Gesture to Voice Converter Using Arduino

Submitted in partial fulfillment of the requirements

of the degree of

Bachelor of Engineering

in

Electronics and Telecommunication

by

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Under the guidance of

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Department of Electronics and Telecommunication Engineering

Anjuman-I-Islam's Kalsekar Technical Campus
Sector 16, New Panvel , Navi Mumbai
University of Mumbai

2018-19

CERTIFICATE

Department of Electronics and Telecommunication Engineering
Anjuman-I-Islam's Kalsekar Technical Campus
Sector 16, New Panvel , Navi Mumbai
University of Mumbai

This is to certify that the project entitled **Gesture to Voice Converter Using Arduino** is a bonafide work of **Afzal Mohammed Ibrahim (14Det69),Ansari Afaque Javed Alam(14Det70),Sonde Shahrukh Salam(15Det81), Ansari Naushad Ahmed Aslam(16Det51)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of Bachelor of Engineering in Department of Electronics and Telecommunication Engineering.

Supervisor	Examiner
Head of Department	Director

CONTENTS:

Project Report Approval for Bachelor of Engineering

This project entitled **"Gesture to Voice Converter Using Arduino"** by **Afzal Ibrahim, Ansari Afaque, Sonde Shahrukh, Ansari Naushad** is approved for the degree of **Bachelor of Engineeringin Electronics and Telecommunication** .

Examiner

.....

Supervisor

.....

Date;

Place:

Declaration

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Date:

Acknowledgments

We would like to record our appreciation to all people that involve in the writing this report. First of all, our appreciation goes to Electronics and Telecommunication Department for all the guidance especially our teacher, **Prof.Altaf H. Balsingh** for guiding and supporting us until we complete this report successfully. In addition, a lots of love and thanks to our parents who always supported and encouraged us with their loves and hopes. Besides, we are also very grateful to all of our friends especially our classmates for all of the information and help. Certainly, thanks to our entire respondent for their co-operation in answering our questionnaire.

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Abstract

Around 5% of the Indian population has difficulty in speaking or cannot speak.So, sign language is a method of non-verbal communication that is used by deaf and dumb people.

Normal people do not learn sign language. The problem arises here and this problem becomes a barrier between them. The past implementation of this project involved using image processing concept and accelerometer.

But the drawback of these implementations are projects were non portable and too expensive.

In this research paper, we have suggested a wearable glove for people who face difficulty in communicating verbally due to various different reasons (be it deaf or dumb), so that with the possession of this device, they can exhibit their basic requirements via their gestures and those gestures will be converted to speech for the hearer to understand what is he or she trying to say.

This project Gesture to Voice Converter using Arduino is the better way of representing hand movement data to the normal people. It is the manual communication used by mute people for an effective communication. There are only few who can understand the sign language communicated by the mute community. The model is developed with the help of electronic device in a way that translates the sign language into text and speech in order to communicate in public place. A wired glove is used with flex sensors stitched according to the length of each finger. This paper guides to the developing technology such as digital glove. It investigates the qualities of the gadget and examines future wok. The goal of this paper is to provide innovative framework for this technology.

Chapter 1

Introduction

A hard of hearing and unable to speak individual uses gesture based communication for correspondence. Here a glove based gadget acts as a correspondence for trading of data between normal and mute community. Communication via gestures is the dialect utilized by hard of hearing and quiet individuals. The gadget utilises the gestures and converts it into text and voice which is read and understood by the normal people. A motion in a gesture based communication is a specific development of the hands with a particular shape made out of them. A gesture based communication as a rule gives sign to entire words. It can likewise give sign to letters to perform words that don't have relating sign in that communication through signing. In this gadget Flex Sensor assumes the real part, it will sense the change in resistance made on twisting of the sensor. This advanced glove means to bring down this obstruction faced by the mute people. It is electronic gadget that can make an interpretation of Sign dialect into discourse so as to influence the correspondence to occur between the quiet groups with the overall population conceivable.

It can likewise give sign to letters to perform words that don't have comparing Sign in that communication via gestures. Sensor gloves innovation has been used by the mute people, which requests precise following and understanding of gesture based communication.

The paper clarifies the outlining necessities, elements of digitalised gloves. The paper clarifies the outlining necessities, elements of digitalised gloves. This paper guides to build up a couple of signal vocalize gloves. It gives the related work, clarifies the framework design, qualities, favourable circumstances and weaknesses of this gadget. In future the framework would be upgraded to wireless gloves which would be more reliable.

➢ RELATEDWORK.

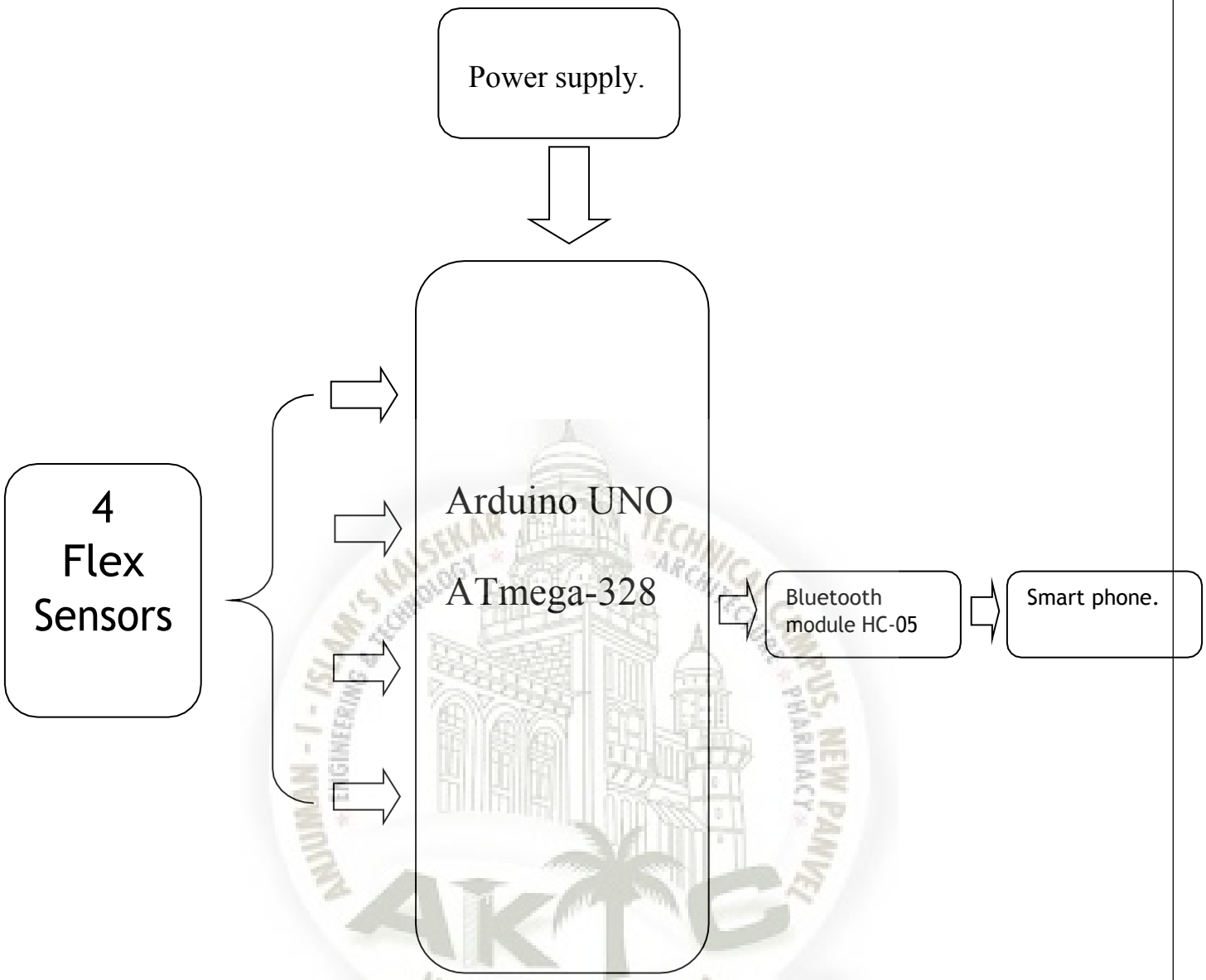
2.1 Microcontroller based Hand Gesture Recognition System using Flex Sensor for Disabled People The signal acknowledgment is finished with the assistance of a sensor glove which comprises of five flex sensors, accelerometer sensor that is best situated in fingers. The plan of glove and the idea of interpreting motion are made conceivable by considering the pivot introduction of the Accelerometer sensor concerning gravity and create some voltage esteems. In view of the voltage esteems the comparing words will be created from the stored templates. [1].

2.2 Hand Gesture Recognition Application for Physically Disabled People D. Vishnu Vardhan Vision based hand motion Recognition framework perceives hand signal in midair, particularly for physically hindered individuals, and gives

perceived character or number as content and comparing sound. Here the hand motions will be caught in type of pictures by the camera. From the caught picture, by advanced picture preparing strategy for each motion developments relating importance of activities will be perceived and shownas the type of content or by voice utilizing amplifier [2].

PROPOSEDWORK.

In this project the sign language translator starts with the Glove, which is the heart of the project. Fig 1 shows the block diagram of the model. The glove contains five flex resistors. Their resistance varies with the change in the direction of fingers. The digital output is fed to the on-chip ADC of the Arduino, thus converting the analog voltages into digital values. The Sign Language is a hand gesture used for manual communication. This type of communication is only understood by few and to make it convenient to the normal people the proposed model works fine. The Look up table is created for the Alphabetical letters which is a simple mapping technique. Here the variable is created that stores ADC values which is compared with the Look up table code. On performing the gesture the resultant equivalent gesture is converted into the voice which would help the normal people to understand the sign language.


Power supply.
4
Flex
Sensors
Arduino UNO
ATmega-328
Bluetooth
module HC-05
Smart phone.

Chapter 2

Litrature Reviews:

1. Sachin Bhat, Amruthesh M, Ashik, Chidanand Das and Sujith:

In their paper, "Translating Indian Sign Language to text and voice messages using flex sensors", in International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 5, May 2015 have designed a Gesture to voice conversion and have concluded that The more reliable, user independent and portable system to convert the sign language to text message form which consumes less power because of the low ultra power AT89S52 microcontroller is designed

2.Priyanka R. Potdar, DR D.M. Yadav:

“Innovative Approach for Gesture to Voice Conversion: Review.” International journal of innovative research and development .vol 3,Issue 6, june2014.have designed Gesture to Voice Conversion and have concluded that completion of the project suggests that these wiredgloves can be used for partial sign language recognition. In future work of this proposed system supporting more number of signs and different language mode.

3.Mr Prashant chaudhari, prof. G.R Phulay and Mr Ravindra Patil

In their paper, "A Review on Hand Gesture Recognition System", in International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 3, January 2013 have designed a Hand Gesture Recognition System and have concluded that data glove can give promising results if used in the field of medicine and also be used for monitoring hand function for rehabilitation purpose.

4.Mr.M.V.N.R.P.Kumar, Mr Ashutosh Kumar, Mr. S.B. Arawandekar Mr. A. A Bhosale, Mr. R.L. Bhosale

“AVR Based Gesture Vocalizer Using Speech Synthesizer IC”. International journal of Research in Advent Technology, vol 3, issue 5, May 2015 have designed Gesture to voice recoginisation project and have concluded that The project aims to lower the communication gap between the deaf or mute community and the normal world. This project was meant to be a prototype to check the feasibility of recognizing sign language using sensor gloves. With this project the deaf or mute people can use he gloves to perform sign language and it will be converted in to speech so that normal people can easily understand.

Chapter 3

TECHNICAL DETAILS.

Methodology.

The user wears a glove that has flex sensors on it. Now when the user wants to say something, he/she makes gestures by bending the fingers. So, different combinations are made with the bending of the flex sensors creating different resistance combinations for the output pin of the Arduino to exhibit different entity. Arduino is connected to Bluetooth module HC - 05; which is further connected to Bluetooth speaker/mobile phone. The flex sensor will give input to Arduino with the bending of the fingers of the person resulting in the change of the angles of the flex sensor hence changing the resistance will trigger the Arduino to give the relevant output as per the code we have written i.e. which combination of resistances will give which entity as my output. Further, when I will have the output, the speaker which is connected to the Bluetooth module will give the speech signal as my output.

This Project Includes the following components:-

(i) Flex Sensors

(ii) Arduino Uno (ATmega328p)

(iii) Bluetooth Module (HC-05)

(iv) Android mobile (to use as an output speaker)

(i) Flex Sensors:

A flex sensor is one of a kind of a variable resistor. It measures the amount of deflection or bend. It's a sensor whose output changes when it is bent i.e. as the sensor is flexed, the resistance across the sensor increases and when it come back to the normal position i.e it is straight, it has lesser resistance as compared to the resistance value when it was bent. This change in resistance is one of the key features being used in our project. The flex sensor has two output wires and the resistance between these two wires varies when the sensor is bent. There are four flex sensors used in this project.

Electrical Specifications:

1. Flat Resistance: 25K Ohms
2. Resistance Tolerance: +-30%
3. Bend Resistance Range: 45K - 125K Ohms (Depending upon bend radius)
4. Power Rating: Continuously 0.50 Watts and 1 Watt Peak.

Working:

Flex sensor are sensors that change in resistance depending on the amount of bend on the sensor. They convert the change in bend to electrical resistance the more bend the more the resistance value. They are usually in the form of a thin strip from 1"-5" long that vary in resistance. They can be made uni-directional and bi-directional.

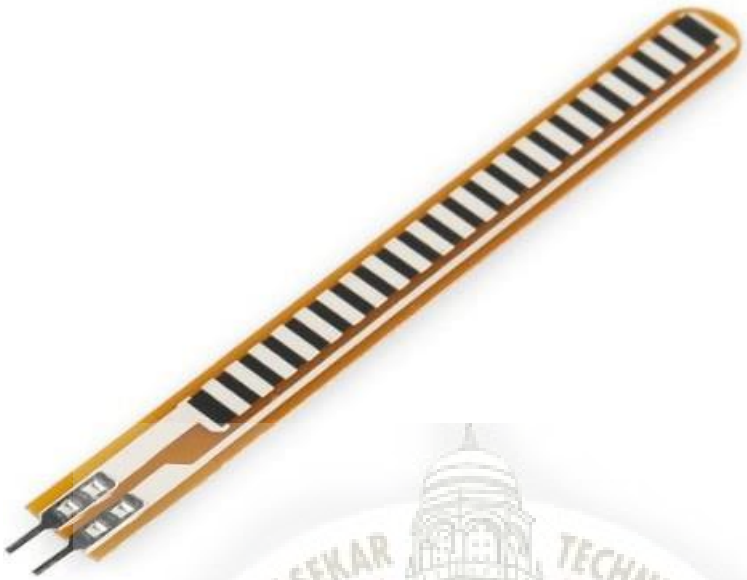


Fig.3(a): Flex sensor.

(ii) Arduino UNO :

We are using Arduino UNO for designing our glove which is a microcontroller board based on the ATmega328P. Arduino is a open source platform that can be used to design various electronic projects. Arduino uno is hardware which is based on microcontroller ATmega 328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Arduino uses its own IDE (Integrated Devlopment Environment) uses a simplified version of C++, making it easier to learn to program.

Features

1. Total Power Output: 3W

2. Impedance Satellite: 4 Ohms

3. Signal to Noise Ratio: 76dB

4. Range: 10m

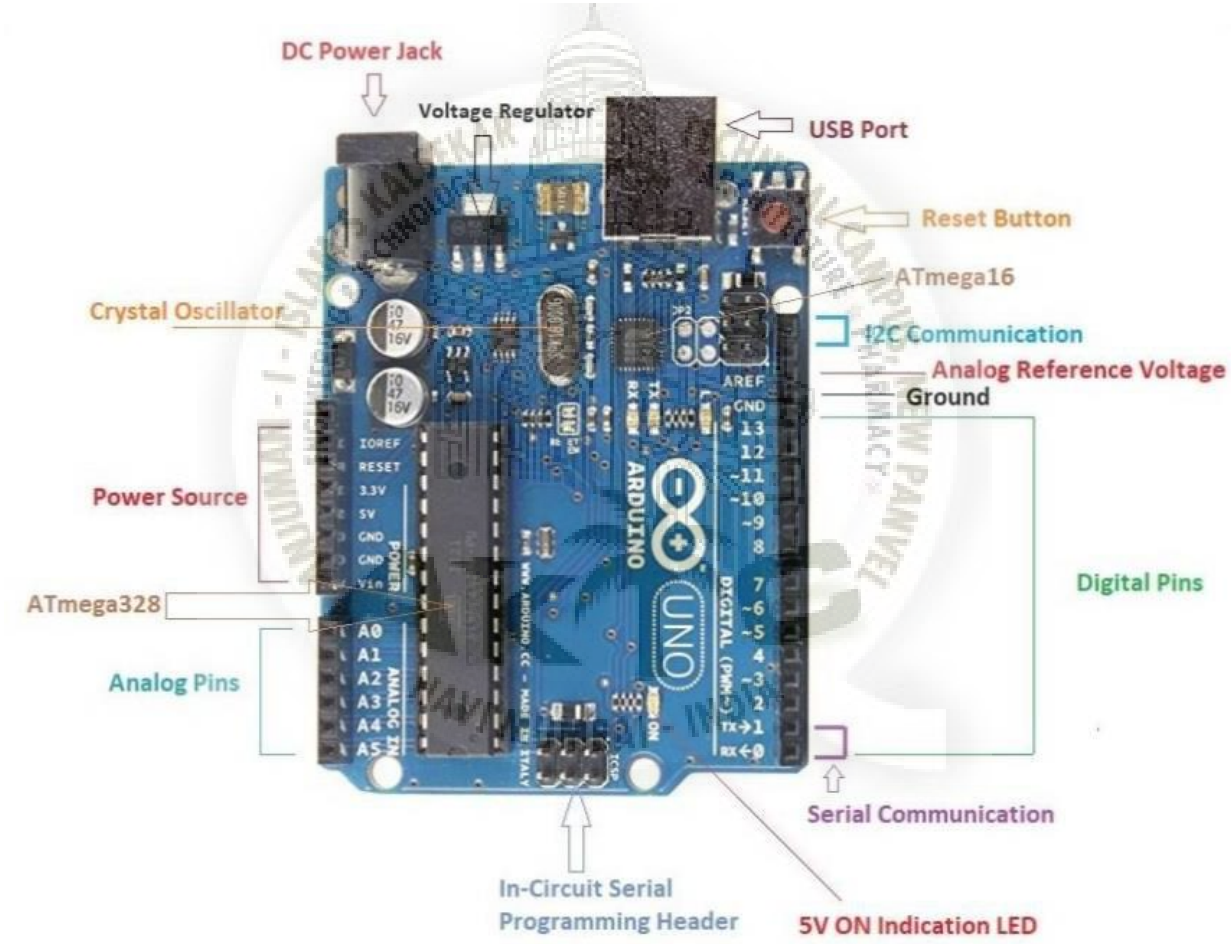
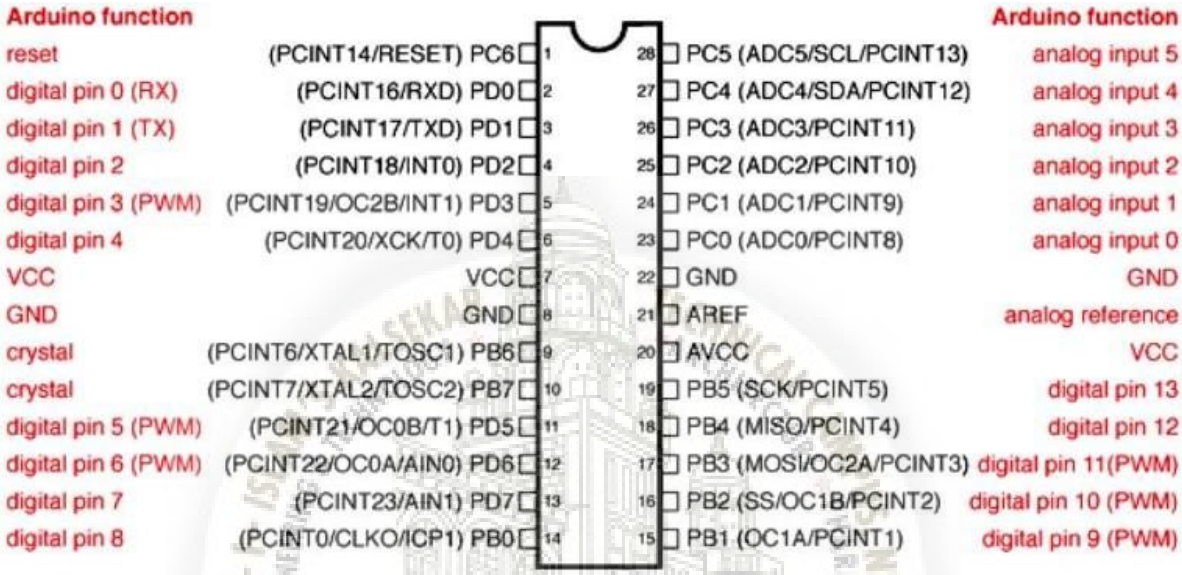


Fig.3(b) Arduino UNO.

Pin diagram:


Arduino function
reset
digital pin 0 (RX)
digital pin 1 (TX)
digital pin 2
digital pin 3 (PWM)
digital pin 4
VCC
GND
crystal
crystal
digital pin 5 (PWM)
digital pin 6 (PWM)
digital pin 7
digital pin 8
(PCINT14/RESET) PC6 1
(PCINT16/RXD) PD0 2
(PCINT17/TXD) PD1 3
(PCINT18/INT0) PD2 4
(PCINT19/OC2B/INT1) PD3 5
(PCINT20/XCK/T0) PD4 6
VCC 7
GND 8
(PCINT6/XTAL1/TOSC1) PB6 9
(PCINT7/XTAL2/TOSC2) PB7 10
(PCINT21/OC0B/T1) PD5 11
(PCINT22/OC0A/AIN0) PD6 12
(PCINT23/AIN1) PD7 13
(PCINT0/CLKO/ICP1) PB0 14
28 PC5 (ADC5/SCL/PCINT13)
27 PC4 (ADC4/SDA/PCINT12)
26 PC3 (ADC3/PCINT11)
25 PC2 (ADC2/PCINT10)
24 PC1 (ADC1/PCINT9)
23 PC0 (ADC0/PCINT8)
22 GND
21 AREF
20 AVCC
19 PB5 (SCK/PCINT5)
18 PB4 (MISO/PCINT4)
17 PB3 (MOSI/OC2A/PCINT3)
16 PB2 (SS/OC1B/PCINT2)
15 PB1 (OC1A/PCINT1)
Arduino function
analog input 5
analog input 4
analog input 3
analog input 2
analog input 1
analog input 0
GND
analog reference
VCC
digital pin 13
digital pin 12
digital pin 11(PWM)
digital pin 10 (PWM)
digital pin 9 (PWM)

Pin Description

Pin Category	Pin Name	Details
Power	Vin, 3.3V, 5V, GND	Vin: Input voltage to Arduino when using an external power source. 5V: Regulated power supply used to power microcontroller and other components on the board. 3.3V: 3.3V supply generated by on-board voltage regulator. Maximum current draw is 50mA. GND: ground pins.
Reset	Reset	Resets the microcontroller.
Analog Pins	A0 – A5	Used to provide analog input in the range of 0-5V
Input/Output Pins	Digital Pins 0 – 13	Can be used as input or output pins.
Serial	0(Rx), 1(Tx)	Used to receive and transmit TTL serial data.
External Interrupts	2, 3	To trigger an interrupt.
PWM	3, 5, 6, 9, 11	Provides 8-bit PWM output.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication.
Inbuilt LED	13	To turn on the inbuilt LED.
TWI	A4 (SDA), A5 (SCA)	Used for TWI communication.
AREF	AREF	To provide reference voltage for input voltage.

Sign Language Table :

S4	S3	S2	S1	Output Voice command
0	0	0	0	Unity
0	0	0	1	Washroom
0	0	1	0	Tea
0	0	1	1	Help
0	1	0	0	Wait/Stop
0	1	0	1	Not well
0	1	1	0	Food
0	1	1	1	Peace
1	0	0	0	I
1	0	0	1	You
1	0	1	0	Lets go
1	0	1	1	OK
1	1	0	0	Thank you
1	1	0	1	Please
1	1	1	0	Call
1	1	1	1	Love

0 – Bend.
1 – Straight.

Bluetooth Module(HC-05):

It is a master - slave module. In our glove, Bluetooth module is taking an input from Arduino, then it is acting as a SLAVE unit and when Bluetooth module is giving an input into the speaker or mobile phone, then it is acting as a MASTER unit.

Fig. Bluetooth module HC-05.

Hardware features

- Typical -80dBm sensitivity
- Up to +4dBm RF transmit power
- Low Power 1.8V Operation ,1.8 to 3.6V I/O
- PIO control
- UART interface with programmable baud rate
- With integrated antenna
- With edge connector

Software features

- Given a rising pulse in PIO0, device will be disconnected.
- Status instruction port PIO1: low-disconnected, high-connected
- Auto-connect to the last device on power as default.
- Permit pairing device to connect as default.
- Auto-pairing PINCODE:"0000" as default

Output.

Here in this project we are going to demonstrate the output on smartphone (with Bluetooth feature), as adding external speaker increases the price of the gadget and external speaker requires power supply, so as we know in todays world everyone has a smartphone or has a phone which has a bluetooth feature, so in order to reduce the size of the project and reduce the cost we have replaced the Bluetooth speaker with a smartphone.

Here the user don't have to carry an external speaker everywhere, instead only a glove is sufficient.

Software Detail:

Here in this project we have used C language programming.
Following steps to be followed in order to in order to prepare the software.

Open Arduino IDE make sure that you have changed your signature as per targeted AVR ATmega

1. Open Arduino IDE

2. File > Examples > Arduino ISP

3. Select Arduino328 from Tools > Board

4. Select your serial port .

5. Burn in your Arduino board.

6. Select Arduino as ISP from Tools > Programmer

7. Select Burn Bootloader

Upload the following code with Arduino UNO in our boot loaded chip (Atmega 328).

```
package com.example.texttospeech;

import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.speech.tts.TextToSpeech;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import java.util.Locale;
import android.widget.Toast;
```

```
public class MainActivity extends AppCompatActivity
   { TextToSpeech t1;
   EditText etInput;
   Button btnRes;

   @Override
   protected void onCreate(Bundle savedInstanceState)
      { super.onCreate(savedInstanceState);
      setContentView(R.layout.activity_main);

      etInput=(EditText)findViewById(R.id.etInput);
      btnRes=(Button)findViewById(R.id.btnRes);

      t1=new TextToSpeech(getApplicationContext(), new
TextToSpeech.OnInitListener() {
         @Override
         public void onInit(int status) {
            if(status != TextToSpeech.ERROR)
               { t1.setLanguage(Locale.UK);
            }
         }
      });

      btnRes.setOnClickListener(new View.OnClickListener()
         { @Override
         public void onClick(View v) {
            String input = etInput.getText().toString();
            String output = ""; if(input.equals("0000"))
```

```
        output = "Unity";
    else if(input.equals("0001"))
        output = "Washroom";
    else if(input.equals("0010"))
        output = "Tea";
```

```
else if(input.equals("0011"))
        output = "Help";
    else if(input.equals("0100"))
        output = "Wait or Stop";
    else if(input.equals("0101"))
        output = "Not Well";
    else if(input.equals("0110"))
        output = "Food";
    else if(input.equals("0111"))
        output = "Peace";
    else if(input.equals("1000"))
        output = "I";
    else if(input.equals("1001"))
        output = "You";
    else if(input.equals("1010"))
        output = "Let's go";
    else if(input.equals("1011"))
        output = "Ok";
    else if(input.equals("1100"))
        output = "Thank You";
```

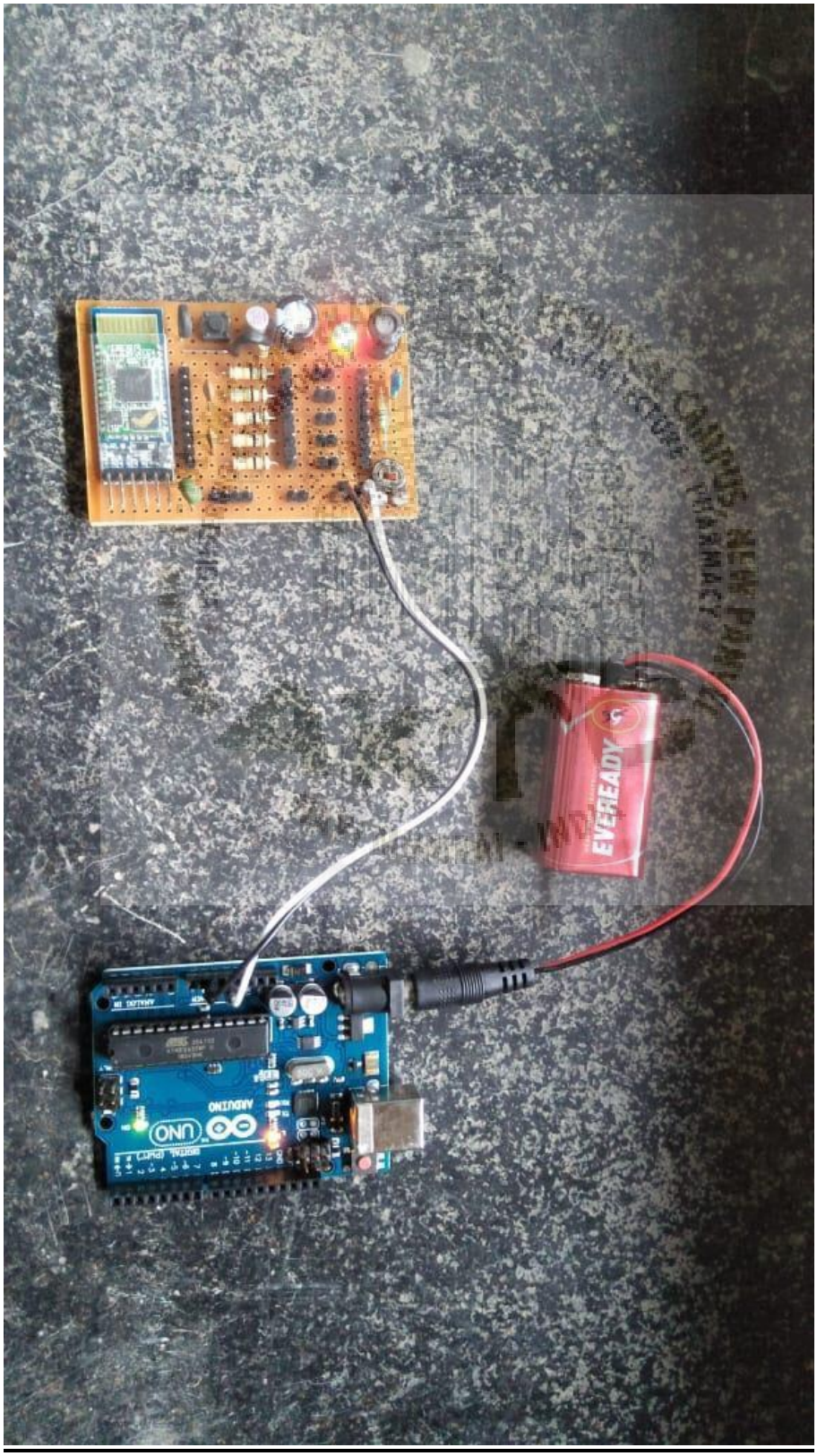
```
        else if(input.equals("1101"))
            output = "Please";
        else if(input.equals("1110"))
            output = "Call";
        else if(input.equals("1111"))
            output = "Love";
        Toast.makeText(getApplicationContext(),
output,Toast.LENGTH_SHORT).show();
        t1.speak(output, TextToSpeech.QUEUE_FLUSH, null);
      }
    });
  }

  public void onPause()
    { if (t1 != null) {
      t1.stop();
      t1.shutdown();
    }
    super.onPause();

  }
}
```

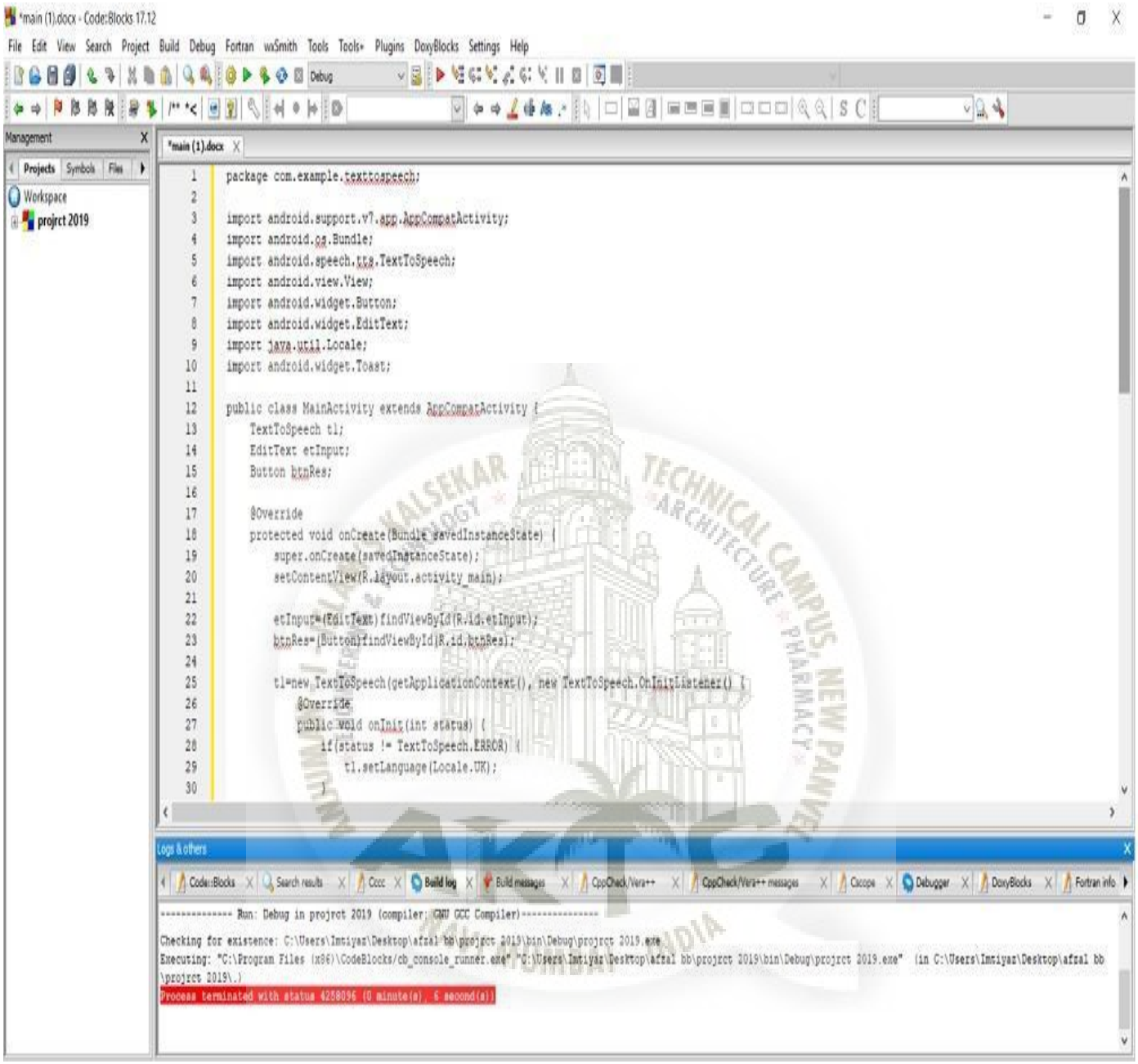
Chapter: 4
Conclusion and Discussion.

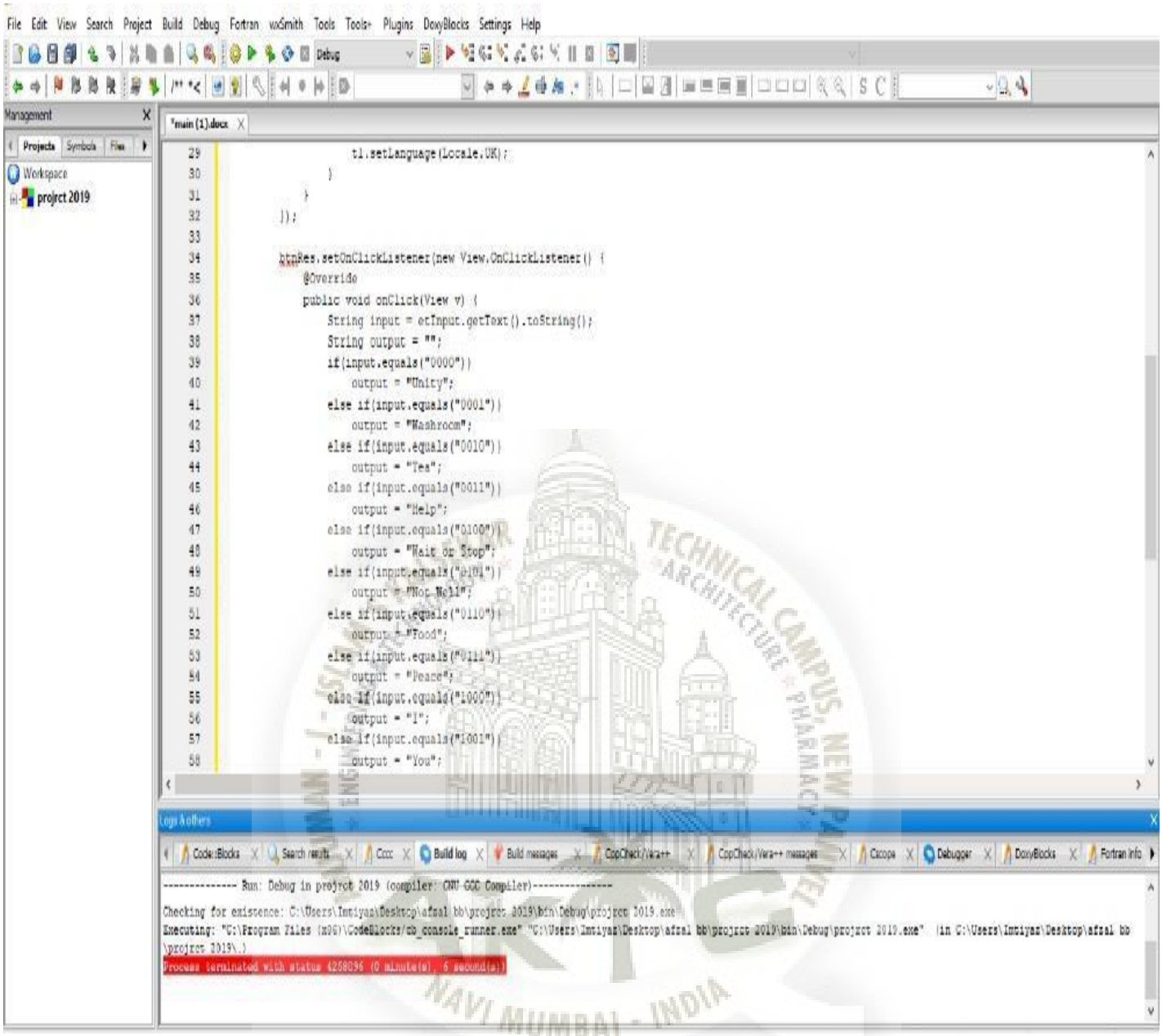
Here is some images of the project hardware.

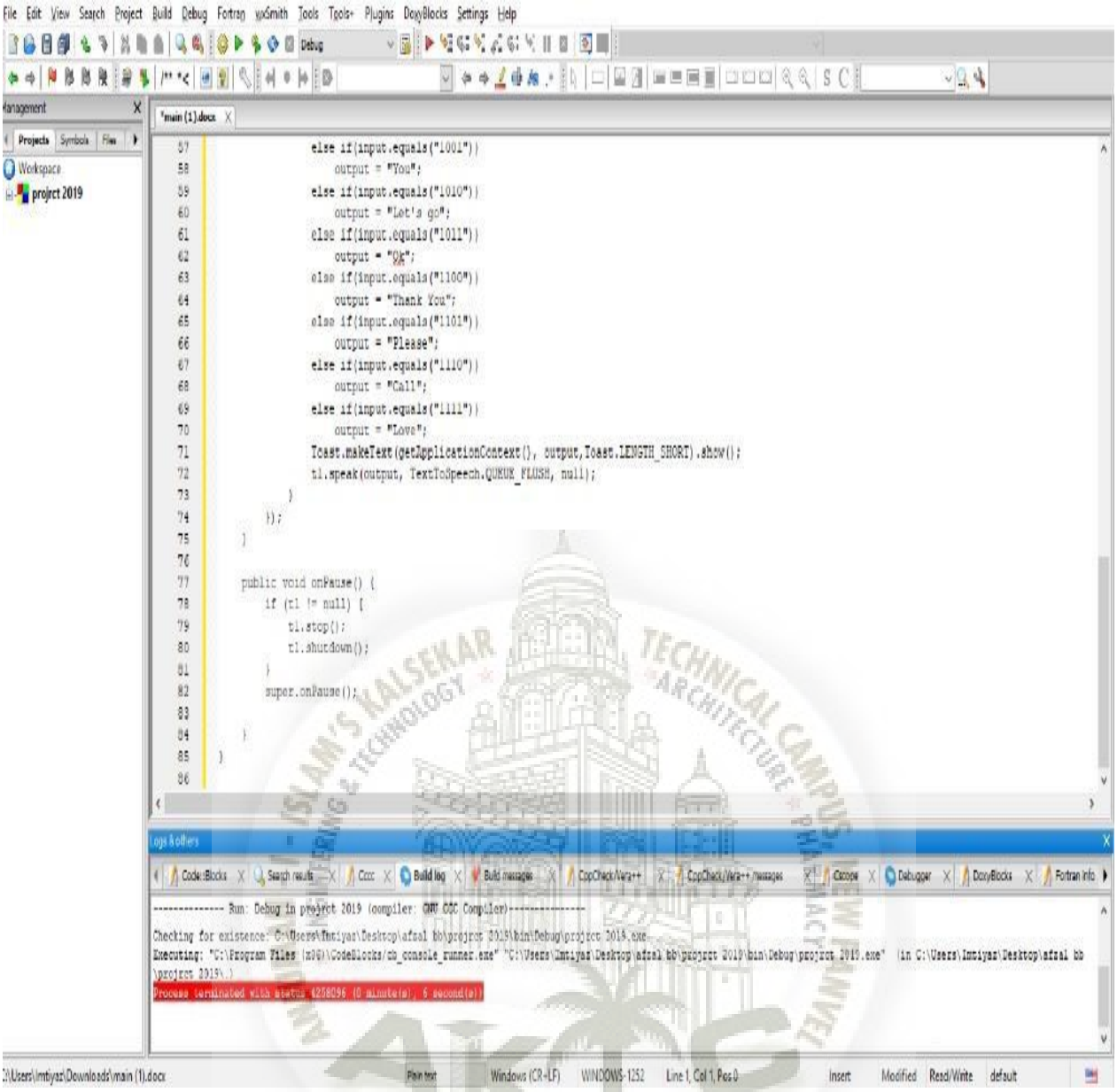



UNO
ARDUINO
EVEREADY

And here there are some images of c language programme we used.




File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help
Management
Projects Symbols Files
Workspace
project 2019
*main (1).docx
tl.setLanguage(Locale.UK);
}
}
});
btnRes.setOnClickListener(new View.OnClickListener() {
@Override
public void onClick(View v) {
String input = etInput.getText().toString();
String output = "";
if(input.equals("0000"))
output = "Unity";
else if(input.equals("0001"))
output = "Washrocm";
else if(input.equals("0010"))
output = "Tea";
else if(input.equals("0011"))
output = "Help";
else if(input.equals("0100"))
output = "Wait or Stop";
else if(input.equals("0101"))
output = "Not Well";
else if(input.equals("0110"))
output = "Food";
else if(input.equals("0111"))
output = "Peace";
else if(input.equals("1000"))
output = "I";
else if(input.equals("1001"))
output = "You";
Logs & others
Code::Blocks
Search results
Cccc
Build log
Build messages
CppCheck/Vera++
CppCheck/Vera++ messages
Cscope
Debugger
DoxyBlocks
Fortran info
---------- Run: Debug in project 2019 (compiler: GNU GCC Compiler)----------
Checking for existence: C:\Users\Imtiyaz\Desktop\afsal bb\project 2019\bin\Debug\project 2019.exe
Executing: "C:\Program Files (x86)\CodeBlocks/cb_console_runner.exe" "C:\Users\Imtiyaz\Desktop\afsal bb\project 2019\bin\Debug\project 2019.exe" (in C:\Users\Imtiyaz\Desktop\afsal bb
\project 2019\.)
Process terminated with status 4258096 (0 minute(s), 6 second(s))


File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help
Debug
Management
Projects Symbols Files
Workspace
project 2019
*main (1).docx
else if(input.equals("1001"))
output = "You";
else if(input.equals("1010"))
output = "Let's go";
else if(input.equals("1011"))
output = "Ok";
else if(input.equals("1100"))
output = "Thank You";
else if(input.equals("1101"))
output = "Please";
else if(input.equals("1110"))
output = "Call";
else if(input.equals("1111"))
output = "Love";
Toast.makeText(getApplicationContext(), output,Toast.LENGTH_SHORT).show();
t1.speak(output, TextToSpeech.QUEUE_FLUSH, null);
});
}
public void onPause() {
if (t1 != null) {
t1.stop();
t1.shutdown();
}
super.onPause();
}
}
Logs & others
Code::Blocks
Search results
Cccc
Build log
Build messages
CppCheck/Vera++
CppCheck/Vera++ messages
Cscope
Debugger
DoxyBlocks
Fortran info
Run: Debug in project 2019 (compiler: GNU GCC Compiler)
Checking for existence: C:\Users\Imtiyaz\Desktop\afzal bb\project 2019\bin\Debug\project 2019.exe
Executing: "C:\Program Files (x86)\CodeBlocks/cb_console_runner.exe" "C:\Users\Imtiyaz\Desktop\afzal bb\project 2019\bin\Debug\project 2019.exe" (in C:\Users\Imtiyaz\Desktop\afzal bb\project 2019\.)
Process terminated with status 4258096 (0 minute(s), 6 second(s))
C:\Users\Imtiyaz\Downloads\main (1).docx
Plain text
Windows (CR+LF)
WINDOWS-1252
Line 1, Col 1, Pos 0
Insert
Modified
Read/Write
default

➢ Application:

The main application of this project is to provide aid for the speech-impaired to communicate with those who do not know the sign language. Due to the simplicity of the model, it can also be implemented in smartphones and is regarded as our future plan to do so.

➢ Future Scope:

In future development of this project may include different languages, and may be more portable size.
It may also include a gps tracker for the safety of the person,
It may include the whole conversation as here we have only added the basic gestures which are needed in case of emergency such as drinking, washroom and some more gestures.

Chapter: 5

Achievements.

Universal College of Engineering

Accredited with B+ Grade by NAAC

Near Bhajansons & Punyadham, Kaman Bhiwandi Road, Vasai.

(Permanently Unaided | Approved by AICTE, DTE & Affiliated to University of Mumbai)

DTE Code: 3460

in association with I.E.T.E. - I.S.F. & I.S.A.

5th National Level Project Exhibition cum Poster and Paper Presentation

Certificate of Participation

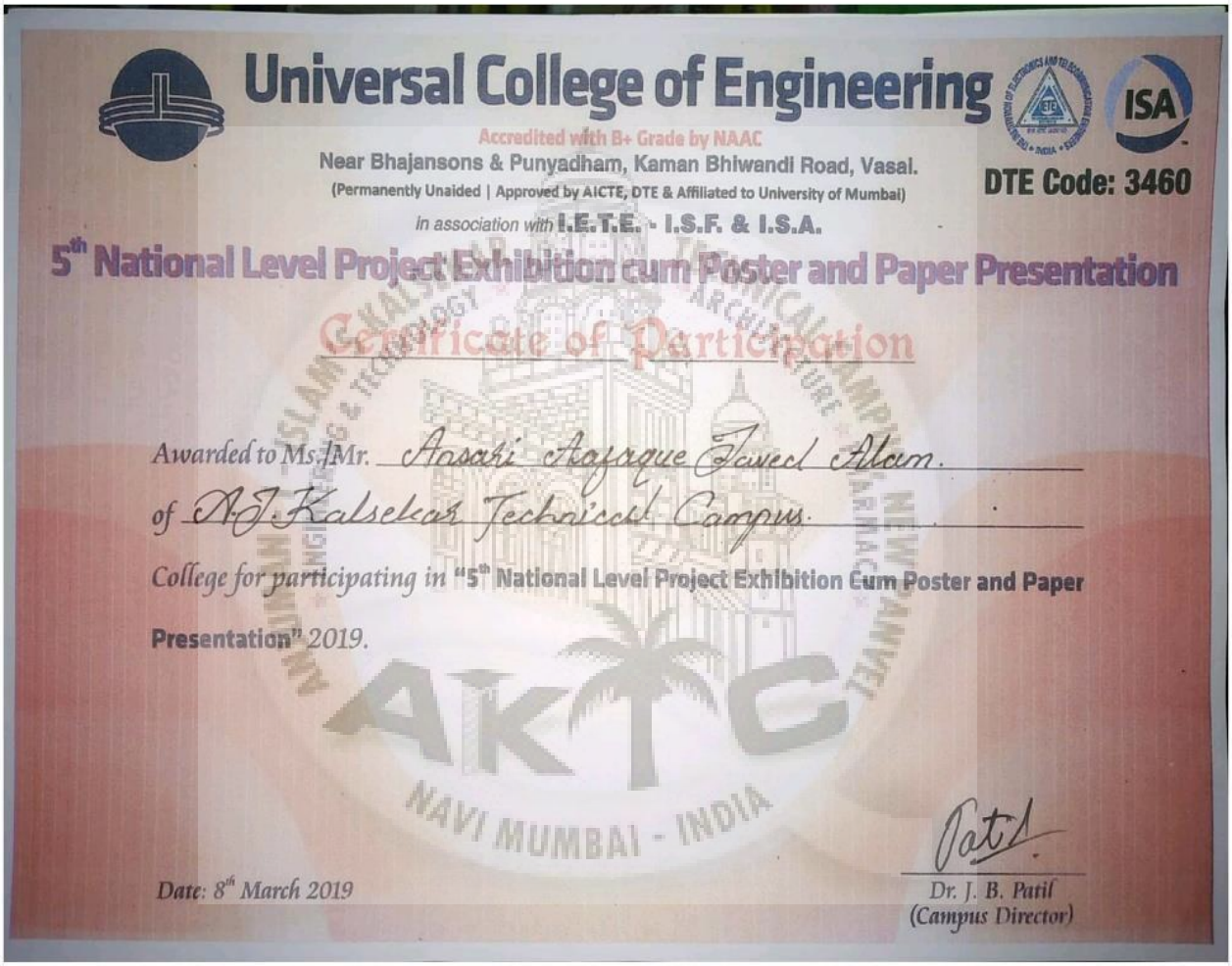
Awarded to Ms./Mr. Ansari Naushad Aslam

of A.J. Kalsekar Technical Campus

College for participating in "5th National Level Project Exhibition Cum Poster and Paper Presentation" 2019.

Date: 8th March 2019

Dr. J. B. Patil
(Campus Director)



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Date: 8th March 2019

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Date: 8th March 2019

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