robot. The presented	The advantage of automated process results is faster completion time with lowest errors. This paper also describes the implementation of a robotic arm with switching

		like form and structure, but more importantly, they must have prepared human like behaviour regarding the motion, communication and intelligence. The model number of this beginner is ASR K-250. This paper we consider the mechanism and mechanical structure of ASR K-250 (Beginner) and its implementation.	approach does not consider the dynamics of the robot arm. This would be necessary to generate realistic velocity distribution for the manipulation motions. In this paper has reviewed the characteristics of the main mechanical structure and construction of a humanoid robotic arm. From this arm the exploration of afterwards will be a full body which is controlled by body switch. The final step of this robot is auto learner, in this stage this robot can learn automatically. The real/exact position and orientation of the arm can be obtained significantly large modifications of the joints θ1, θ2	controlled. The application of the force controlled function can be seen in the industrial/manufacturing environments.

			and θ3. The assistive robotic arm will must be able to contribute most of the challenges in our daily life. However, the resulting configuration is not guaranteed to be human-like.	
Bionic prosthetic hands: A review of present technology and future aspirations	R.G.E. Clement, K.E. Bugler, C.W. Oliver	discuss some of the key areas of research that could lead to vast improvements in bionic limb functionality that may one day be able to fully replicate the biological hand or perhaps even surpass its innate capabilities. It is important for the healthcare community to have an understanding	prostheses still have to overcome considerable hurdles in order to mimic or even improve upon the intrinsic hand and they carry significant economic implications. The advancements in this field of medicine are exponential and it is likely that within 10 years there will be commercially available limbs that provide both sensation and accurate motor	The progress to bioartificial organs that are fully integrated into the central nervous system and have capabilities that surpass our own may still sound more like science fiction than science fact but can cohesive work between medicine, engineering and materials science.

		of the development of bionic hands and the technology underpinning them as this area of medicine will expand.	control from day 1.	

Chapter – III
Analysis of the Circuit

CHAPTER 3

3.1 What is meant by Arduino?

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards can 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.

To do so you use the Arduino programming language (based On Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments.

All Arduino boards are completely open source, empowering users to build them independently and eventually adapt them to their needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

3.2 Why using Arduino board over others?

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics.

Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit or sharing ideas online with other members of the Arduino community.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia'sBX-24, fidgets, MIT's Handy board, and many others offer similar functionality. All these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

Inexpensive - Arduino boards are relatively inexpensive compared to another microcontroller
platforms. The least expensive version of the Arduino module can be assembled by hand,
and even the pre-assembled Arduino modules cost less than $50

Cross-platform - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and
Linux operating systems. Most microcontroller systems are limited to Windows.

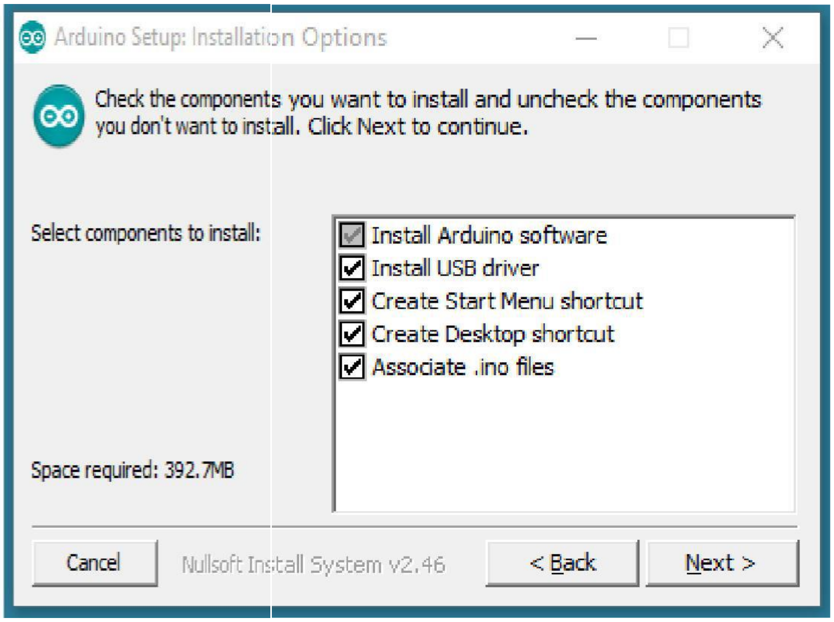
Simple, clear programming environment - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

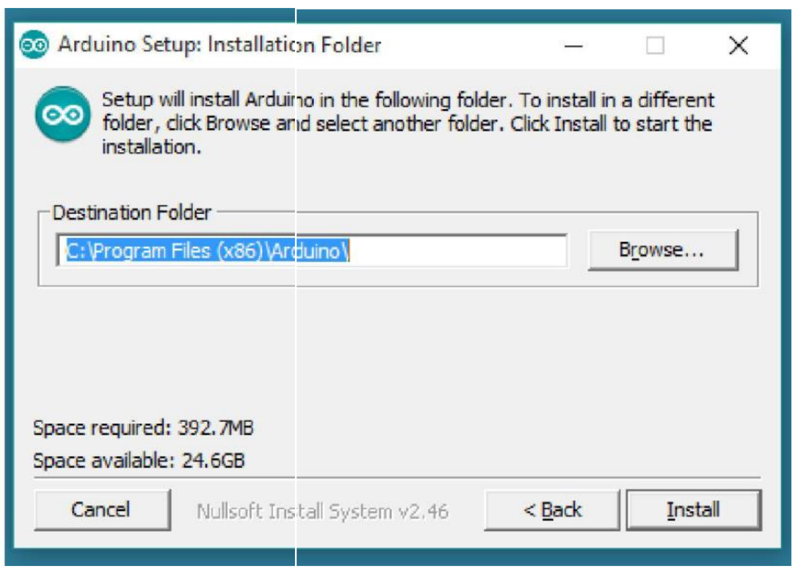
Open source and extensible software - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.

3.2(a) Installation process of Arduino Software and Genuino products: -

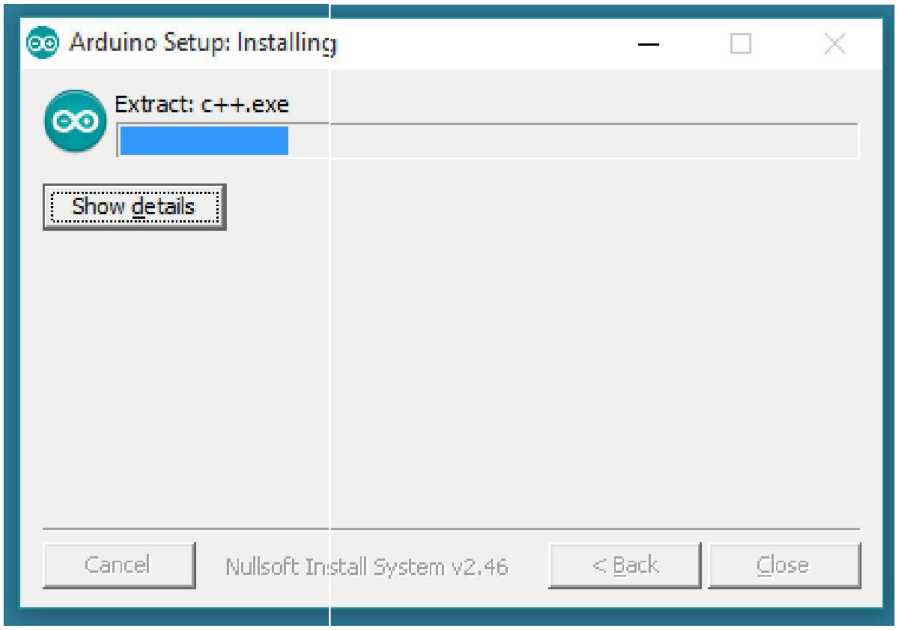
How to Download the Arduino Software (IDE):

Get the latest version from the download page. You can choose between the Installer (.exe) and the Zip packages. We suggest you use the first one that installs directly everything you need to use the Arduino Software (IDE), including the drivers. With the Zip package you need to install the drivers manually. The Zip file is also useful if you want to create a portable installation. When the download finishes, proceed with the installation and please allow the driver installation process when you get a warning from the operating system.
Choose the components to install





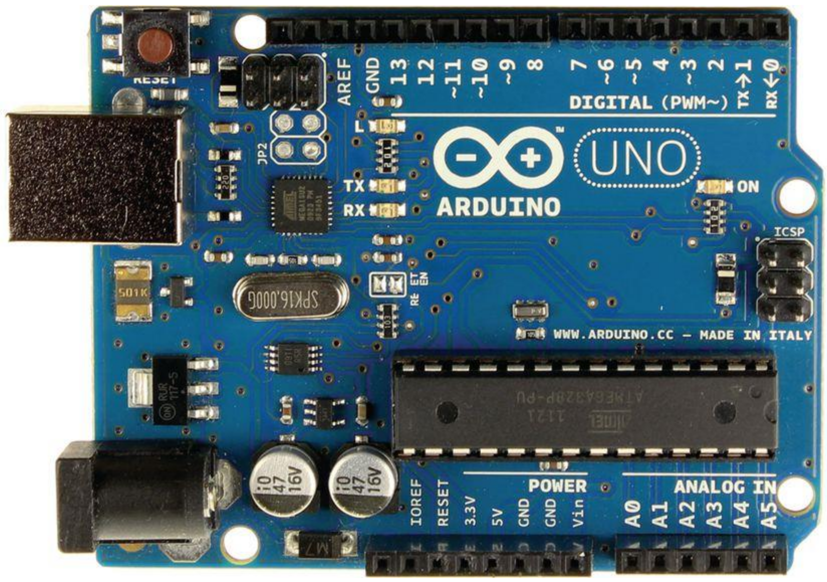
Choose the installation directory



The process will extract and install all the required files to execute properly the Arduino Software (IDE)

Proceed with board specific instruction:

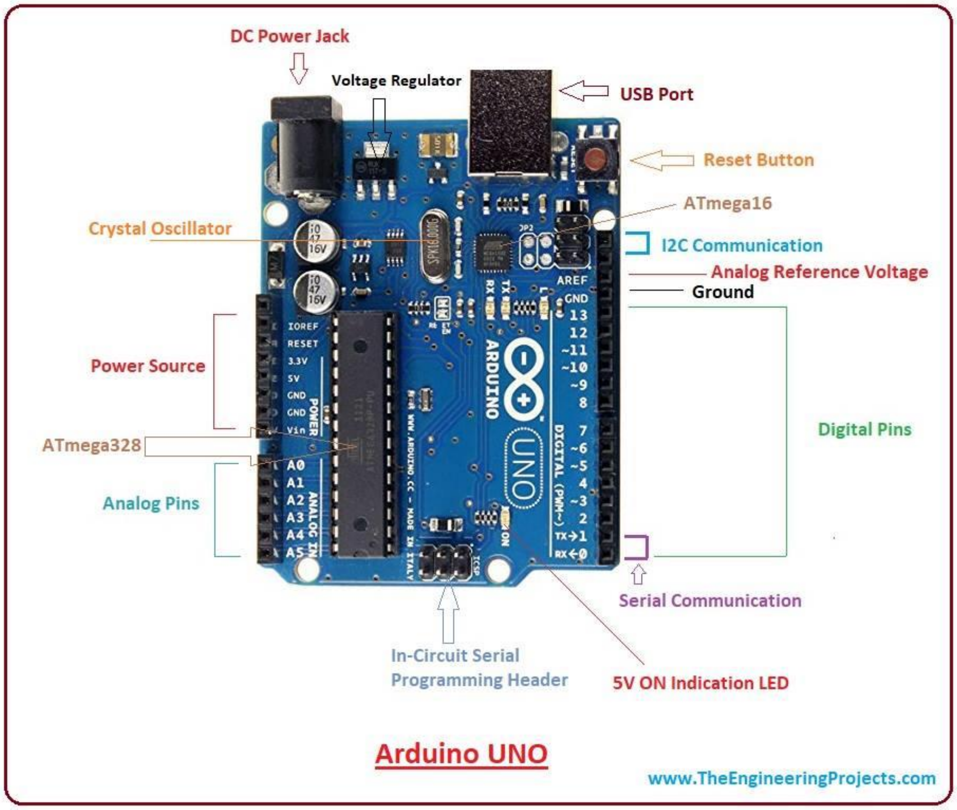
When the Arduino software (IDE) is properly installed you can go back to the getting started Home and choose your board from the list on the right of the page.



3.3 Arduino Boards

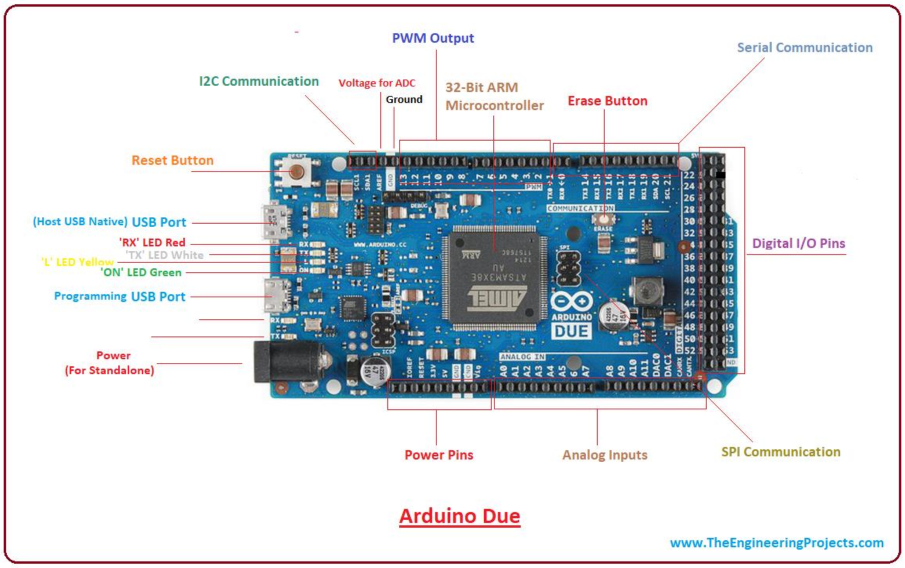
3.3.1. The Arduino Uno

The Uno is the most common board and the one labelled as the classic Arduino. This board comes with everything new users need to learn about the electronics and programming requires starting this hobby. It is compatible with most available Arduino shields.



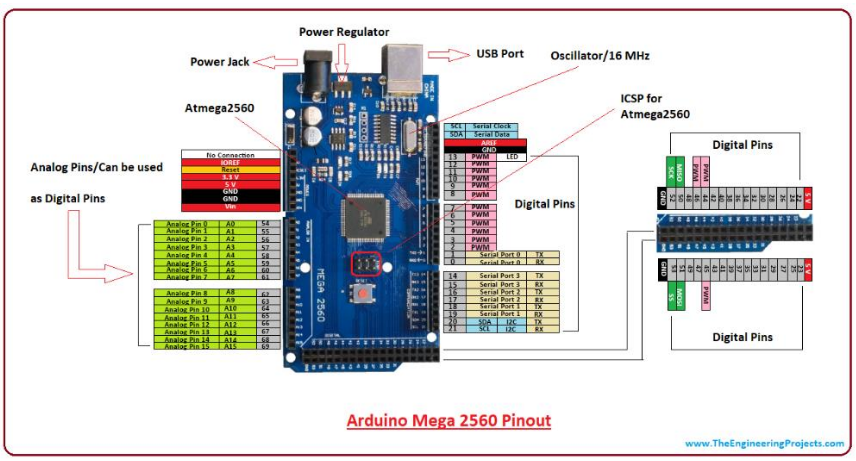
3.3.2 The Arduino Due

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.



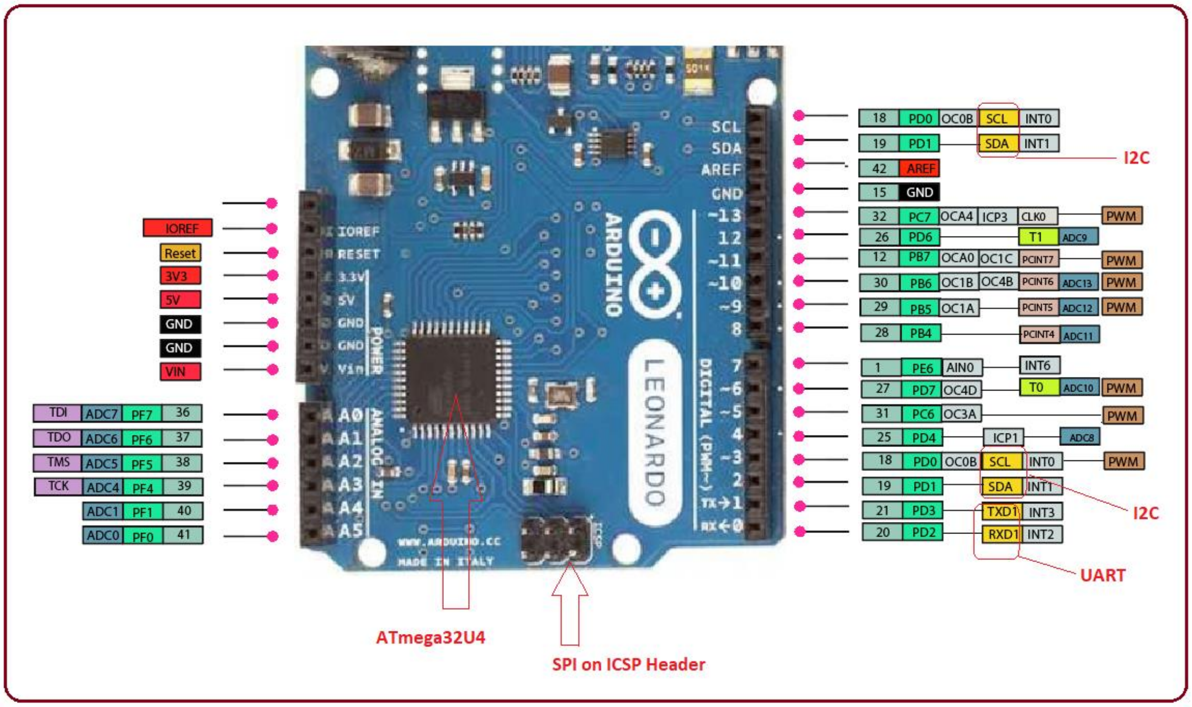
3.3.3 The Arduino Mega

The Arduino Mega comes in two types, the Mega 2560 and the MEGA ADK. The ADK is like the 2560; however, it also has a programmable USB host chip installed. It uses the same 5V power supply as the Uno, so many of the Arduino shields are also compatible with the Mega; however, because of the placement of some of the pins, not all of them are usable.



3.3.4 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.



3.4 Advantages of Arduino

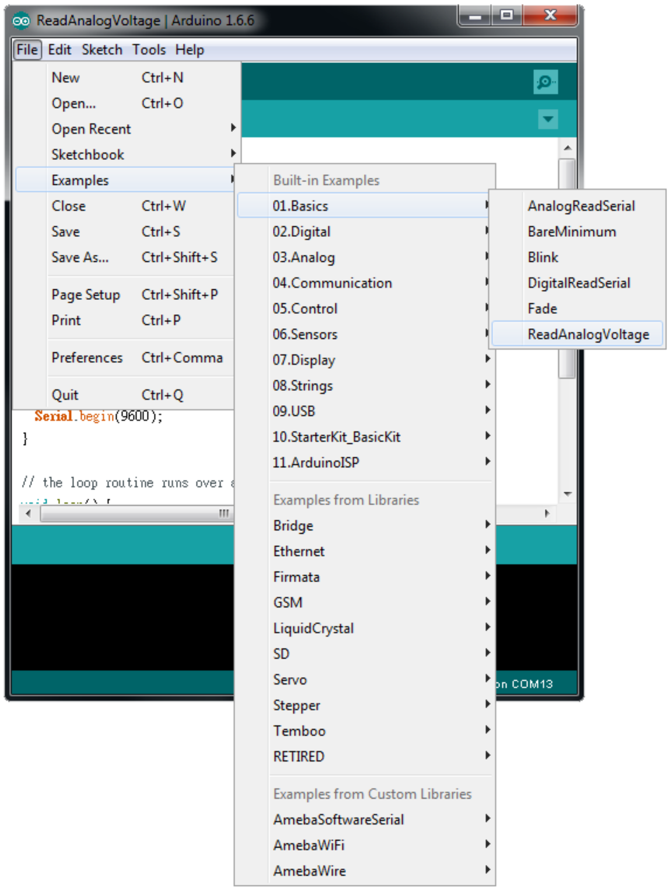
Using an Arduino simplifies the amount of hardware and software development you need to do to get a system running. The Arduino hardware platform already has the power and reset circuitry setup as well as circuitry to program and communicate with the microcontroller over USB. In addition, the I/O pins of the microcontroller are typically already fed out to sockets/headers for easy access (This may vary a bit with the specific model).

On the software side, Arduino provides several libraries to make programming the microcontroller easier. The simplest of these are functions to control and read the I/O pins rather than having to fiddle with the bus/bit masks normally used to interface with the Atmega I/O (This is a minor inconvenience). More useful are things such as being able to set I/O pins to PWM at a certain duty cycle using a single command or doing Serial communication. On the other hand, if you want to measure the voltage using Arduino.

3.4.1- 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 interface, LED and headers for the connections. You don't have to think about programmer connections for programming or any other interface. Just plug it into USB port of your computer and that's it. Your revolutionary idea is going to change the world after just few words of coding.

3.4.2- Examples of codes: Another big advantage of Arduino is its library of examples present inside the software of Arduino. I'll explain this advantage using an example of voltage measurement. For example, if you want to measure voltage using ATmega8 micro-controller and want to display the output on computer screen then you must 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. DC voltage measurement using Atmel AVR micro-controller.

On the other hand, if you want to measure the voltage using Arduino. Just plug in your Arduino and open the Read Analog Voltage example as shown in the figure 1.



3.4.3- Effortless functions: During coding of Arduino, you will notice some functions which make the life so easy. Another advantage of Arduino is its automatic unit conversion capability. You can say that during debugging you don't have to worry about the unit's conversions. Just use your all force on the main parts of your projects. You don't have to worry about side problems.

3.4.4- 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 functions of Arduino.

So, we should conclude the advantage of Arduino by saying that during working on different projects you just must worry about your innovative idea. The remaining will handle by Arduino itself.

3.5 Development

It was in the year 2005 that the first ever Arduino board was born in the classrooms of the Interactive Design Institute in Ivrea, Italy. Well, if you are not very familiar with the term, an Arduino is an Open Source microcontroller-based development board that has opened the doors of electronics to several designers and creative engineers. It was in the Interactive Design Institute that a hardware thesis was contributed for a wiring design by a Colombian student named Hernando Barragan.

The title of the thesis was “Arduino–La rivoluzionedell’open hardware” (“Arduino – The Revolution of Open Hardware”). Yes, it sounded a little different from the usual thesis, but none would have imagined that it would carve a niche in the field of electronics. A team of five developers worked on this thesis and when the new wiring platform was complete, they worked to make it much lighter, less expensive, and available to the open source community. Arduino is an open-source hardware.

The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available. The source code for the IDE is released under the GNU General Public License, version 2. Although the hardware and software designs are freely available under copy left licenses, the developers have requested that the name "Arduino" be exclusive to the official product and not be used for derived works without permission.

The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product. Several Arduino-compatible products commercially released have avoided the Arduino name by using -Arduino name variants.

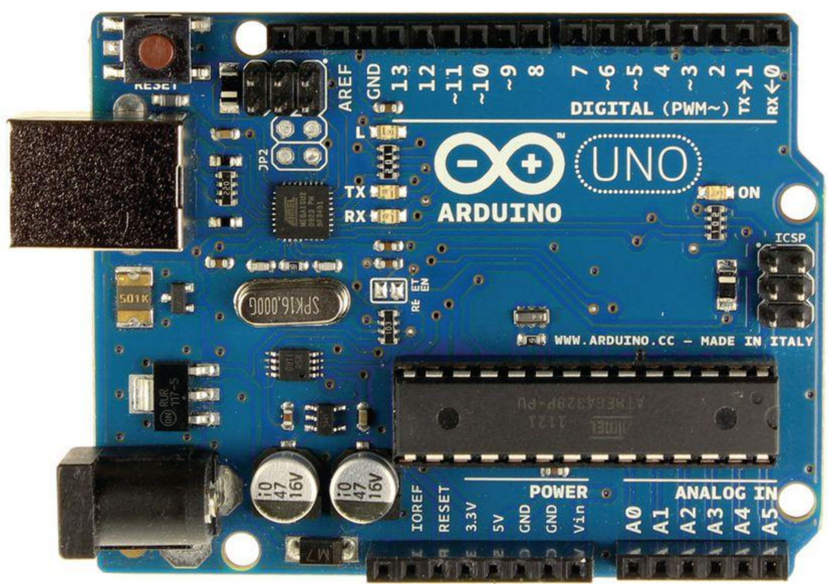
Chapter – IV
Design and Implementation

CHAPTER 4

This project is a combination of multiple components and in this chapter, we discuss a few components used in throughout the project. The goal of this project is to take the motion of a human hand and simulate it by a robotic hand. This will hopefully help us later to develop a hand rehabilitation device for those who have hand injuries. Strokes, osteoarthritis and tendinitis can lead to hand disabilities in adults. A significant amount of stroke survivors suffer from weakness on one side of the body, leaving them with impaired hand function. By replicating the motion of a human hand with a robotic hand, one can take principals of this design and apply the ideas to a hand rehabilitation device.

4.1 List of components Used:

4.1.1 Arduino (Discussed in CHAPTER 1)



4.1.2 Connecting Wires

Mainly we have used two types of wires in this project

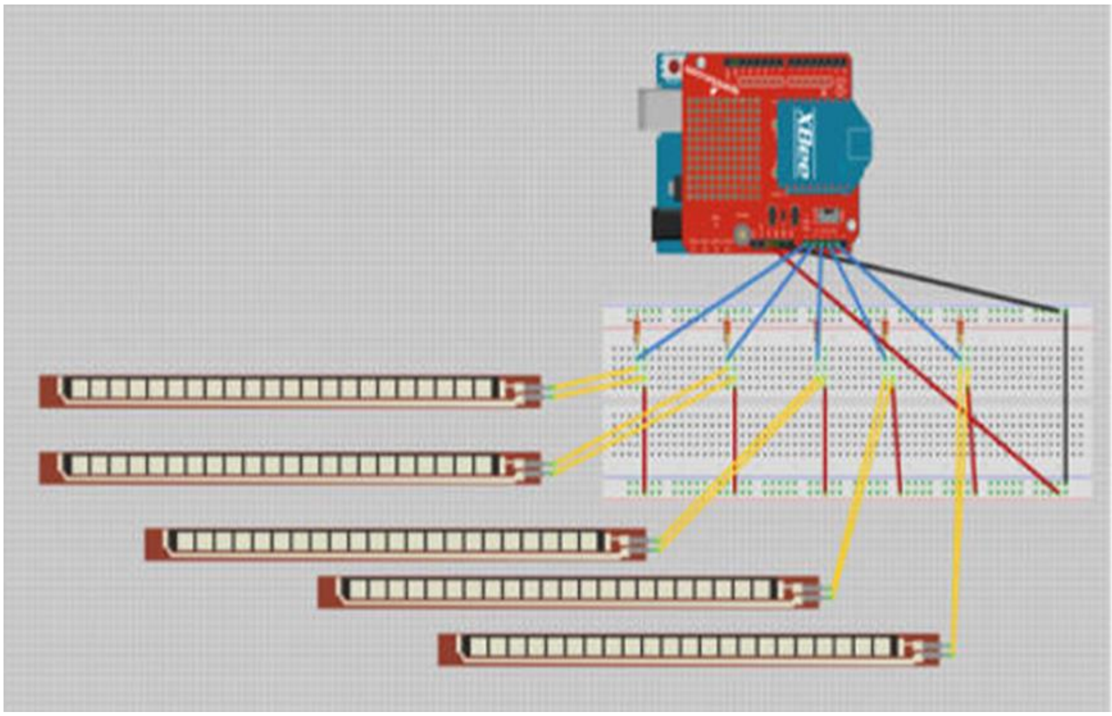
4.1.2.1 USB 2.0 cable type A/B:

Standard USB 2.0 cable. Use it to connect Genuino Uno, Genuino Mega 2560, Genuino 101 or any board with USB female port of your computer. Cable length is approximately 175cm and its colour and shape may slightly vary depending on the site and vendor.

4.1.2.2 Male-Male Jumping Wires:

These are jumper wire male to male, used in connecting female header pin of any development board (like Arduino) to other development board or breadboard. You can also combine it with our female jumper wire to create male to female jumper wire.

4.1.3 Flex Sensors

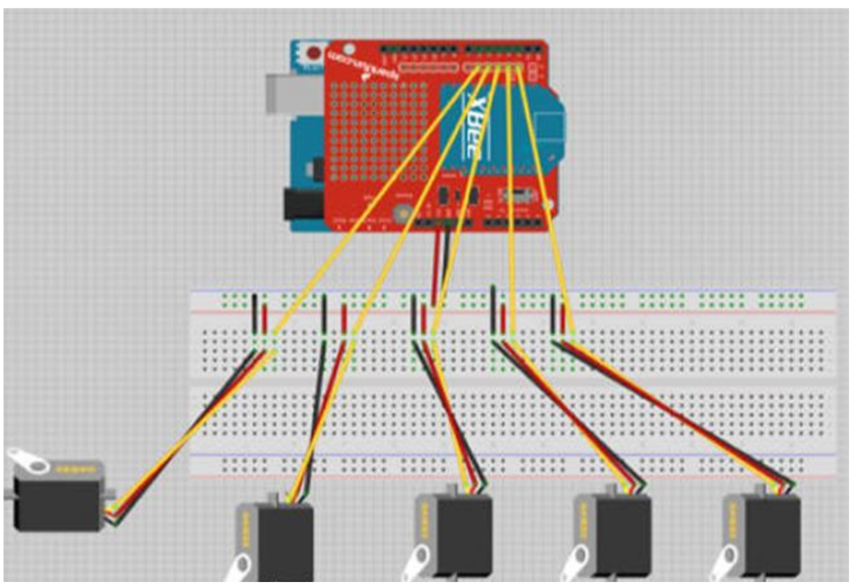


Flex sensors are used to convert the flexing motion of the fingers into rotational motion of the servo motors. The flex sensors used for the design are 4.5 inches long, which allows it to cover each finger. The flex sensors are sewed onto the glove. As the flex sensor bends, this increases its resistance. This change in resistance is the signal that is sent to the servomotors. These flex sensors were soldered onto wires for simpler use. A 15k resistor was also placed in series with each flex sensor in order to protect it. The flex sensors were powered by the 5V pin on the Arduino.

4.1.4 Wireless Communication

To allow wireless communication between the two Arduinos, two nRF24L01 modules are used. The nRF24L01 allows wireless communication between microcontrollers such as Arduinos, computers, and any system that has a serial port. Thus two nRF24L01 were required; one for each Arduino.

4.1.5 Servomotors



The servomotors used for this design is the standard sized. It operate at a voltage of 5V and is able to turn 180 degrees. The servomotors pull on the fish wire which causes the robotic hand to flex. The servomotors were powered by the 5V from the Arduino. The maximum amount of torque that these servos are able to generate is 2.5kg/cm.

4.1.6 Metal Coil Spring

made out of round metal wire, most commonly music wire or stainless steel. Wire size 008 to .115 in diameter.

4.1.7 Miscellaneous

4.1.7.1 Battery 5v

4.1.7.2 Hot Glue gun

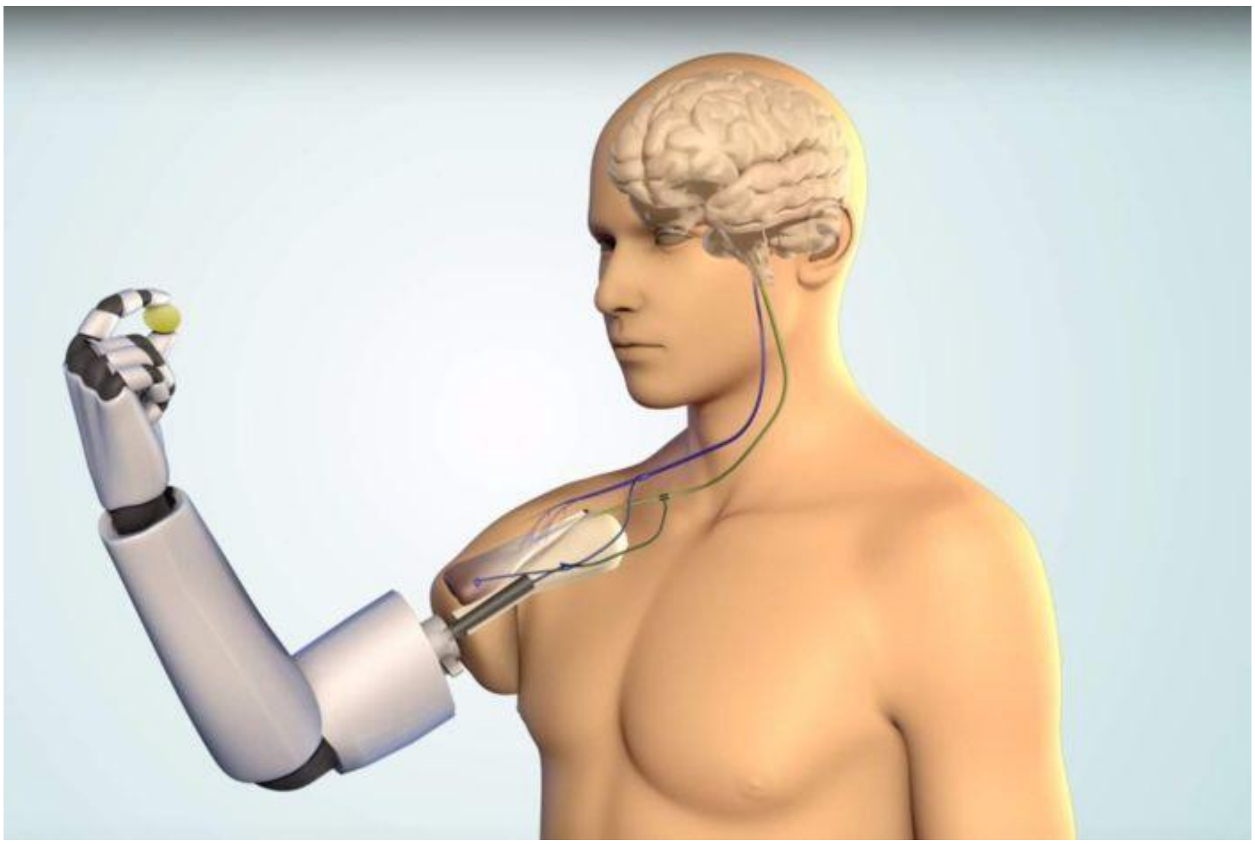
4.1.7.3 10k Ohm Resistors

4.1.7.4 Nylon Strings

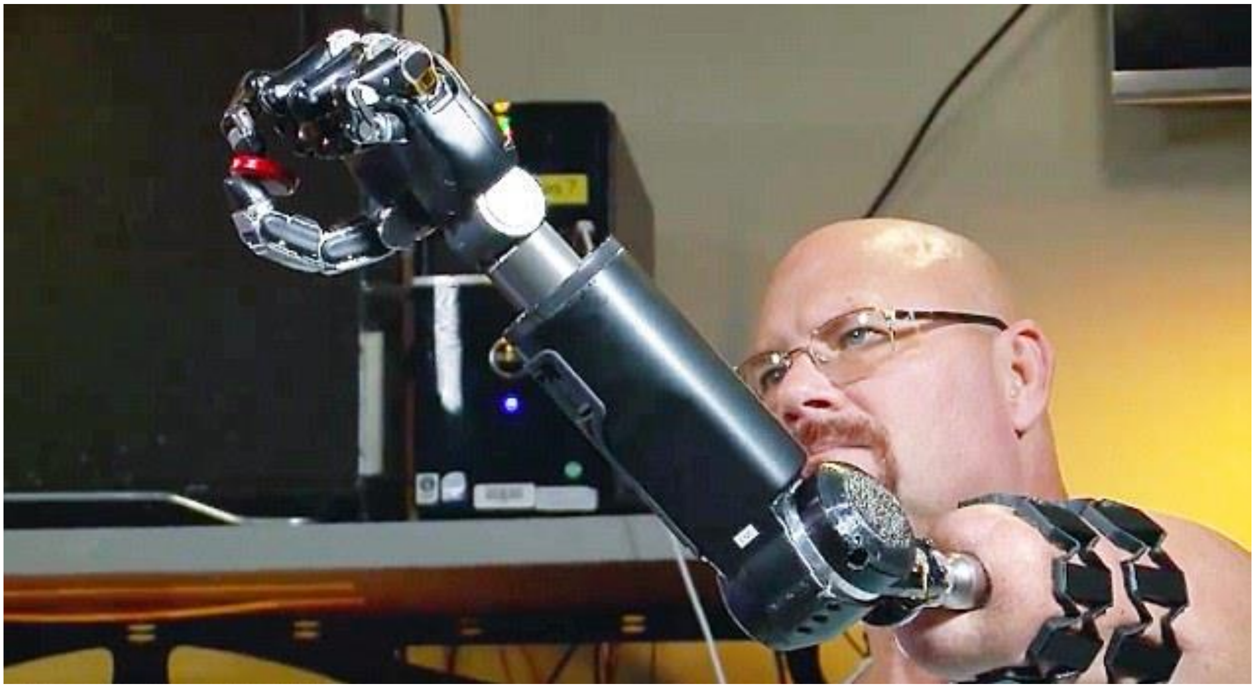
4.1.7.5 Foam Board

4.2 Implementation

The design is to convert the bending motion of flex sensors into rotational motion of servomotors that are controlled by flex sensors. The servomotors will act as actuators to pull and release fish tackle, which is used to control the motion of the robotic fingers.



4.3 Working



It is all controlled by Arduino code burned on the internal memory. Code is assigned to every operation. Arduino Platform is the key for working. Coding is done in a Arduino software then the code is being run on the Arduino board. Now any movement we want our wireless robotic hand to replicate can be input via the flex sensors.

We have put the flex sensors on the glove that will be used to input the movement that are to be replicated by the robotic arm.

Once the flex sensors take the analog data it is processed and converted to digital form for the motors to work and the movement to occur.

4.4 Advantages

The wireless robotic hand could potentially be used as a surgical device. The surgeon will be able to control its movement using the glove, and the robotic hand performs surgery on the patient. Precisely the robotic hand replicates every movement the surgeon makes. The robotic hand can be built in a microscopic size where it can easily fit through very small incisions, which can potentially minimize scarring, of the patient. Furthermore, it can provide the surgeon with unprecedented control in a minimally invasive environment, and is more hygienic and thus reduces the chances of postoperative infections.

Additionally, the wireless robotic hand could be found useful in environments where it is dangerous for humans. In space or places such as hazardous radioactive environments is where the robotic hand would be useful.

Chapter –V

Conclusion and Future Scope

5.1 Future Scope

5.1.1 Prosthetic Arm

Our project can be related to biomechanical engineering. We have designed a prosthetic arm for the amputees who have lost their forearm and hand due to an accident, in a war or any other cause.

5.1.2 Wireless Arm

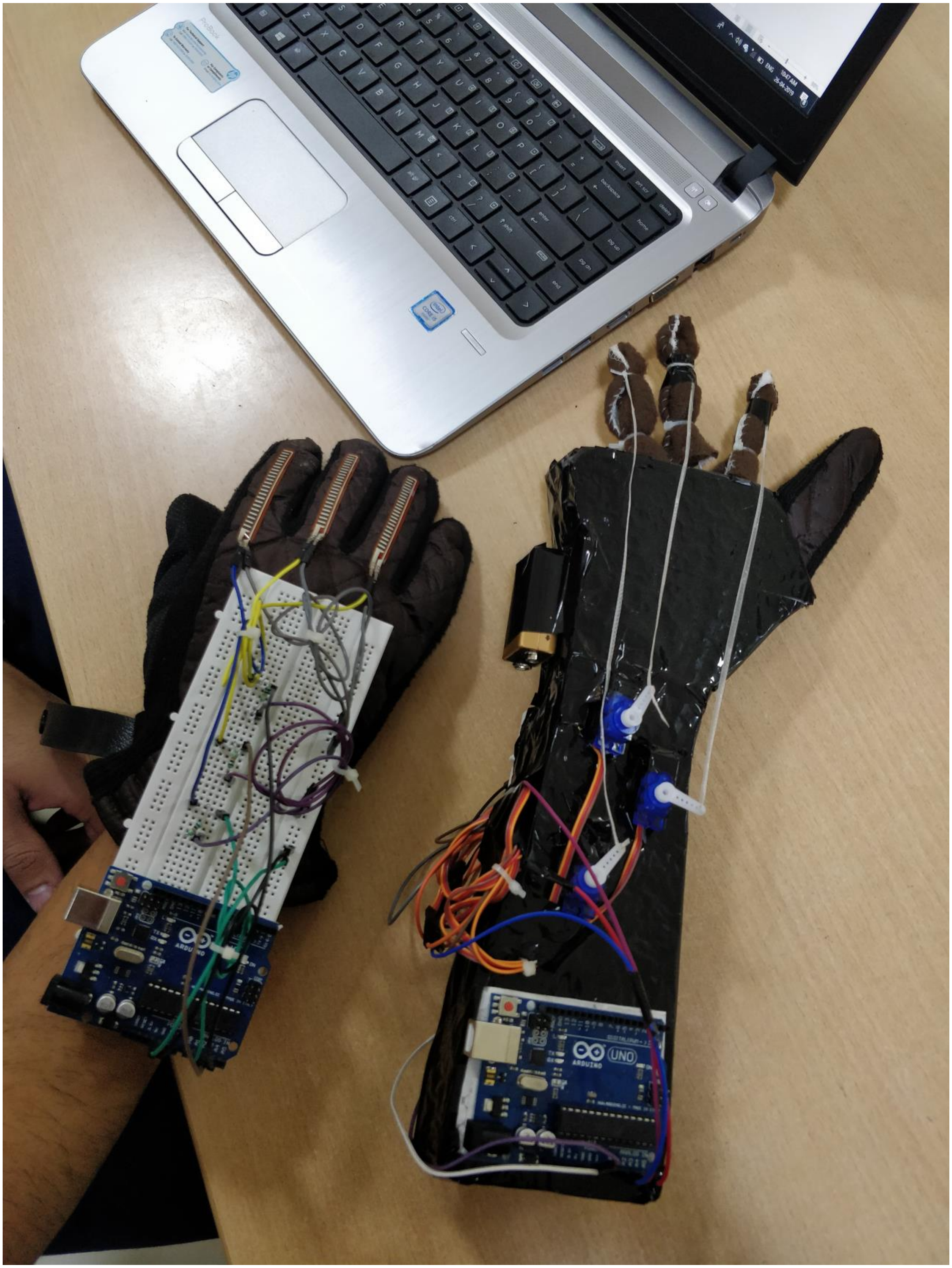
Imagine a scenario where you need to operate on a person thousands of miles from you or you have to diffuse an explosive from a safe distance, a wireless arm has numerous applications and using it to do fine motor work up until done by human hands is one of them

5.1.3 Automating Jobs

There are numerous jobs that require fine motor skills only available in humans, now with the help of this technology those jobs can be successfully automated.

5.2 Conclusion

This project is a big step towards helping the human kind and putting it away from the danger. It aims mostly but not limited at helping the amputees in need, however it can also be used to perform jobs requiring fine motor skills like operating someone or diffusing an explosive. Our paper can be the possible outcome of the problems, as mentioned earlier. The project is a proof of concept that would require further resources both human and financial for further uses and development. The device would consist of the modern technology, which makes it different and better from other devices available in the market.


UNO
ARDUINO

REFRENCES

- Mastura binti Muhammed, Siti Zarina binti Mohd. Muji, Siti Rozaini Zakaria, Mohd Zarar bin Mohd. Jenu "MR999-E Wireless Robotic Arm"
- KSM Kader Ibrahim, Babul Salam and Samin, Reza Ezuan and Kamaril Yusoff, Mohd Ashiq "Wireless mobile robotic arm"
- Md. Anisur Rahman , Alimul Haque Khan , Dr. Tofayel Ahmed , Md. Mohsin Sajjad "Design, Analysis and Implementation of a Robotic Arm- The Animator" e-ISSN : 2320-0847 p-ISSN : 2320-0936 Volume-02, Issue-10, pp-298-307
- R.G.E. Clement, K.E. Bugler, C.W. Oliver "Bionic prosthetic hands: A review of present technology and future aspirations"