GESTURE DRIVE

(FINAL YEAR PROJECT REPORT)

Session 2013-2017

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CERTIFICATE

It is certified that **Kamran Ahmed** (Registration No. BSIT-142-17), **Aramghan Sarwar** (Registration No. BSIT-142-04), **Iqra Mushtaq** (Registration No. BSIT-142-25), **Malik Usman Hassan** (Registration No. BSIT-142-26),**M.Usman**(Registration No. BSIT-142-08) has carried out all the work related to this project under my supervision at the Faculty of Computer Science and Information Technology, Superior University, Lahore, Pakistan and the work fulfills the requirements for award of Bachelors of Information Technology degree.

Date: 24th October, 2017

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𝒟EDICATION

To

Our Parents, Teachers and Friends

ACKNOWLEDGEMENTS

Alhamdulilah, all praises to Allah Almighty, the most Merciful and the most Gracious, for the strengths and His blessings in completing this Project. Working on this project was indeed a challenging task that demanded immense efforts. But we feel proud to express our deepest sense of gratitude and appreciation to our supervisor Mr.Khurram Jilani for his kind help, advice, inspired guidance, unlimited support, sympathetic attitude and sincere personal involvement throughout the development of project.

We would never have been able to reach this stage but for the prayers and great support of our families. Thanks and best wishes for all those who have made this learning experience so wonderful for us.

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ABSTRACT:

The objective of this project is to build RC (remote control) car that can be controlled by the fingers or gestures by the hand. User is able to control motions of the RC car by wearing the controller glove and performing predefined gestures. This RC car can move forward and backward automatically when the gesture is given; in addition, feedback messages are sent to the controller and it will successfully move from one place to another. This project provides a basic platform for many potential applications such as wireless controlled car like we can play racing games, as well as gesture human-machine interfacing, and etc. For this project, mini arduino microcontroller and Bluetooth are employed for the controller; jumper wires, and flex sensor are employed for the controlled car. A pair of Bluetooth module, R1000, which is used to connect or communicate between the controller and RC car. However, the hardware is also ready for wireless module to be connected

Chapter 1: Introduction

1.1. Brief Introduction

We are providing Gesture drive as a service. On different places different type of services is needed. And now days every place, Homes, sector, bank, Toys, general Student projects need a services. In this world of technology there is also better service systems.
If we talk about Gesture Drive gadget, then we can say it is an IOT system [1]. Every person have different needs in their daily life to be used instantly without using extra force. Everything now a days is being automatic and replaced by machines and internet of things. Everyday work of people get fast easy and reliable so we just build a gadget for those who want their work to be done faster and with an easy way. It is available in many colors and can be modified. But nowadays there is a lot of things in the market but they don't give a solution that is reliable, flexible and easy to use. Gesture Drive can modified and easily can be used anywhere.

1.1.1. Introduction of Concepts:

The main concepts involved in the development of Gesture Drive gadget are following:

- **Technical customized solution**

We are giving custom-built glove based sensor solutions for the Students and general public.

- **Reliable Service**

This will be reliable service in future which cannot be accomplished by a normal company's even expert in Information Technology. This is a new gadget that will help the modern era.

- **Use of technology**

You can Control anything which you think that is necessary to keep using at any time, like Banks, Homes. Securities your own Schools, Offices, your Cabins, your toys, your projects, your IOT even though everything which you think that should use to be controlled with your fingertips.

•Goals and Objectives

- Must build a prototype for the general people.
- Build a solution prototype also for comfort and luxury life style.
- Meeting our challenges and chances as one teams focus on common goals.
- Handling our associates, customers, suppliers, and dealers with respect.

- Striving for excellence and working to improve every day.
- Develop a marketing plan, sales, website, e-commerce, and sales department.
- Holding ourselves accountable in repairing results and always doing the right thing.
- Offering our customers the best services experience by exceeding their expectations
- Serve and improve the communities in which we live.

1.2. Scope

Over the years, a variety of Gesture related applications and projects have been developed to cater the needs of users [2]. The reason to develop this project is to provide safety and ease of work load to the user where they can save their life and time.

The users can also avail the opportunity to Go to Specific modification (toys, home accessories and Specific machines. For better understanding one can control with gesture of glove the specific machine. For understanding meaning of controlling he/she can move, on, off, stop it's working in by movement of fingers .
User can Increase speed or can change glove specifications, color. User can share glove with any his friends or members according to its choice like in home, in office or in a factory. User can also connect it with any toy any other service after some modifications.

1.3. Tools

During the development of this system, we plan to use the following technologies:

- **Corel Draw, Adobe Photoshop** Corel Draw & Adobe Photoshop used for user display and to make web things just like images, posters, logos etc.
- **HTML**

- **Arduino software** Arduino software used to compile your program and then upload it on micro controller.

- **SQL Server 2012** will be used to save and regained the data of the website.

- **Flex sensor** flex sensor is a sensor that measures the amount of deflection or bending. ... Since the resistance is directly proportional to the amount of bend it is used as goniometer, and often called flexible potentiometer

- **Micro Controller** the Arduino omega is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, also have a USB connection, a power jack, an ICSP header, and a reset button.

Types of Flex Sensor

1. conductive ink-based
2. fiber-optic
3. conductive fabric/thread/polymer-based

1. Conductive ink-based

There are these sorts of bend or flex sensors inert resistive are devices generally that is unreal by putting an error of resistive ink that is on a versatile elastic substrate, formed as a skinny, versatile stripe in lengths between 1" and 5". [2] At rest (when ordered flat), the bend detector is characterised by associate degree intrinsic resistance, because the detector is bent, the resistive materials within it square measure force more apart. Fewer adjacent resistive particles acquire contact, thereby increasing the resistance. Typically, the nominal resistance lays between 10kΩ and 50kΩ and will increase by an element of 10 at full deflection

Figure 1: Conductive ink-based

Properties

- Hyperstress, noise neglectible
- Resistance is function of radius of curvature, not angle at one point
- Has a very high temperatures and moisture-tolerance
- Relatively very low cost
- Customizable coatings, covering materials

Applications

- automotive applications
- industrial applications, for e.g. switches which is use for safety, shipping, machine control
- medical applications (e.g. "Smart Bed")
- gaming devices
- measuring devices
- Assistive technology
- robotics for e.g. mapping of the floor, and the collision detection

2. Fiber Optics

Fiber-optic is a technology that uses glass thread or plastic to transmit data with light beams. Data is transmitted digitally rather than analogically. Light is emitted into the plastic optical fibre (POF) at one end and perceived at the opposite end. Bending the glass fiber leads to a loss of

light (intensity). The loss of light is commonly increased by cutting, polishing a locality of the POF. Due to the sensing principle single fiber-optical bend sensors are uni-polar devices.

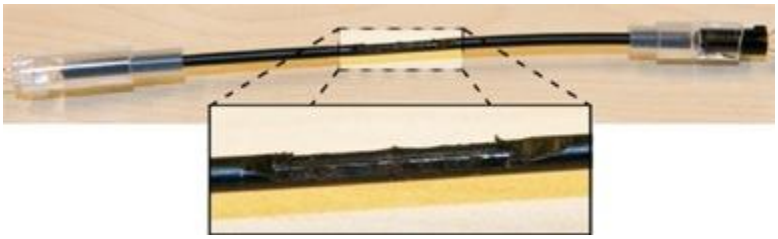

Figure 2: Fiber-Optics

Properties

- mostly custom-built or developed in the lab
- high repeatability, hysteresis neglectible
- can be bent in any direction
- usually unipolar measurement (global flexion)
- can be expensive

Applications

- medical applications
- educational studies (e.g. the CARESS project)

3. Conductive fabric-, thread- or polymer-based

Conductive fabric-, thread- or polymer-based flexion sensors usually encompass 2 layers of conductive material with a layer of resistive material in between [2]. it's principally sandwiched in between layers of additional rugged material, e.g in stretch of the sensing element material that exerts pressure onto the sensing element. it's this pressure that's measured. Foam or Polymer that relies on sensors decrease their nominal resistance because the material is compressed. These sensors are known to have poor accuracy, repeatability and hysteresis.

Figure 3: Conductive fiber

Properties

- quasi-linear behavior for pressure-sensing
- slow response, due to physical deformation (internal energy)
- high hysteresis, poor accuracy & repeatability
- high temperature- and humidity-tolerance (can be used underwater)
- highly customizable
- Cheap

Applications

- artistic projects

Comparison

Table 1: Comparison between different Flex Sensors

conductive ink	**fibre-optic**	**fabric/polymer**
+ robust & durable	+ accurate, repeatable measurements	+ attractive physical qualities
- fixed lengths, drift	- requires light-source & detector	- poor & variable performance

Chapter 2: Problem Definition

2.1. Problem statement

New technologies and automation is needed by almost all the people around the world whether they want to keep their precious things interact or to use something from a distance or direct access. Automation is becoming one of the most-needed thing in the life of a human.

No doubt there are so many automatic system are introduced. But nowadays it's not easy to automate a thing which can be modified and can be connected to others and use as we want [1]. Gesture drive can be connected to number of things including from the things you tough you're your hands and even Doors and quad copters where your hand and fingers are used to control your Devices. Regular used things are not automated so we have to think of a project which can help the people to control or automate the things which they use daily so we come up with a solution.

2.2. The Solution

We have designed a flex sensor-based gesture drive service which will require the user to tell a specific needs and we will modify the Glove sensor to control the device preferred by the user, something like a door or Toy, Quad copter etc. The user can only access the items or unlock the door of room/ etc. when the glove is being used by the user it will easily control the device or door specified by the user with the fingers.

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2.3. Industry Analysis

We will follow where we will implement this technology on small cases to some companies or banks and toy stores and if, successful, we will implement it on large scales.

Service will provide

- ✓ General Service
- ✓ Automation
- ✓ Functionality
- ✓ Merging
- ✓ Reliability
- ✓ Trust

- ✓ Accuracy

2.4. Web Application

- Client Registration
- Client Connection Authentication
- Normal Feedback and suggestions
- Maintenance of database for storing information

2.5. Opportunities

We know that there is no other project like us. We don't have any competitors. These opportunities include, but are not limited to:

- Due to modification of different devices we have a vast area.
- If anybody want any type of automation we can deal with it
- Fast growing population in Local areas
- No other project or services providing like us
- Open market
- Opportunity of launching business at large scale
- Wide range of services

2.6. Strengths

Here the strengths of our project:

- Clear vision of the needs.
- Pick and deliver facility.
- Quality service project.
- Attractive Gloves.
- Automate anything.

Chapter 3 Literature Review

3.1 Related Work

Our gesture controlled robot [6] works on the principle of accelerometer (measuring device) that records hand movements and sends that information to the comparator that assigns correct voltage levels to the recorded movements. That info is then transferred to a encoder that makes it prepared for RF transmission [9]. On the receiving end, the info is received wirelessly via RF, decoded and

so passed onto the micro-controller that takes numerous choices supported the received info. These choices are passed to the motor driver IC that triggers the motors in numerous configurations to create the automaton move in a very specific direction. The block diagram helps to grasp the function of the robot:

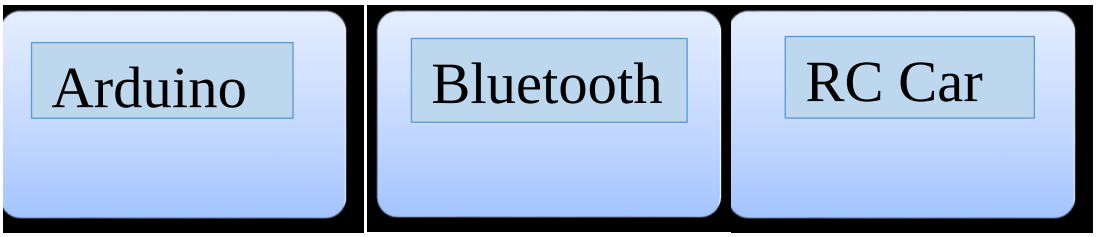


Figure 4: Block Diagram of the design

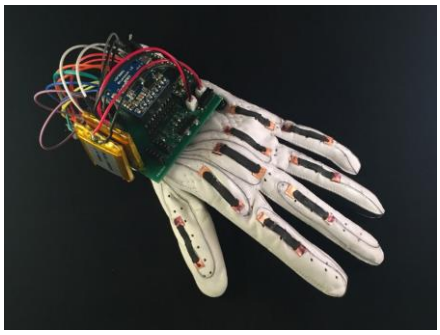
We divided our task into two parts to make the task easy and simple and to avoid complexity and make it error free.

The first is the glove section which includes the following components:

- Glove
- Arduino mini
- Jumper wires
- Bluetooth module
- The second is the receiving end which comprises of following main components:
- RF Receiver Module of Bluetooth
- Arduino Omega
- Remote Control Car
- Jumper wires
- DC Battery

3.2 Glove

Glove [12] is the main component of the project so we have to choose very specific and useful glove so that the users can easily use it and it also controlled with ease and can be used to easily integrate with the sensors. It would nor very thick or some highly leather made so after some time the sensors will stop working or lose its accuracy.



3.3 Arduino mini

Figure 5: Glove Design

The biggest benefit of the mini is that we can use it on small spaces o where cannot use arduino in the projects or else where there we use this type of arduino. The Arduino which is Mini so it is also called as mini arduino. It is small in size micro-controller which is originally built on AT-mega168 [7], but it is now provided with 328 projected to and for use on with bread-boards and where and when space or two spaces which is a premium. It has total 14 digital inputs as well as outputs pins of which is based on 6 and it can or will be used as a PWM outputs, after this we can say 8 analog inputs, as well as and very important figure of 16 MHz oscillator.

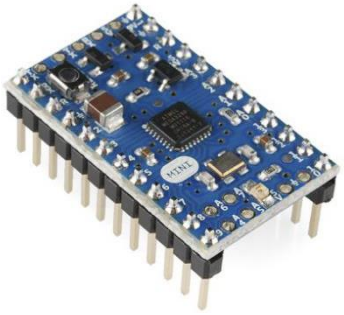


Figure 6: Arduino mini

3.4 Jumper wires

Jumper wires are used in connecting or for the connections.
Male to female

Figure 7: Jumper wires

3.5 Bluetooth Module

It is used to give the connection from glove to the car so we can access it with the wires so we can also say that for the use of long distance so we can use Bluetooth [8] and as well as wireless module. We were making our project as a demo so we make this to attach with the bluetooth. We can also attach the wireless with our project instead of bluetooth but we have to us this for a short distance so we are using this bluetooth module. It is easy that we can use it on the glove also to connect it with the car so can it could move forward or backward as the user desired.

Figure 8: Bluetooth Module

3.6 DC battery

There are two batteries being used in this project. One is used in glove with arduino and he second is used in the RC car. The battery which is attached with the glove has a very specific task related to the glove which is to give energy to the arduino bluetooth which is attached with or connected with the bluetooth of the RC car. So it is attached with the glove. And the battery attached with the with the RC car is because it has a very major attempt to the car so it could move when the signal from the bluetooth is sent to this car so it can receive and perform the given commands which is being given by the user through the bluetooth.

Figure 9: DC Battery

Chapter 4 Analysis

4.1. Project Analysis

Around half a million people died due the lack of technology, some died due to lack of technology knowledge. In Pakistan and all around the world technology is increasing and making our life easy and better. So we make a product that will help people in many ways. So they can also use this product to save people life. We can use this product to automate households. We can use this technology to automate kid's toys. But our main focus is on saving people life's we are using this project to control the things in which we have a life risk like cranes, the places which have high voltages we can use it to control robotics or machines. So in many ways by using this project we can save a lot of people life and make their work easy. Total population in Pakistan 195, 396,795 which is increasing day by day. In the whole of this 6.8% people are died due to lack of technology in Pakistan. So we will be able to save as many life's as we can with this project

Figure 10: Crane accident

4.2. Hardware architecture analysis:

We are using a glove in which there are sensors are attached with it on every finger of the glove. And we are sing an RC car for the prototype. We use to attach an arduino with the glove sensors as well as with the car. The arduino which is attached with the car also have a Bluetooth module or we can attach a wireless module with the arduino of RC car.

4.3. Vision

1: To Establish ourselves as the premier training institute training for industrial automation and robotics.
2: We give the automation to the automobile.
3: We fulfill your desires with the help of New Technology

4.4. Mission

Progress towards realization of the vision requires a sustainable industrial investment both to build solutions or real industrial state of the art systems and also to have the outreach to a wide variety of industrial users and applications

4.5. Unique Value of Preposition:

Points which separate us from others are following:

1. Quality services
2. The first one of its kind
3. Adding extra layer of security
4. Impossible to imitate
5. Scalable for every field
6. Cost effective
7. Easy access
8. Handle large no of customers
9. Quick response
10. Use modern technology

Chapter 5 Design and Architecture

5. 1. Software Development Lifecycle

The Development Cycle adopted for this project is incremental Model [3]. Incremental Model could be a method of computer code development wherever necessities are weakened into multiple standalone modules of computer code development cycle. Every iteration passes through the necessities, design, writing and testing phases. And every ulterior unleash of the system adds operate to the previous unleash till all designed practicality has been enforced.

The system is place into production once the primary increment is delivered. The primary increment is usually a core product wherever the essential needs square measure addressed, and supplementary

options square measure supplemental within the next increments. Once the core product is analyzed by the consumer, there's arrange development for following increment.

- Incremental Phases **.**Activities performed in incremental phases
- Requirement Analysis **.**Requirement and arrangement of the software are composed
- Design**.** We then design some new function which are designed during this stage.
- Code **.**Coding of software is done during this stage
- Test **.**Once the system is deployed; it goes through the testing phase.

How do we do our project to get what we need?

1. Requirements specification
2. Design
3. Construction (implementation and coding)
4. Integration
5. Testing and debugging (Validation)
6. Installation And Maintenance

5. 2. **Block Diagram**

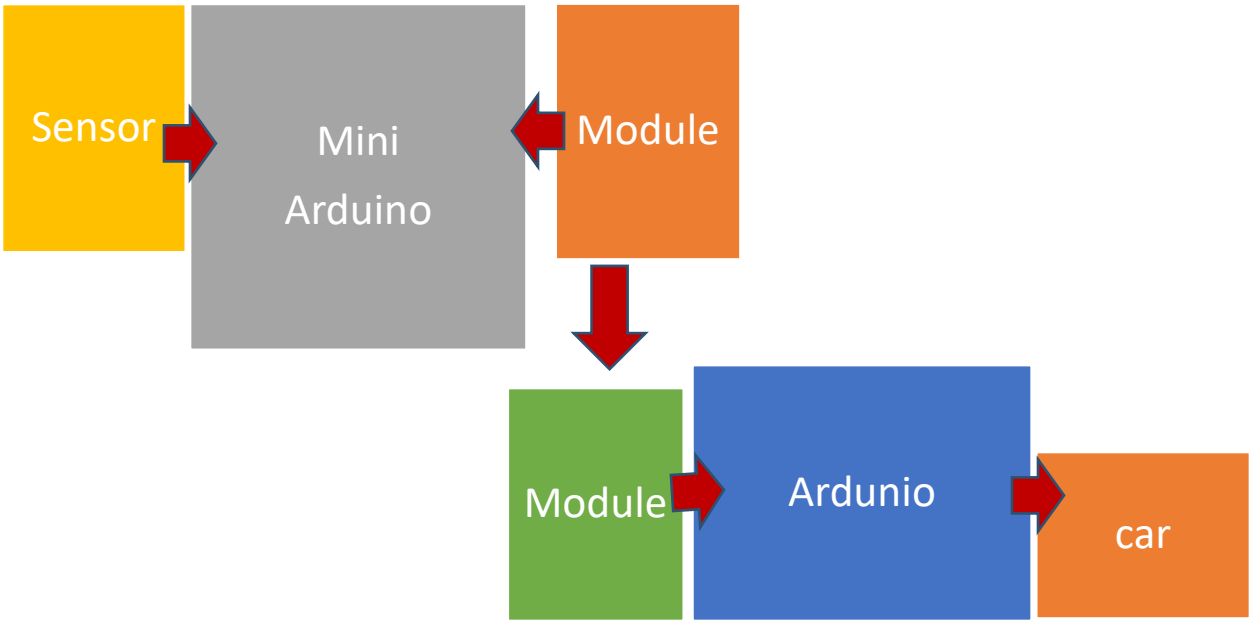


Figure 11: Block Diagram of proposed design

5. 3. **Circuit Diagram:**

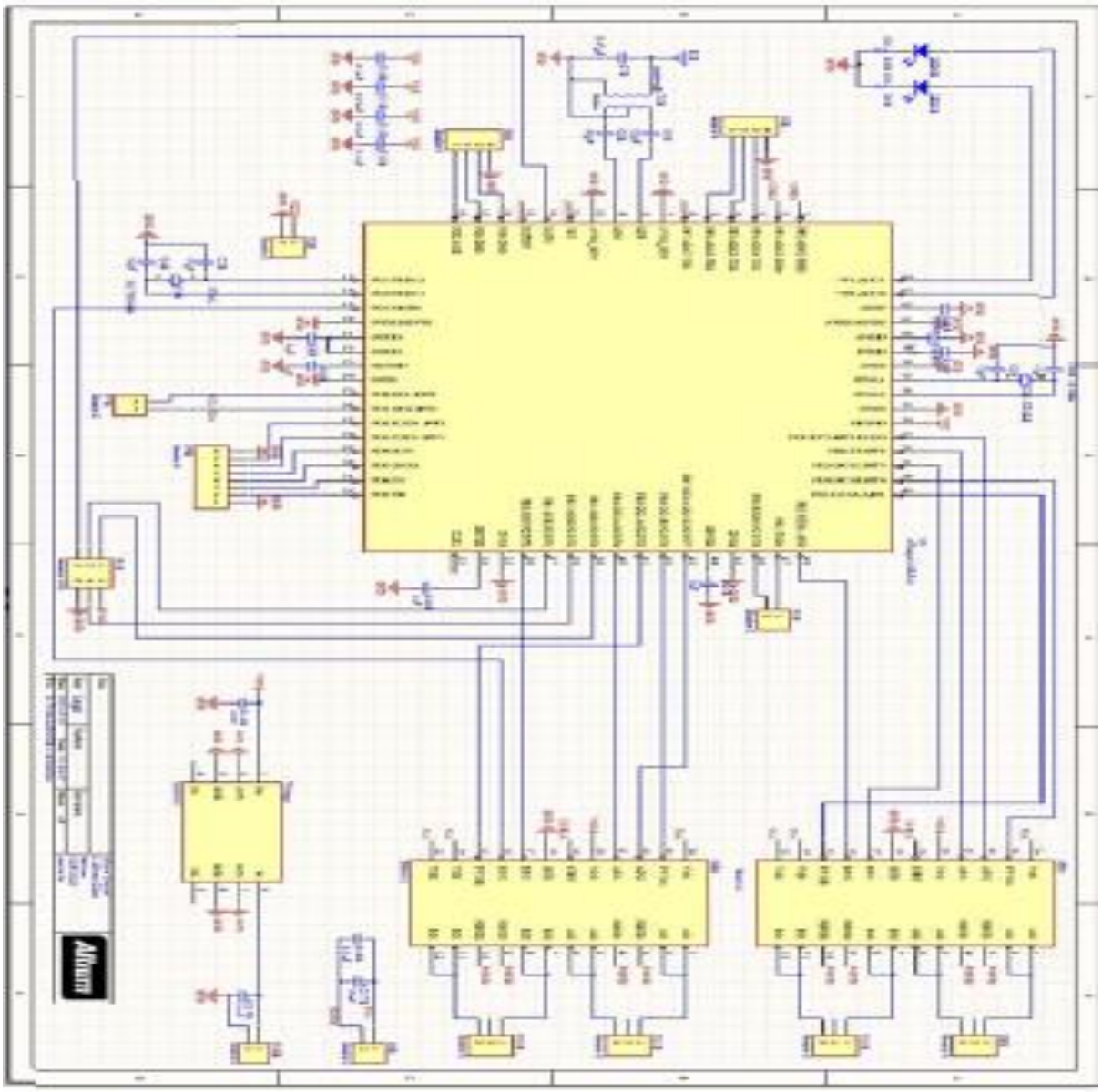
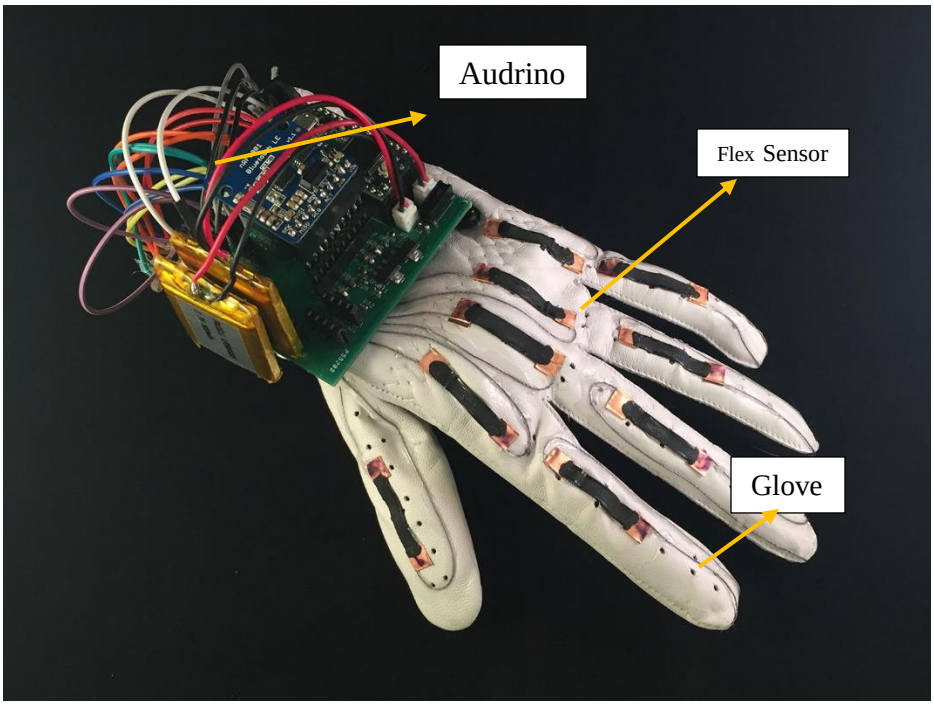


Figure 12: Schematic of RC car

5. 4. System Design:



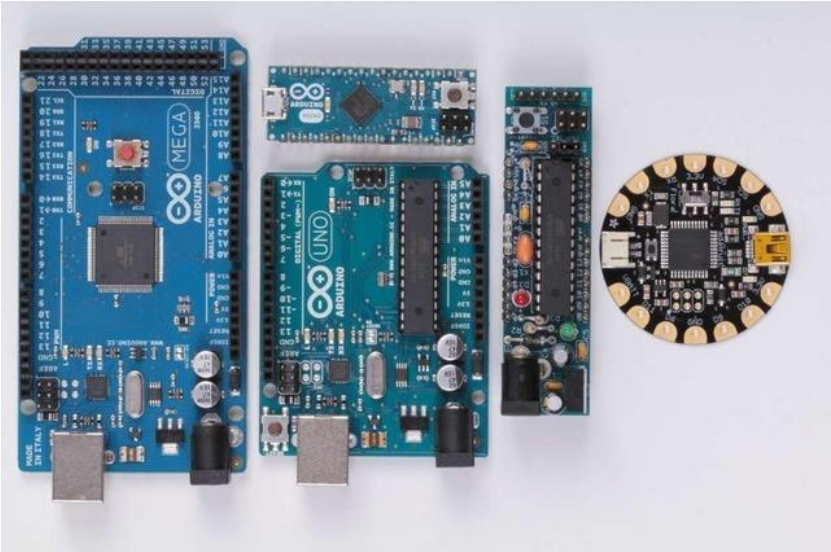


Figure 13: Arduino types

Figure 14: Bluetooth Module

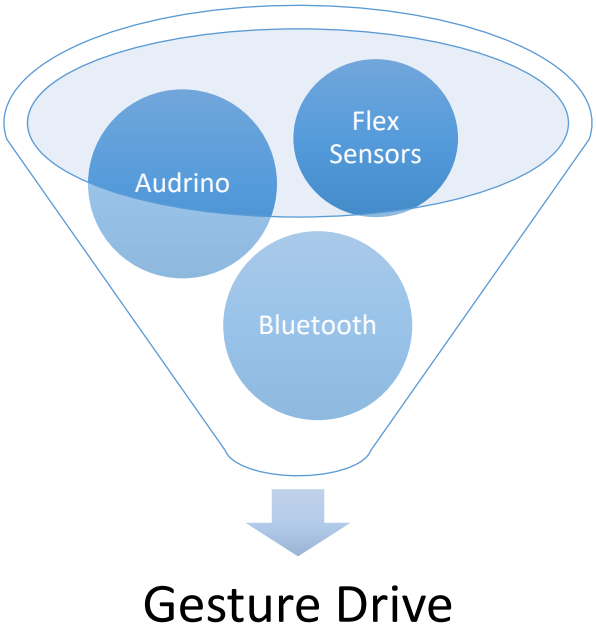


Figure 15: Gesture Drive [10]

5. 5. **Help and Feedback**

In this module through system application can reply to customer for his questions. It will also inform customers to about delivery notification and order placement notification. It will show the links of all social media link details. We are going to build a website as well as an application. The main features are mentioned as:

- Email Sending
- Social sites links
- Video links
- Query replies
- Service

5. 6. Use case diagram

5. 6. 1. Use case diagram (Movements of hand)

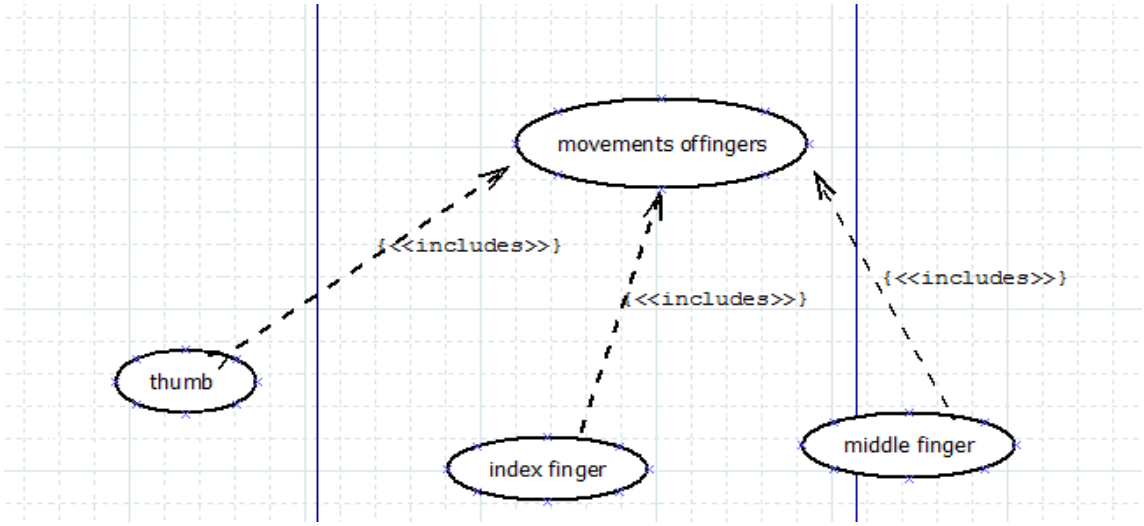


Figure 16: Use Case diagram (Movements)

5. 6. 2. Use case diagram (Commands)

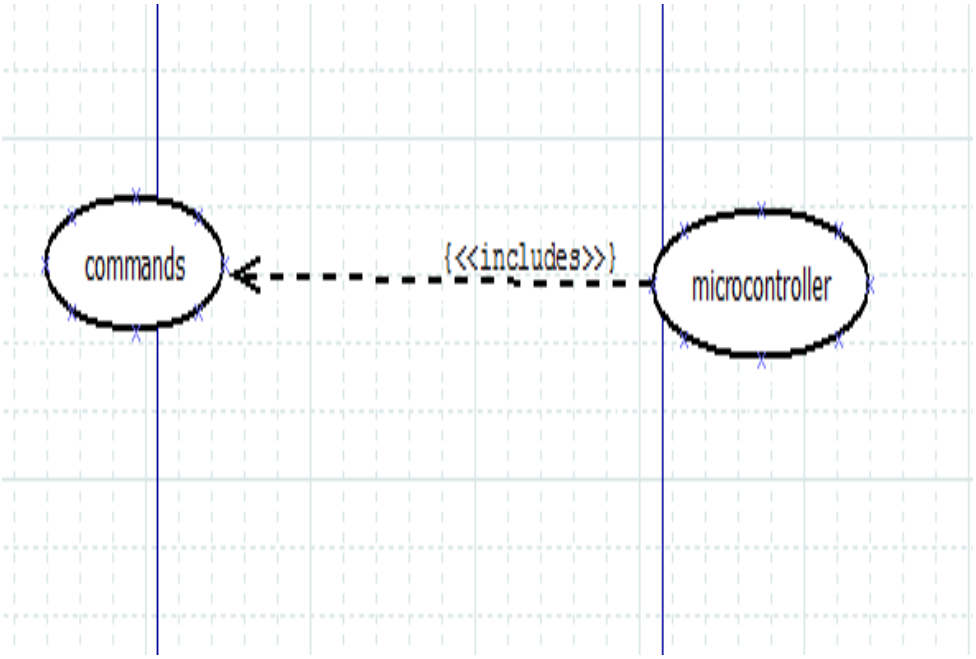


Figure 17: fully dressed up commands

5.7 Website Design

We have also designed a website to get to know more about us.

Pictures of website

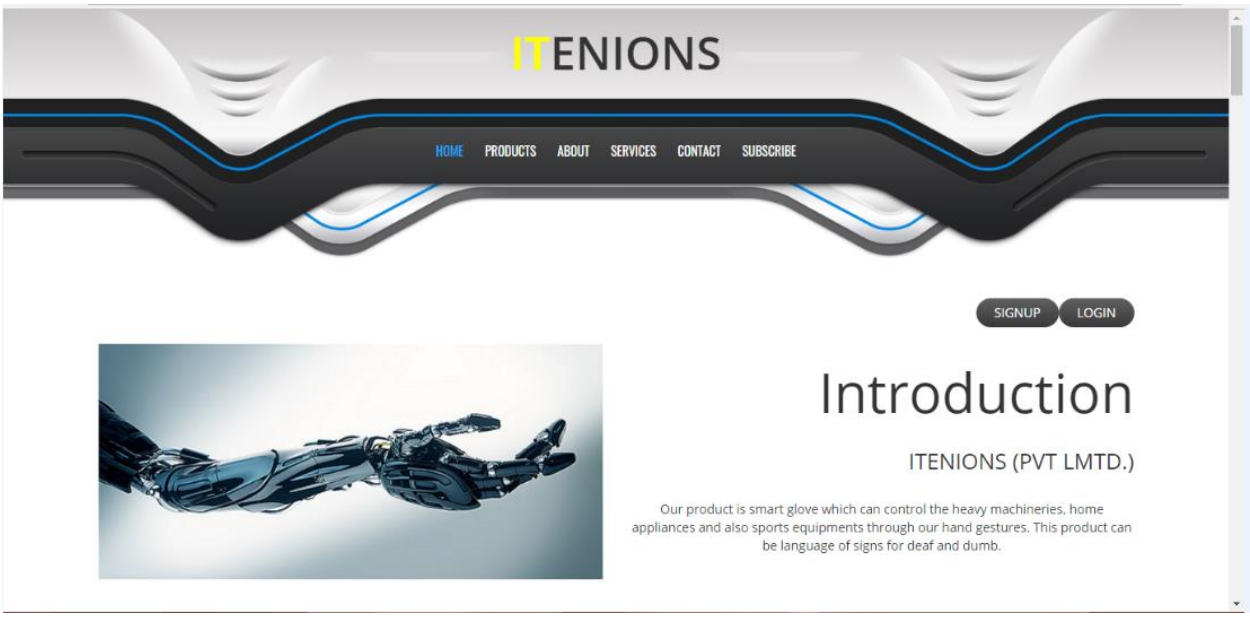


Figure19: Web site layout

Picture of application

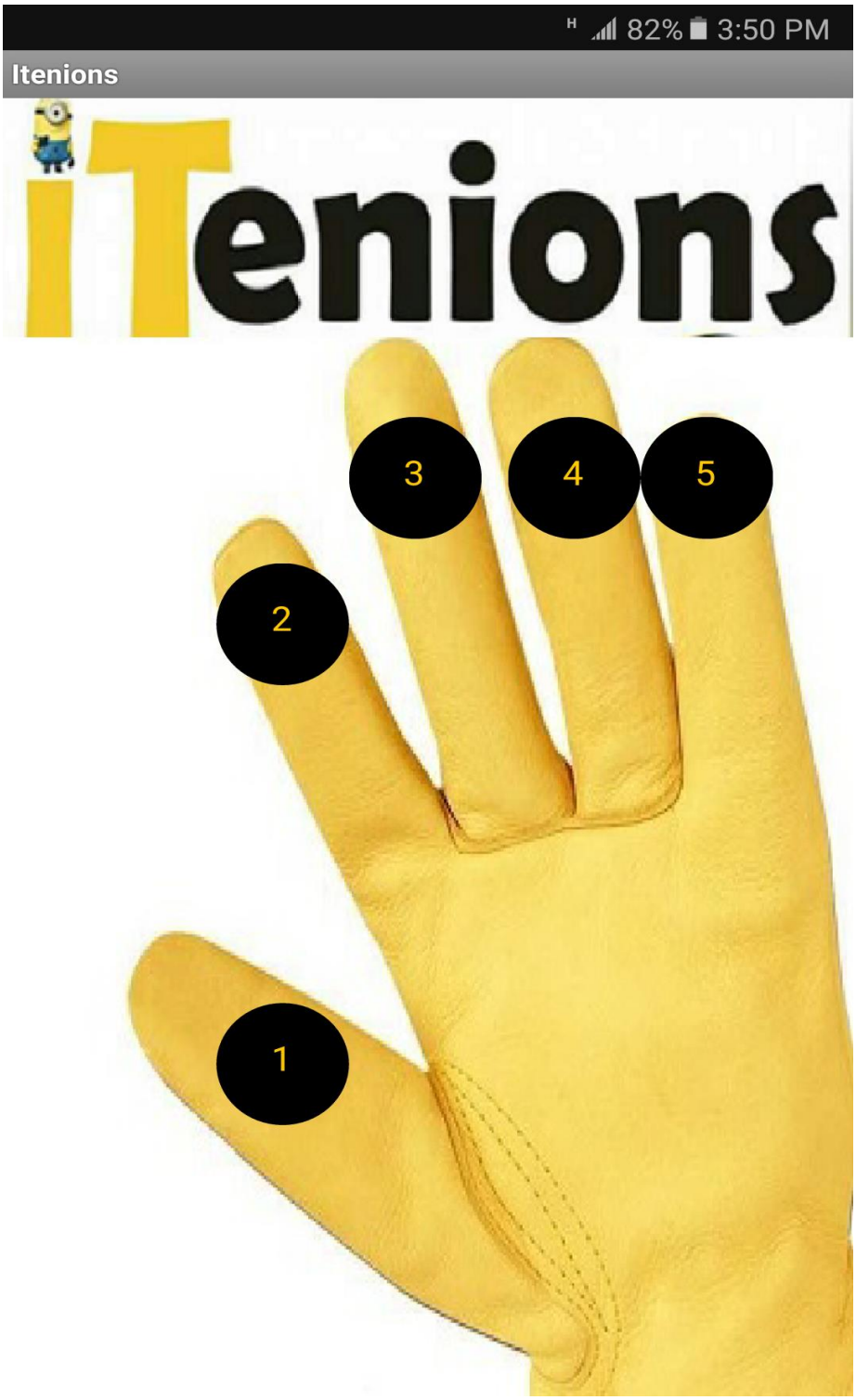


Figure 20: App layout

Chapter 6 Testing

6. 1. Testing

The customized solution has been tested on user level where we have deployed it in testing phase to Superior Lahore University on techno final presentation. We controlled the RC car using our Gesture drive and changed its position backward and forward.

6. 1. 1. White box testing

The white-box testing was done internally among our team members who kept adjusting the values as per need. [4]

6. 1. 2. Black Box Testing

We tested the flex sensor glove with a friend who doesn't know about the algorithm. The same was tested on teachers who controlled the car by using our customized gesture drive set. [5]

6. 2. E-1: Test Case 1

Test case of Checking Working	
Test Case ID: TC-01	***Engineers:*** Kamran,Aramghan,Usman,Iqra,M.usman
Project Name:	Gesture Drive
Purpose:	To check that It is working properly without any delay.
Environment:	*Hard Ground, Surface ,Bumpy surface* Mobile(android)
Expected Results:	Gesture drive will Work properly without any delay.
Observations:	After Pressing on the desired Finger gesture from Glove, user will select the desired Finger Gesture from the Glove and then see the RC Car completely moving.
Result:	Desired Gesture is worked properly.
Re-Test Results:	As above

Table 2: Test Case 1

6. 3. E-2: Test Case 2

Test case of Checking Sensor Accuracy	
Test Case ID: TC-03	***Engineers:*** Kamran,Aramghan,Usman,Iqra,M.usman
Project Name:	Gesture Drive
Purpose:	To check that It's sensors are working without any delay.
Environment:	*Hard Ground, Surface ,Bumpy surface* Mobile(android)
Expected Results:	Gesture drive Sensors will work without any delay.
Observations:	After Pressing on the desired Finger sensor from Glove, user will select the desired Finger sensor from the Glove and then see the RC Car start moving.
Result:	Desired Gesture sensor is working properly.
Re-Test Results:	As above

Table 3: Test Case

6. 4. E-3: Test Case 3

Test case of Bluetooth	
Test Case ID: TC-03	***Engineers:*** Kamran,Aramghan,Usman,Iqra,M.Usman
Project Name:	Gesture Drive
Purpose:	To check that It's Bluetooth connectivity properly without any delay.
Environment:	*Hard Ground, Surface ,Bumpy surface* Mobile(android)
Expected Results:	Gesture drive Bluetooth will connect with other Bluetooth properly without any delay.
Observations:	After Pressing ON button the Bluetooth of gesture drive from Glove, it will connect with the Bluetooth of the RC car it will connect with no delay.
Result:	Desired Gesture Bluetooth is worked properly.
Re-Test Results:	As above

Table 4: Test Case 3

Chapter 7 Summary and Conclusions

7. 1. **Summary**

We have designed a modified solution handset glove which will read the movement of the hand and fingers and will trigger actions against it. Our handset will read the reading from the hand of the user through flex sensors and will perform desired actions i.e. moving wheel chair, controlling appliances, controlling bowling machines, etc.

The Gesture drive is a Pakistan's university final year project, whose core values are ease, trust, enhancement, Automate, services and reliability. Hand mount device will provide complete control the appliances and wheel chairs that are design for the disable persons. In the present world there are many disable persons and cannot do anything without the help of other person. So we are introducing a new innovative product which can help those people to do their daily routine work without the help of others.

Many International companies are working on these type of glove handset and, but there is not a single company who is providing such kind of solution which we are providing to the people. Automobile industry is very large. 9 million people live in just Lahore. Almost 20% people are using technology and rest they are not aware of the technology we want to make aware of the technology and enhancement of the Pakistan's future. With the passage of time number of technology in the world is growing or increasing rapidly. Our target is to introduce this type of the projects to the 40% market initially and Insha'Allah in future we will target the whole country to facilitates with quality services and our commitment.

7. 2. **Lessons I learned**

I get some of the codes such as the Bluetooth driver I coded back in 2016 and then I just ported to this project. The thing or the lessons I have learned here is that as well as observed code can be easily re-assigned or reused and recycled. Therefore, remarking the code is completely value doing. And the second lesson I learned is that we must always have a backup plan. For example, I never expected a flex manufactory would will make that mistake and it will delayed my project vividly. I should already have started my backup planes earlier and it would almost ensure and personally sure about a better quality project. However, in some senses, "it's better late than nothing". Successfully Surviving with a "Plan B" once again confirms that backup plans will be made always and generated through my coming project developments.

7. 3. **Conclusions**

In past people were facing lots of problems due to doing normal routine task and they have to do the work really hard many have lost their precious life's in this line of hard work. They need to depend on others, if they do not want to depend on others, so what is the single thing which is in proper work. That is use your brain and use technology to maintain this type of work with ease. So now time has changed. People want easiness in their life. They need easy solution for doing their task without doing many hard work so the simple solution is that we have to take the benefits of the technology. So our customized gesture drive headset provides a customized solution on their need. They can control any electric task by using our customized gesture drive handset.

Chapter 8 Future Work

8.1 Future Work

As this is the age of innovation and competition and getting the hands on Artificial intelligence everyone is working on the technology day by day. And it is assumed that in near 2019 there will be 4 billion internet of things devices working in the world so this means this will increase day by

day: there may be twists for improvements or we can say enhancements in our gesture drive. We highly appreciate customer's feedback and with the passage of time we will make our products and services more efficient and reliable.

8.1.1 Generating Bill Receipt

In future bills generated on website that will help customers to check out their budget and place orders accordingly. And can add their functionality they wanted to add in their product

8.1.2 Mobile Application

Mobile application is very compulsory for placing order more quickly and efficiently so it will also be added in this regard.

8.1.3 Wi-Fi Module

In the near future we are going to attach it with the Wi-Fi module so that we could control it with internet and also it could move without any distance limitation

Chapter 9 User manual

9.1 User Manuals

Our product is designed for everyone; it would be people working in construction and general public and for the students and also can be used for the children's. The use of our customized gesture drive sensor handset is very easy. Our customer just needs to wear our customized handset which is connected with different electronic things that what you want to control with your fingers or hand through Bluetooth or we can say wirelessly. Your electronic things are connected with any micro controller board. There are Bluetooth to Bluetooth connectivity between flex sensor headset and micro controller board. Gesture drive handsets transmit the signals to the micro controller board and your task will be performed.

Code:

Code of flex sensors:

```
#include <SoftwareSerial.h>
SoftwareSerial BTserial(10, 12);

const int flexPin0 = A0;
const int flexPin1 = A3;

const int flexPin2 = A5;
const int flexPin2 = A7;

int value0;

int value1;


int value2;
int value3;

void setup() {

  Serial.begin(9600);
  BTserial.begin(38400);


}

void loop() {
value0 = analogRead(flexPin0);
value1 = analogRead(flexPin1);
value2 = analogRead(flexPin2);
value2 = analogRead(flexPin3);



   // Serial.print("value1:   ");
  //Serial.println(value1);
 //Serial.print("value2:   ");
// Serial.println(value2);
 Serial.print("value3:   ");
 Serial.println(value3);
 Serial.print("value0:   ");
 Serial.println(value0);
```

```
  if (value1 >= 550) {
    BTserial.write('2');  //sends a 1 through the bluetooth serial link

  }
  else if (value2 >= 600) {
    BTserial.write('3');  //sends a 1 through the bluetooth serial link

  }

else if (value0 >= 800) {
    BTserial.write('4');  //sends a 1 through the bluetooth serial link

  }

else if (value0 >= 1000) {
    BTserial.write('5');  //sends a 1 through the bluetooth serial link

  }



  else  {
    BTserial.write('0');

  }
  delay(400);
}
```

Code of motor driver:

```
#include <SoftwareSerial.h>
SoftwareSerial BTserial(10, 12);

char state = '0';

void setup() {
  // initialize digital pin 8 as an output.

  Serial.begin(9600);
  BTserial.begin(38400);


  pinMode(4, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(7, OUTPUT);
```

```
  digitalWrite(4,LOW);
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);


}

void loop() {

  if (BTserial.available() > 0) { // Checks whether data is comming from the serial port
    state = BTserial.read(); // Reads the data from the serial port
  }


  Serial.println(state);
  // Controlling the LED
  if (state == '2') {
  digitalWrite(4,LOW);
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);


  }
  else if (state == '3'){

      digitalWrite(4, HIGH);
      digitalWrite(5, LOW);


    }
    else if (state == '4'){

      digitalWrite(4, LOW);
      digitalWrite(5, HIGH);


    }
    else if (state == '5'){

      digitalWrite(6, HIGH);
      digitalWrite(7, LOW);


    }else if (state == '6'){

      digitalWrite(6, LOW);
```

```
      digitalWrite(7, HIGH);

   }

   state = '0';
  delay(400);
}
```

Code of website:

```
<!DOCTYPE html>
<head>
        <!--
        Pro Audio
        http://www.templatemo.com/preview/templatemo_429_pro_audio
   -->
        <title>Itenions - Free Responsive Template</title>
        <meta name="keywords" content="" />
        <meta name="description" content="" />
        <meta charset="UTF-8">
        <meta name="viewport" content="width=device-width, initial-scale=1.0">
        <link href='http://fonts.googleapis.com/css?family=Oswald' rel='stylesheet'
type='text/css'>
        <link href='http://fonts.googleapis.com/css?family=Open+Sans:400,600' rel='stylesheet'
type='text/css'>
        <link href="css/font-awesome.min.css" rel="stylesheet">
        <link href="css/bootstrap.min.css" rel="stylesheet" type="text/css">
        <link href="css/templatemo_style.css" rel="stylesheet" type="text/css">
</head>
<body>
        <nav id="responsive-menu">
      <ul class="menu-holder">
        <li><a href="#home"><i class="fa fa-home"></i>Home</a></li>

        <li><a href="#albums"><i class="fa fa-cogs"></i>Albums</a></li>
        <li><a href="#about"><i class="fa fa-list"></i>About</a></li>
        <li><a href="#services"><i class="fa fa-list"></i>Services</a></li>
        <li><a href="#contact"><i class="fa fa-briefcase"></i>Contact</a></li>
                        <li><a href="#subscribe"><i class="fa fa-
briefcase"></i>Subscribe</a></li>
      </ul>
   </nav>
        <div class="templatemo-header">
                <div class="templatemo-header-gradient-bg"></div>
                <div class="container">
                        <h1 class="text-center text-uppercase templatemo-site-name"><span
class="blue">It</span>Enions</h1>
```

```
                    <nav class="hidden-xs text-center text-uppercase templatemo-nav">
                        <ul class="menu-holder">
                            <li class="active"><a href="#home">Home</a></li>

                            <li><a href="#albums">products</a></li>
                            <li><a href="#about">About</a></li>
                            <li><a href="#services">services</a></li>

                            <li><a href="#contact">Contact</a></li>
                            <li><a href="#subscribe">Subscribe</a></li>
                        </ul>
                    </nav>
                    <div class="text-right visible-xs">
                <a href="#" id="mobile_menu"><span class="fa fa-bars"></span></a>
              </div>
                </div>
        </div>
        <div class="templatemo-header-image"></div>
        <div class="container">
                <a href="login.html" class="pull-right btn-gradient margin-top-30 text-
uppercase">login </a>
        <a href="signup.html" class="pull-right btn-gradient margin-top-30 text-
uppercase">signup </a>
                <section id="home" class="templatemo-section">
                    <div class="row">
                        <div class="col-lg-6 col-md-6 col-sm-6 col-xs-12">
                            <img src="images/hand1.jpg" alt="Banner" class="img-
responsive center-block">

                        </div>
                        <div class="col-lg-6 col-md-6 col-sm-6 col-xs-12">
                            <h2 class="text-right">Introduction</h2>

                            <h3 class="text-uppercase text-right margin-top-
30">Itenions (pvt lmtd.)</h3>
                            <p class="text-right margin-top-30"><center>Our product
is smart glove which can control the heavy machineries, home appliances and also sports
equipments through our hand gestures. This product can be language of<text=left> signs for deaf
and dumb</text>.</center></br></br></br>
                             <!--<a rel="nofollow"
href="http://www.smashingmagazine.com/2012/11/20/art-professions-icons-png/">Art
Professions</a> Icon and <a rel="nofollow" href="http://unsplash.com">Unsplash</a> </p> -->
                            <a href="intro.html" class="pull-right btn-gradient margin-
top-30 text-uppercase">more </a>
                        </div>
                    </div>

                <img src="images/border.png" alt="Border" class="templatemo-border">
```

```
                <section id="albums" class="templatemo-section">
                        <h2 class="text-uppercase text-center">products</h2>
                        <div class="row margin-top-50 templatemo-albums-container">
                                <div class="col-lg-6 col-md-6 col-sm-6 templatemo-album">
                                        <div class="templatemo-album-images">
                                                <img src="images/pro.jpg" alt="Album 1"
class="img-circle templatemo-album-img">
                                                <img src="images/album-img-bg.png" alt="Album
background" class="templatemo-album-img-bg">
                                                <img src="images/circle_gray.png" alt="Album
frame" class="templatemo-album-img-frame">
                                        </div>
                                        <div class="templatemo-album-description">
                                                <p class="templatemo-album-name">Cranes</p>
                                                <p class="templatemo-album-artist">Toys</p>
                                                <p class="templatemo-album-date">Cars</p>
                                        </div>
                                </div>
                                <div class="col-lg-6 col-md-6 col-sm-6 templatemo-album">
                                        <div class="templatemo-album-images">
                                                <img src="images/homs.png" alt="Album 2"
class="img-circle templatemo-album-img">
                                                <img src="images/album-img-bg.png" alt="Album
background" class="templatemo-album-img-bg">
                                                <img src="images/circle_gray.png" alt="Album
frame" class="templatemo-album-img-frame">
                                        </div>
                                        <div class="templatemo-album-description">
                                                <p class="templatemo-album-name">Fans</p>
                                                <p class="templatemo-album-artist">Lights</p>
                                                <p class="templatemo-album-date">TV
control</p>
                                        </div>
                                </div>
                                <div class="col-lg-6 col-md-6 col-sm-6 templatemo-album">
                                        <div class="templatemo-album-images">
                                                <img src="images/mil.png" alt="Album 3"
class="img-circle templatemo-album-img">
                                                <img src="images/album-img-bg.png" alt="Album
background" class="templatemo-album-img-bg">
                                                <img src="images/circle_gray.png" alt="Album
frame" class="templatemo-album-img-frame">
                                        </div>
                                        <div class="templatemo-album-description">
                                                <p class="templatemo-album-name">Guns</p>
                                                <p class="templatemo-album-artist">Canons</p>
                                                <p class="templatemo-album-date">Drones</p>
                                        </div>
```

```
                        </div>
                        <div class="col-lg-6 col-md-6 col-sm-6 templatemo-album">
                            <div class="templatemo-album-images">
                                <img src="images/med.jpg" alt="Album 4"
class="img-circle templatemo-album-img">
                                <img src="images/album-img-bg.png" alt="Album
background" class="templatemo-album-img-bg">
                                <img src="images/circle_gray.png" alt="Album
frame" class="templatemo-album-img-frame">
                            </div>
                            <div class="templatemo-album-description">
                                <p class="templatemo-album-name">virtual
surgeries</p>
                                <p class="templatemo-album-artist">voice nodes
for deaf and dumb</p>
                                <p class="templatemo-album-date">Laser bone
cutting devices</p>
                            </div>
                        </div>
                    </div>
                </section>
                <img src="images/border.png" alt="Border" class="templatemo-border">
                <section id="about" class="templatemo-section">
                    <h2 class="text-uppercase text-center">About</h2>
                    <div class="tm-about-img-container">
                        <img src="images/about-frame.png" alt="About frame" class="tm-
about-frame img-responsive">
                        <img src="images/demoo.jpg" alt="About" class="tm-about-img
img-responsive">
                    </div>
                    <p class="margin-top-50 text-center"> To Establish ourselves as the
premier company and training institute for industrial automation and robotics.</br>Our company
basically deals with those products that are associated with scenarios that looked impossible in
past.</br>Our priority first is the customers Satisfaction. Our Company Products are very
reliable and easy to use and also very effective in Use.</br>itenions is a partnership based
company .</p>
                </section>
                <img src="images/border.png" alt="Border" class="templatemo-border">
                <section id="services" class="templatemo-section">
                    <h2 class="text-uppercase text-center">Services</h2>
                    <div class="row margin-top-50">
                        <article class="col-lg-4 col-md-4 col-sm-4 col-xs-12 templatemo-
product">
                            <img src="images/need.png" alt="Product 1"
class="center-block">
                            <h3 class="text-uppercase text-center"></h3>
                            <p class="text-center">Construction is a always a very
hard work to do.Using big machine that need many trained workers etc, hard to find heavy
```

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machinery Drivers and need many people to control many machines at a time. Its difficult to control many machine at a time if you have limited Workers</p>
                        </article>
                        <article class="col-lg-4 col-md-4 col-sm-4 col-xs-12 templatemo-product">
                            <img src="images/ft.jpg" alt="Product 2" class="center-block">
                            <h3 class="text-uppercase text-center"></h3>
                            <p class="text-center">Heavy Machinery control.</br>Sports Equipment control</br>Home Appliances</br>Medical Equipments</br>Military Equipments</br>Sign language converter</br></p>
                        </article>
                        <article class="col-lg-4 col-md-4 col-sm-4 col-xs-12 templatemo-product">
                            <img src="images/solution.jpg" alt="Product 3" class="center-block">
                            <h3 class="text-uppercase text-center"></h3>
                            <p class="text-center">Gesture Drive is a new way of taking control over machinery with the help of just one Hand. It is also a Solution towards the Multitasking</p>
                        </article>
                    </div>
                </section>
                <img src="images/border.png" alt="Border" class="templatemo-border">
                <section id="contact" class="templatemo-section">
                    <h2 class="text-uppercase text-center">Contact</h2>
                    <div class="margin-top-50">
                        <div class="col-lg-6 col-md-6 col-sm-6 col-xs-12">
                    <div id="map-canvas"></div>
                    </div>
                    <div class="col-lg-6 col-md-6 col-sm-6 col-xs-12">
                        <form action="#contact" method="post" class="tm-contact-form">
                            <div class="form-group">
                                <input type="text" id="contact_name" class="form-control" placeholder="Name..." />
                            </div>
                            <div class="form-group">
                                <input type="email" id="contact_email" class="form-control" placeholder="Email..." />
                            </div>
                            <div class="form-group">
                                <input type="text" id="contact_subject" class="form-control" placeholder="Subject..." />
                            </div>
                            <div class="form-group">
                                <textarea id="contact_message" class="form-control" rows="8" placeholder="Your message..."></textarea>
                            </div>
```

```
                        <button type="submit" class="btn text-uppercase tm-dark-bg tm-orange-text tm-send-btn btn-gradient">Send</button>
                    </form>
                        <iframe src="https://www.google.com/maps/embed?pb=!1m10!1m8!1m3!1d13613.44347264889!2d74.27075075!3d31.459257849999997!3m2!1i1024!2i768!4f13.1!5e0!3m2!1sen!2s!4v1509982356497" width="600" height="450" frameborder="0" style="border:0" allowfullscreen></iframe>
                        </section>
                <img src="images/border.png" alt="Border" class="templatemo-border">
                <section id="subscribe" class="templatemo-section">
                    <h2 class="text-uppercase text-center">Subscribe!</h2>
                    <p class="text-center margin-top-50"></p>
                    <img src="images/logo.png" alt="Border" class="img-responsive center-block">
                    <form action="#" method="post" class="margin-top-50 tm-subscribe-form">
            <input type="email" id="subscriber_email" class="center-block" placeholder="Your Email..." />
            <a href="#" class="center-block text-center tm-subscribe-btn">Subscribe to our newsletter</a>
        </form>
                </section>
                    </div>
                    </div>
                </section>
        </div>

        <footer class="templatemo-footer margin-top-50">
                <div class="container">
                    <p class="text-uppercase small templatemo-copyright">Copyright 2017 <a href="#">Itenions</a></p>
                    <img src="images/go-to-top.png" alt="Go to top" class="img-responsive tm-go-to-top">
                </div>
        </footer>
        <script src="js/jquery-1.11.1.min.js"></script>
        <script src="js/templatemo_script.js"></script>
</body>
</html>
```

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