

SIGN LANGUAGE TO SPEECH CONVERSION

Submitted in partial fulfilment of the requirements for the completion of

INTERDISCIPLINARY PROJECT

By

ALLA YASWANTH GANESH (Reg. No. 40860005)

ANSHUL MALATHKAR (Reg. No. 40860006)

ASHWIN S (Reg. No. 40090003)

YOGESH G (Reg. No. 40090706)



DEPARTMENT OF AUTOMOBILE ENGINEERING

SCHOOL OF MECHANICAL ENGINEERING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI – 600119

APRIL 2023



SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with "A" grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119
www.sathyabama.ac.in



DEPARTMENT OF AUTOMOBILE ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **ALLA YASWANTH GANESH** (Reg. No. 40860005), **ANSHUL MALATHKAR** (Reg. No. 40860006), **ASWIN S** (Reg. No. 40090003) and **YOGESH G** (Reg. No. 40090706) who carried out the Interdisciplinary Project entitled **SIGN LANGUAGE TO SPEECH CONVERSION** under our supervision from February 2023 to April 2023.

Dr. DILLIP KUMAR SAHOO., M.E., Ph. D

External Guide
Dr PRAKASH M.E., Ph D
External Guide

Dr PRAKASH M.E., Ph D

Head of the Department
Dr. V.K. BUPESH RAJA., M.E., Ph. D

Submitted for Viva voce Examination held on 28/04/2022

Internal Examiner

External Examiner

DECLARATION

I **ALLA YASWANTH GANESH** (Reg.No. **40860005**) hereby declare that the Project Report entitled **SIGN LANGUAGE TO SPEECH CONVERSION** done by me under the guidance of **Dr. DILLIP KUMAR SAHOO., M.E., Ph. D.,** and **Dr PRAKASH M.E., Ph D**, is submitted in partial fulfilment of the requirements for the completion of Interdisciplinary Project.



DATE: 28.04.2022

SIGNATURE OF THE CANDIDATE

PLACE: CHENNAI

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my sincere thanks to **Dr. S. Prakash, M.E., Ph.D.**, Dean, School of Mechanical Engineering and **Dr. V.K. BUPESH RAJA ,M.E., Ph. D**, Head of the Department, Department of Automobile Engineering for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Internal Guide **Dr. DILLIP KUMAR SAHOO., M.E., Ph. D**, and External Guide **Dr PRAKASH M.E., Ph D** , for their valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work.

I also express my thanks to all Teaching and Non-teaching staff members of the Department of Mechanical Engineering who were helpful in many ways for the completion of the project work.

ABSTRACT

Sign language is mostly used by deaf and dumb people as their mother tongue. Sign language uses the hand gestures. In general, deaf people have problem in communicating with other people, who unable understand sign language. The Objective of the project is to design a smart glove for sign language translation that helps an easy way of communication for speech impaired or hearing-impaired people. In this project, glove need to be equipped with sensors such as Flex sensor. Flex sensors are placed on fingers which measure the bending of fingers according to a gesture made. They convert the change in bend to electrical resistance, the more the bend, more the resistance value. The output from the sensor is in analog in nature and is converted to digital and compared the output of sensors with prestored values in controller (Arduino UNO) .this values are then displayed using the lcd display. This also help normal person to understand what he is trying say and reply accordingly. This also aims to design a health care system which will be helpful for paralyzed and mute people

TABLE OF CONTENTS

CHAPTER No.	TITLE	PAGE No.
	ABSTRACT	1
	LIST OF FIGURES	4
	LIST OF TABLES	5
1	INTRODUCTION	6
	1.1 Project objective	7
	1.2 project outline	7
	2.1 sign languages	7
	2.1.1 American sign languages	8
	2.1.2 British,Australian and Newzealand sign language	9
		9
	2.1.3 Chinese sign language	9
	2.1.4 French sign language	10
	2.1.5 Japaneese sign language	10
	2.1.6 Arabic signs	11
	2.1.7 Spanish signs	11
	2.1.8 Mexicon signs	11
	2.2 standard signs	12
		13
	2.3 Advantages	13
2	LITERATURE SURVEY	14
3	CHAPTER 2	16
	SENSORS AND COMPONENTS	16

CHAPTER No.	TITLE	PAGE No.
4	MATERIALS AND EXPERIMENTAL METHOD	16
	MATERIALS USED	16
	Flex sensor	17
	Flex simulation	19
	Arduino UNO	19
	Arduino simulation	22
	CODE USED	28
	Methodology	33
5	RESULTS AND DISCUSSION	35
	FUTURE SCOPE	35
6	SUMMARY AND CONCLUSION	36
	6.1 CONCLUSION	36
7	REFERENCES	37
	APPENDIX	

LIST OF FIGURES

FIGURE No	TITLE	PAGE No.
2.1	American signs	8
2.2	British and Australia signs	9
2.3	Chinese signs	9
2.4	French signs	10
2.5	Japanese signs	10
2.6	Arabic signs	11
2.7	Spanish signs	12
2.8	Mexican signs	12
2.9	Standard signs	13
3.1	Flex sensors	17
3.2	Flex Working	18
3.3	I2c interface	19
3.4	Arduino uno	20
3.5	DF mini player	23
3.6	Speaker	25
3.7	Circuit diagram	26
3.8	Block diagram	27
5.9	Methodology	28

LIST OF TABLES

TABLE No	TITLE	PAGE No.
3.1	DF MINI PLAYER DISCRIPTION	24

1 INTRODUCTION

Impact of hearing and speech can cause people to become no friends or company and lonely, having worse effect on both their social and working life. Here Looking up the meaning of a sign is not a straightforward task. The Sign Language is a well structured code gesture where every gesture has a meaningful assigned to it. Sign Language is the only means of communication for hard of hearing people. With advancement of science and technology many research and technique have been developed not only to minimize the difficulty of deaf and dumb people but also to implement in different working fields. Sign language is a language which instead of voice or sound patterns uses human communication and body language to convey the meaning. This involves mostly the mixing of shapes, orientation and movement of the hands. Sign language is not only used by deaf but also who can hear, but cannot physically speak to any other people. The Sign language is the language used by deaf and mute people that uses gesture's instead of sound to convey or to express fluidly a speaker's thoughts. A gesture in a sign language is a particular movement of the hands with a specific symbol made out of them. The main objective of this paper is to present system that can efficiently translate Sign Language gestures to auditory voice. Several languages are being spoken all around the anywhere in the world. So this system aims to give the voice output in different regional languages.

1.1 PROJECT OBJECTIVE

The Aim of the project is to develop a hand glove equipped with sensors such as Flex sensor.

Firstly sensors were simulated to extract the sensed data. Secondly the sensed data from sensors is sent to Arduino UNO board for further processing and transfer data to A LCD display. The data will be in the form of text. This text data is then converted into speech.

1.2 PROJECT OUTLINE

This project report is presented over the four remaining chapters. describes the sign languages. presents the principle of operation of sensors and various components used in the project. explains the concepts of Arduino programming. It presents the simulation results of the various signs simulated using the Arduino simulator.

1.2.1 SIGN LANGUAGE DESCRIPTION

Sign languages are visual languages that use hand, facial and body movements as a means of communication. There are over 135 different sign languages all around the world including American Sign Language (ASL), Australian Sign Language (Auslan) and British Sign Language (BSL). There are also signed representations of oral languages such as Signed Exact English (SEE) and mixes such as Pidgin Signed English (PSE).

Sign language is commonly used as the main form of communication for people who are deaf or hard of hearing, but sign languages also have a lot to offer for everyone. Sign languages are an extremely important communication tool for many deaf and hard-of-hearing people. Sign languages are the native languages of the Deaf community and provide full access to communication. Although sign languages are used primarily by people who are deaf, they are also used by others, such as people who can hear but can't speak.

People who know a sign language are often much better listeners. When using a sign language, a person must engage in constant eye contact with the person who is speaking. Unlike spoken language, with sign languages a person cannot look away from the person speaking and continue to listen. This can be an extremely beneficial habit to have for spoken language as well as sign language. By maintaining eye contact in spoken language, it shows that a person is genuinely interested in what the other is saying.

2.1 Different Sign Languages

2.1.1 American Sign Language (ASL):

Although ASL has the same alphabet as English, ASL is not a subset of the English language. American Sign Language was created independently and it has its own linguistic structure. (It is, in fact, descended from Old French Sign Language.) Signs are also not expressed in the same order as words are in English. This is due to the unique grammar and visual nature of the sign language. ASL is used by roughly half a million people in the world.



Fig 2.1

2.1.2 British, Australian and New Zealand Sign Language (BANZSL):

Sharing a sign language alphabet is British Sign Language, Australian Sign Language (Auslan) and New Zealand Sign Language. Unlike ASL, these alphabets use two hands, instead of one and it is shown in fig.2.2

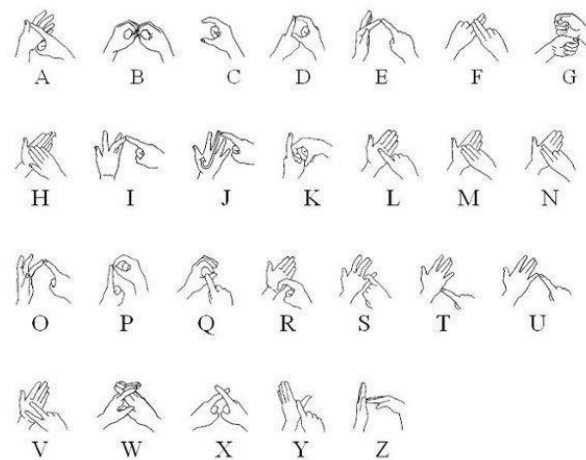
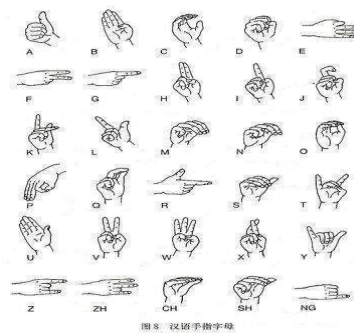


Fig 2,2

2.1.3 Chinese Sign Language (CSL):

CSL's signs are visual representations of written Chinese characters, they use a one handed alphabet as shown in fig.2.3. There are many CSL dialects but the Shanghai dialect is the most common. The language has been developing since the late 1950's and The Chinese National Association of the Deaf, is working hard to raise awareness and promote use of the language throughout the country

Fig 2.3



French Sign Language is similar to ASL - since it is in fact the origin of ASL - but there are minor differences throughout. LSF also has a pretty fascinating history. LSF is shown in fig.2.4

French Sign Language is similar to ASL - since it is in fact the origin of ASL - but there are minor differences throughout. LSF also has a pretty fascinating history. LSF is shown in fig.2.4

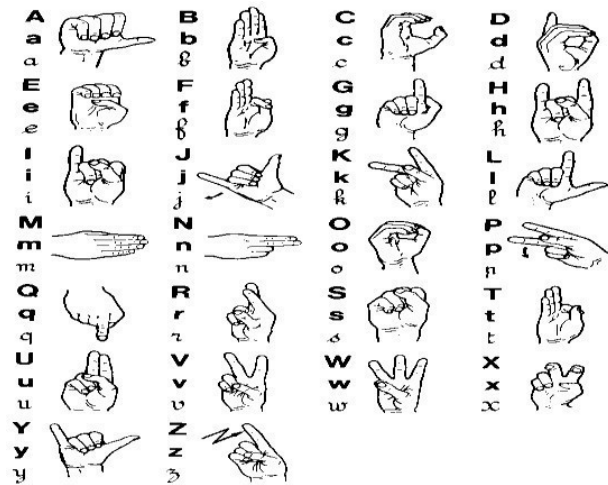


Fig 2.4

2.1.5 Japanese Sign Language (JSL) Syllabary:

The Japanese Sign Language (JSL) Syllabary is based on the Japanese alphabet, which is made up of phonetic syllables. JSL is known as Nihon Shuwa in Japan and as shown in fig.2.5

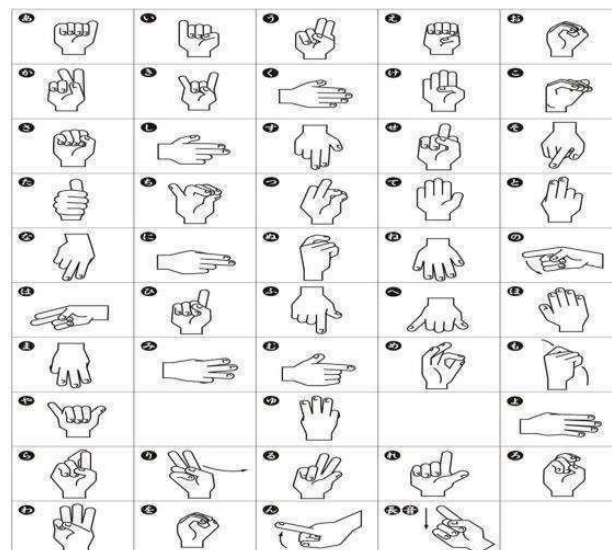


Fig 2.5

2.1.6 Arabic Sign Language:

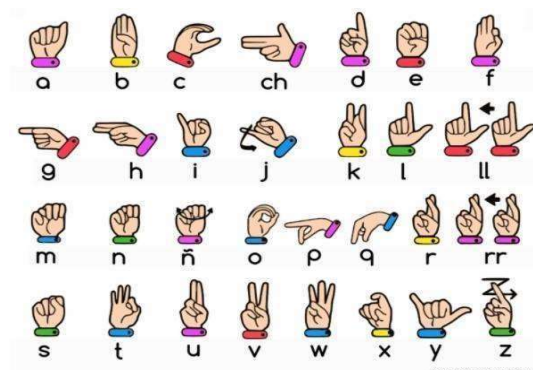
The Arab sign-language family is a family of sign languages across the Arab Mideast. Data on these languages is somewhat scarce, but a few languages have been distinguished, including Levantine Arabic Sign Language. Arabic sign language is shown in fig.2.6



Fig 2.6

2.1.7 Spanish Sign Language (LSE):

Spanish Sign Language is officially recognized by the Spanish Government. It is native to Spain, except Catalonia and Valencia. Many countries that speak Spanish do not use Spanish Sign Language! (See Mexican Sign Language below, for example.) SSL is mainly used in Spain and there is an estimated 100,000 signers of SSL. SSL is completely different from ASL, in the same way that English is different from Spanish. SSL is used across all of Spain, except in Catalonia which uses Catalan Sign Language and Valencia which uses Valencian Sign Language. LSE is shown in fig.2.7



2.1.8 Mexican Sign Language (LSM):

Mexican Sign Language ('lengua de señas mexicana' or LSM) is different from Spanish, using different verbs and word order. The majority of people who use Mexican Sign Language reside in Mexico City, Guadalajara and Monterrey. Variation in this language is high between age groups and religious backgrounds. LSM is shown in fig.2.8

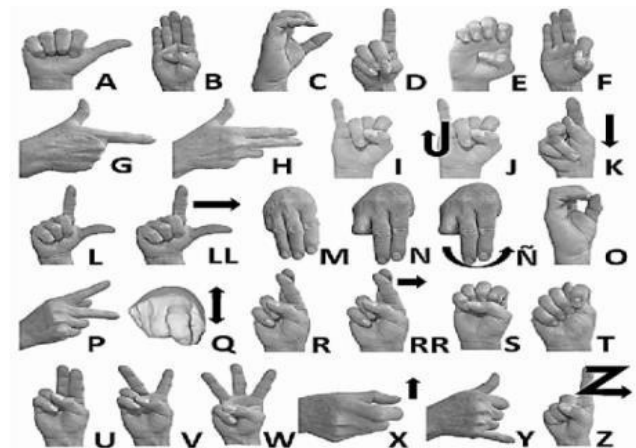


Fig 2.8

2.2 STANDARD SIGNS

There is no universal sign language. Different sign languages are used in different countries or regions. For example, British Sign Language (BSL) is a different language from ASL, and Americans who know ASL may not understand BSL. Some countries adopt features of ASL in their sign languages.

It's not always practical to spell out words for everyday interactions. That's where these expressions come in handy! And are as shown in fig.2.9. We can use common expressions to meet people, show your appreciation, and communicate with friends. It becomes easy for impaired persons to communicate with normal persons.



Fig 2.9

2.3 ADVANTAGES

1. It reduces frustration.
2. It increases self esteem.
3. It enhances languages and listening skills.
4. It enriches relationships.
5. It provides a window into your child's world.
6. It increases their IQ

LITRATURE SURVEY

1. Recognition of Tamil Sign Language Alphabet using Image Processing to aid Deaf-Dumb People

This paper proposes a method that provides the conversion of a set of 32 combination of the binary number 25 which represents the UP and DOWN positions of fiver fingers into decimal numbers. For the conversion of binary numbers, Palm Extraction method, Feature point extraction method, training phase and testing phase are used.

2. Sign Language Recognition and Translation: A Multidisciplined Approach From the Field of Artificial Intelligence

In recent years, research has progressed steadily in regard to the use of computers to recognize and render sign language. This paper reviews significant projects in the field beginning with finger-spelling hands such as “Ralph” (robotics), Cyberloves (virtual reality sensors to capture isolated and continuous signs), camera-based projects such as the Copycat interactive American Sign Language game (computer vision), and sign recognition software

3. Hidden Markov model for human to computer interaction: A study on human hand gesture recognition

Human hand recognition plays an important role in a wide range of applications ranging from sign language translators, gesture recognition, augmented reality, surveillance and medical image processing to various Human Computer Interaction (HCI) domains.

4. A real-time continuous gesture recognition system for sign language

A large vocabulary sign language interpreter is presented with real-time continuous gesture recognition of sign language using a data glove. Sign language, which is usually known as a set of natural language with formal semantic definitions and syntactic rules, is a large set of hand gestures that are daily used to communicate with the hearing impaired.

CHAPTER 2

SENSORS AND COMPONENTS

The proposed system consists of primarily two sections:

1. Transmitter Section

2. Receiver Section.

The devices contained in the transmitter section are:

1. Flex sensors
2. DF Mini Player
3. 16*2 Display
4. I2c Module
5. Arduino Uno R3.
6. Speaker
7. Resistor
8. Jumper Wires

The gloves contain flex sensors which are the main sensors for this product. They are devices which can show variable resistance based on various bend angles. The sensors are connected in a voltage divider circuit such that the resultant analog voltage is sent to one analog port of the micro-controller. The glove is mounted with 4 flex sensors, each on one finger of the glove except the thumb finger.

3.1 FLEX SENSORS

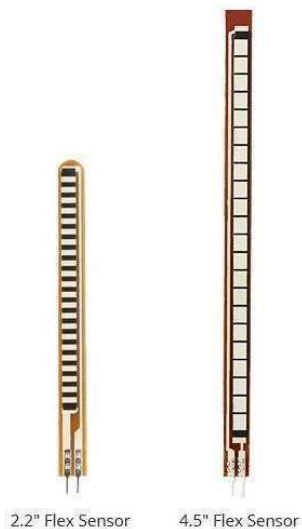
A **flex sensor** or **bend sensor** is a low-cost and easy-to-use sensor specifically designed to measure the amount of deflection or bending. It became popular in the 90s due to its use in the Nintendo Power Glove as a gaming interface. Since then

people have been using it as a goniometer to determine joint movement, a door sensor, a bumper switch for wall detection or a pressure sensor on robotic grippers.

3.1.1 Flex Sensor overview

A flex sensor is basically a variable resistor that varies in resistance upon bending. Since the resistance is directly proportional to the amount of bending, it is often called a **Flexible**

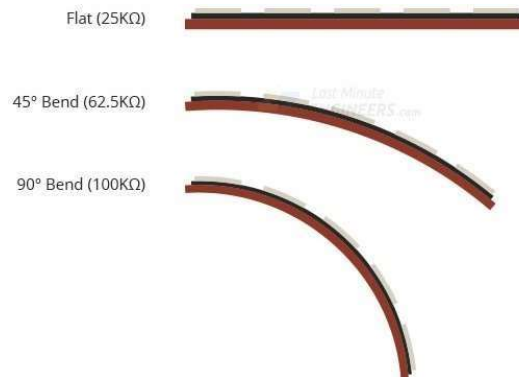
Potentiometer. Flex sensors are generally available in two sizes: one is 2.2" (5.588cm) long and another is 4.5" (11.43cm) long. A flex sensor consists of a phenolic resin substrate with conductive ink deposited and is shown in fig.3.1. A segmented conductor is placed on top to form a flexible potentiometer in which resistance changes upon deflection. Flex sensors are designed to flex in only one direction – away from ink. Bending the sensor in another direction may damage it. Also take care not to bend the sensor close to the base, because the bottom of the sensor (where the pins are crimped on) is very fragile and can break when bent over.



3.1.2 Flex Sensor Working

The conductive ink printed on the sensor acts as a resistor. When the sensor is straight, this resistance is about 25k as shown in fig.3.2 When the sensor is bent, conductive layer is stretched, resulting in reduced cross section (imagine stretching a rubber band). This reduced cross section results in an increased resistance. At 90°

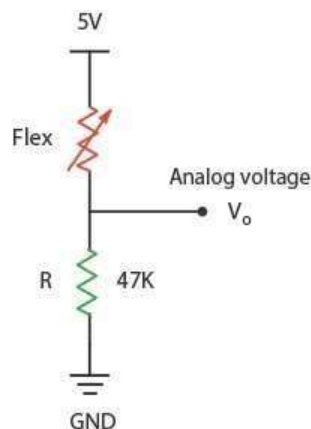
angle, this resistance is about 100K Ω . When the sensor is straightened again, the resistance returns to its original value. By measuring the resistance, you can determine how much the sensor is bent.



3.1.3 Reading a Flex Sensor

The easiest way to read the flex sensor is to connect it with a fixed value resistor (usually 47k Ω) to create a voltage divider. To do this you connect one end of the sensor to Power and the other to a pull-down resistor as shown below. Then the point between the fixed value pull-down resistor and the flex sensor is connected to the ADC input of an Arduino. This way you can create a variable voltage output, which can be read by Arduino's ADC input.

Note that the output voltage you measure is the voltage drop across the pull-down resistor, not across the flex sensor. In the shown configuration, the output voltage decreases with increasing bend radius. The output of the voltage divider configuration is described by the equation 0



3.2.3 The I2C Interface

The module uses the I2C interface for communication with the Arduino. It supports two separate I2C addresses: 0x68_{HEX} and 0x69_{HEX}. This allows two MPU6050s to be used on the same bus or to avoid address conflicts with another device on the bus.

The ADO pin determines the I2C address of the module. This pin has a built-in 4.7K pulldown resistor. Therefore, when you leave the ADO pin unconnected, the default I2C address is 0x68_{HEX} and when you connect it to 3.3V, the line is pulled HIGH and the I2C address becomes 0x69_{HEX}.

MPU6050 module doesn't only provide the measurement of acceleration but it is also useful in measurement of Rotation i.e. as a gyroscope and also it can measure the temperature.

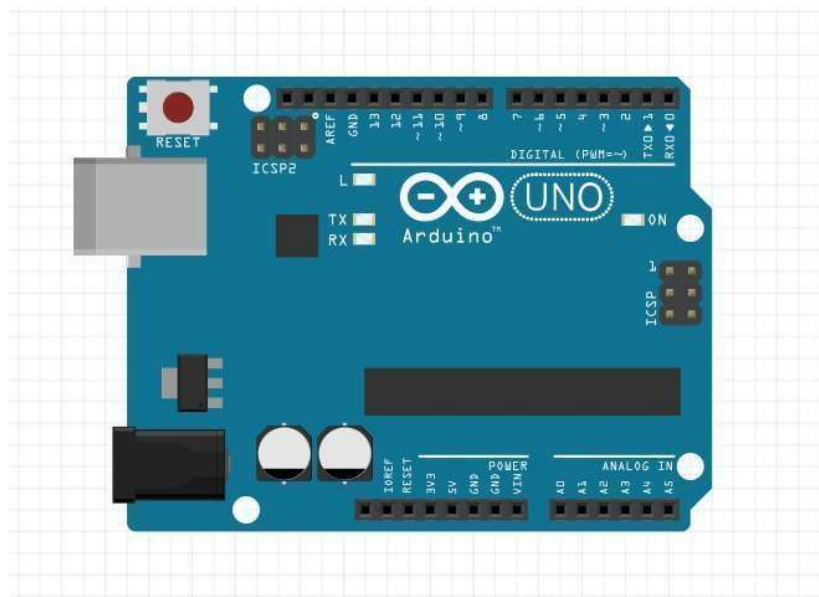


3.5 ARDUINO UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated

Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to 23 newer releases. The ATmega328 on the board comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer. While the Uno communicates using the original STK500 protocol, it differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.



General pin functions

LED: There is a built-in LED driven by digital pin 13. When the pin is high value, the LED is on, when the pin is low, it is off.

VIN: The input voltage to the Arduino/Genuino board when it is using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.

3V3: A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND: Ground pins.

IOREF: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source, or enable voltage translators on the outputs to work with the 5V or 3.3V.

RESET: Typically used to add a reset button to shields that block the one on the board.

Special pin functions

Each of the 14 digital pins and 6 analog pins on the Uno can be used as an input or output, under software control (using `pinMode()`, `digitalWrite()`, and `digitalRead()` functions). They operate at 5 volts. Each pin can provide or receive 20 mA as the recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50K ohm. A maximum of 40mA must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5; each provides 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though it is possible to change the upper end of the range using the AREF pin and the `analogReference()` function.

Serial / UART: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL serial chip.

External interrupts: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

PWM (pulse-width modulation): pins 3, 5, 6, 9, 10, and 11. Can provide 8-bit PWM output with the `analogWrite ()` function.

SPI (Serial Peripheral Interface): pins 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK). These pins support SPI communication using the SPI library.

TWI (two-wire interface) / I²C: pin SDA (A4) and pin SCL (A5). Support TWI communication using the Wire library.

AREF (analog reference): Reference voltage for the analog inputs

Applications of Arduino Uno ATmega328

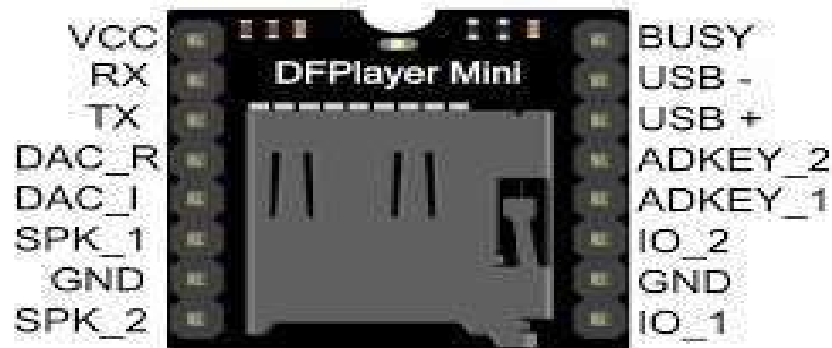
The **applications of Arduino Uno** include the following:

- **Arduino Uno** is used in Do-it-Yourself projects prototyping.
- In developing projects based on code-based control
- Development of Automation System
- Designing of basic circuit designs.

Thus, this is all about **Arduino Uno datasheet**. We can conclude that this is an 8-bit ATmega328P microcontroller. It has different components like serial communication, **crystal oscillator**, the voltage regulator for supporting the microcontroller.

This board includes a USB connection, digital I/O pins-14, analog i/p pins-6, a power-barrel jack, a reset button, and an ICSP header.

DF Mini Player:



The DFPlayer Mini MP3 Player For Arduino is a small and low cost MP3 module with an simplified output directly to the speaker. The module can be used as a stand alone module with attached battery, speaker and push buttons or used in combination with microcontrollers such as Arduino

Specification

- Sampling rates (kHz): 8/11.025/12/16/22.05/24/32/44.1/48
- 24 -bit DAC output, support for dynamic range 90dB , SNR support 85dB
- Fully supports FAT16 , FAT32 file system, maximum support 32G of the TF card, support 32G of U disk, 64M bytes NORFLASH
- A variety of control modes, I/O control mode, serial mode, [AD button](#) control mode
- advertising sound waiting function, the music can be suspended. when advertising is over in the music continue to play
- audio data sorted by folder, supports up to 100 folders, every folder can hold up to 255 songs
- 30 level adjustable volume, 6 -level EQ adjustable

Application

- Car navigation voice broadcast;
- Road transport inspectors, toll stations voice prompts;
- Railway station, bus safety inspection voice prompts;
- Electricity, communications, financial business hall voice prompts;
- Vehicle into and out of the channel verify that the voice prompts;
- The public security border control channel voice prompts;
- Multi-channel voice alarm or equipment operating guide voice;
- The electric tourist car safe driving voice notices;
- Electromechanical equipment failure alarm;
- Fire alarm voice prompts;
- The automatic broadcast equipment, regular broadcast

Tab 3.1

Pin	Description	Note
VCC	Input Voltage	DC3.2~5.0V;Type: DC4.2V
RX	UART serial input	
TX	UART serial output	
DAC_R	Audio output right channel	Drive earphone and amplifier
DAC_L	Audio output left channel	Drive earphone and amplifier
SPK2	Speaker-	Drive speaker less than 3W
GND	Ground	Power GND
SPK1	Speaker+	Drive speaker less than 3W
IO1	Trigger port 1	Short press to play previous (long press to decrease volume)
GND	Ground	Power GND
IO2	Trigger port 2	Short press to play next (long press to increase volume)
ADKEY1	AD Port 1	Trigger play first segment
ADKEY2	AD Port 2	Trigger play fifth segment
USB+	USB+ DP	USB Port
USB-	USB- DM	USB Port
BUSY	Playing Status	Low means playing \High means no

Work Mode

1. Serial Mode

Support for asynchronous serial communication mode via PC serial sending commands Communication Standard:9600 bps Data bits :1 Checkout :none Flow Control :none

- Instruction Description
- Serial Control Cmd
- Serial Query Cmd

2. AD KEY Mode

We use the AD module keys, instead of the traditional method of matrix keyboard connection, it is to take advantage of increasingly powerful MCU AD functionality, Our module default configuration 2 AD port, 20 key resistance distribution.

Get AD Button from DFRobot Store or DFRobot Distributor.

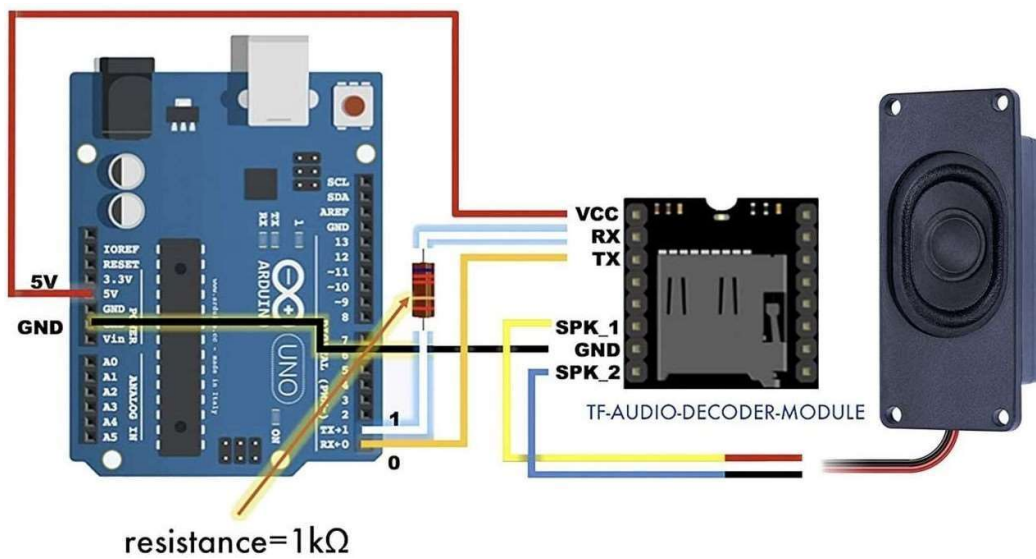
- Refer diagram

3. I/O Mode

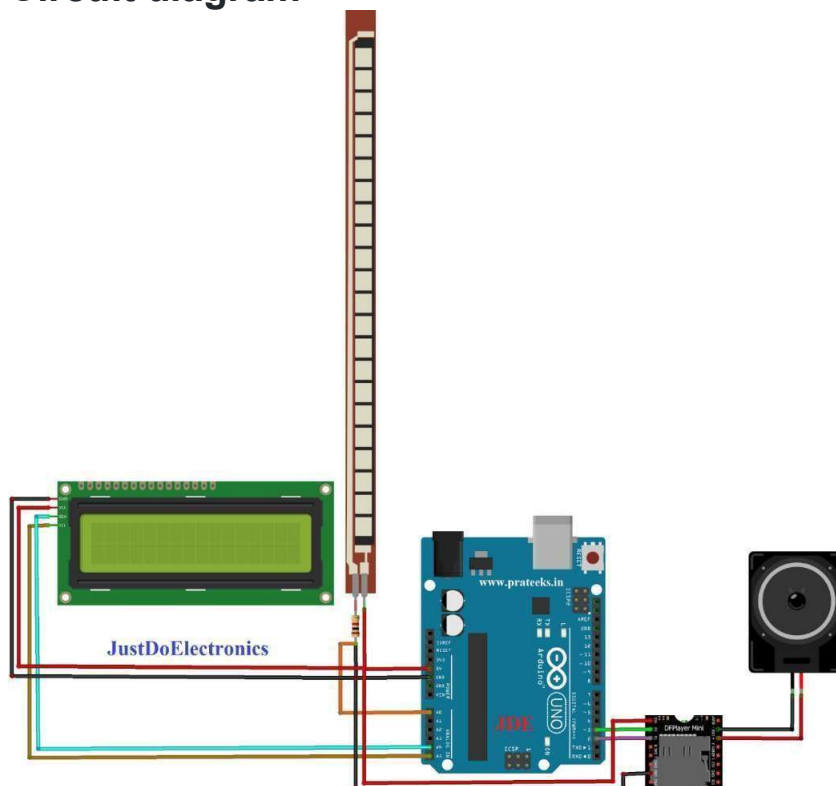
- Here comes the most simple way to use this module.
- Refer diagram

note: short time press means pre/next,and long time press means vol- ,vol +

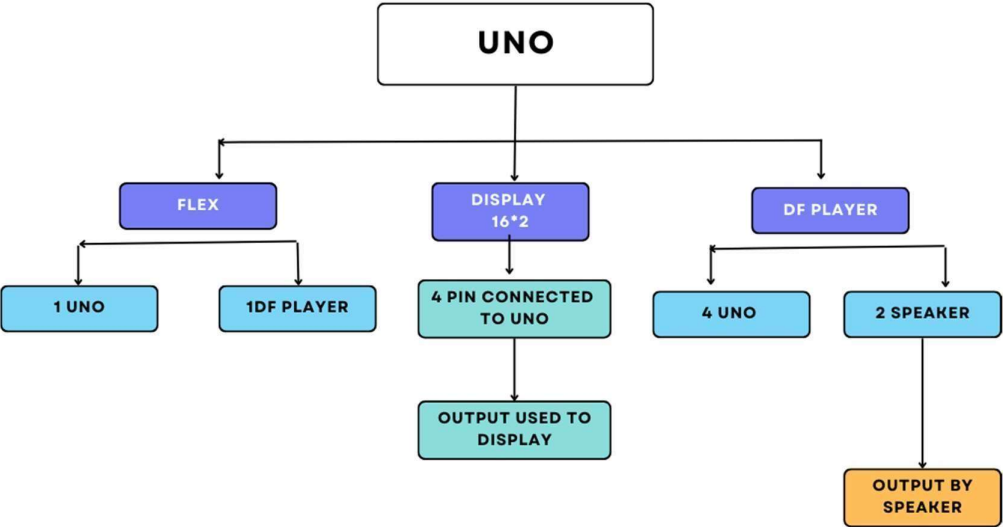
Speaker:



Circuit diagram



Block diagram



Code used

```
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 16, 2);


#include "SoftwareSerial.h"
#include "DFRobotDFPlayerMini.h"
DFRobotDFPlayerMini myDFPlayer;
void printDetail(uint8_t type, int value);
#define blue 2
#define green 3
#define red 4
unsigned int f;
//SoftwareSerial mySoftwareSerial(10, 11);


void setup()
{
  lcd.init();
  lcd.backlight();
  lcd.setCursor(0, 0);
  lcd.print("Sign Language to");
  lcd.setCursor(0, 1);
```

```
lcd.print("Speech Convert");  
delay(6000);  
lcd.clear();  
pinMode(blue, OUTPUT);  
pinMode(green, OUTPUT);  
pinMode(red, OUTPUT);  
Serial.begin(9600);  
mySoftwareSerial.begin(9600);  
Serial.begin(115200);  
Serial.println();  
Serial.println(F("Initializing DFPlayer..."));  
  
//Use softwareSerial to communicate with MP3  
if (!myDFPlayer.begin(mySoftwareSerial)) {  
Serial.println(F("Unable to begin:"));  
Serial.println(F("1.Please recheck the connection!"));  
Serial.println(F("2.Please insert the SD card!"));  
while (true);  
}  
Serial.println(F("DFPlayer Mini online."));  
myDFPlayer.volume(30);
```

```
}
```

```
void loop()
```

```
{
```

```
  f = analogRead(1);
```

```
  Serial.println(f);
```

```
  if (f > 320)                //No Bend; Blue LED Glows
```

```
  {
```

```
    digitalWrite(blue, HIGH);
```

```
    digitalWrite(green, LOW);
```

```
    digitalWrite(red, LOW);
```

```
    Serial.println("Please Give Me Water");
```

```
    lcd.clear();
```

```
    lcd.setCursor(0, 0);
```

```
    lcd.print("Cmd 1");
```

```
    lcd.setCursor(0, 1);
```

```
    lcd.print("I Feel Sleepy");
```

```
    myDFPlayer.play(1);
```

```
    delay(1000);
```

```
  }
```

**else if ((f < 320) && (f > 280)) //Small Bend; Green LED
Glow**

```
{  
  digitalWrite(green, HIGH);  
  digitalWrite(blue, LOW);  
  digitalWrite(red, LOW);  
  Serial.println("Please Give Me Food");  
  lcd.clear();  
  lcd.setCursor(0, 0);  
  lcd.print("Cmd 2");  
  lcd.setCursor(0, 1);  
  lcd.print("Give Me Food");  
  myDFPlayer.play(2);  
  delay(1000);  
}
```

**else if ((f < 200) && (f > 100)) //Small Bend; Green LED
Glow**

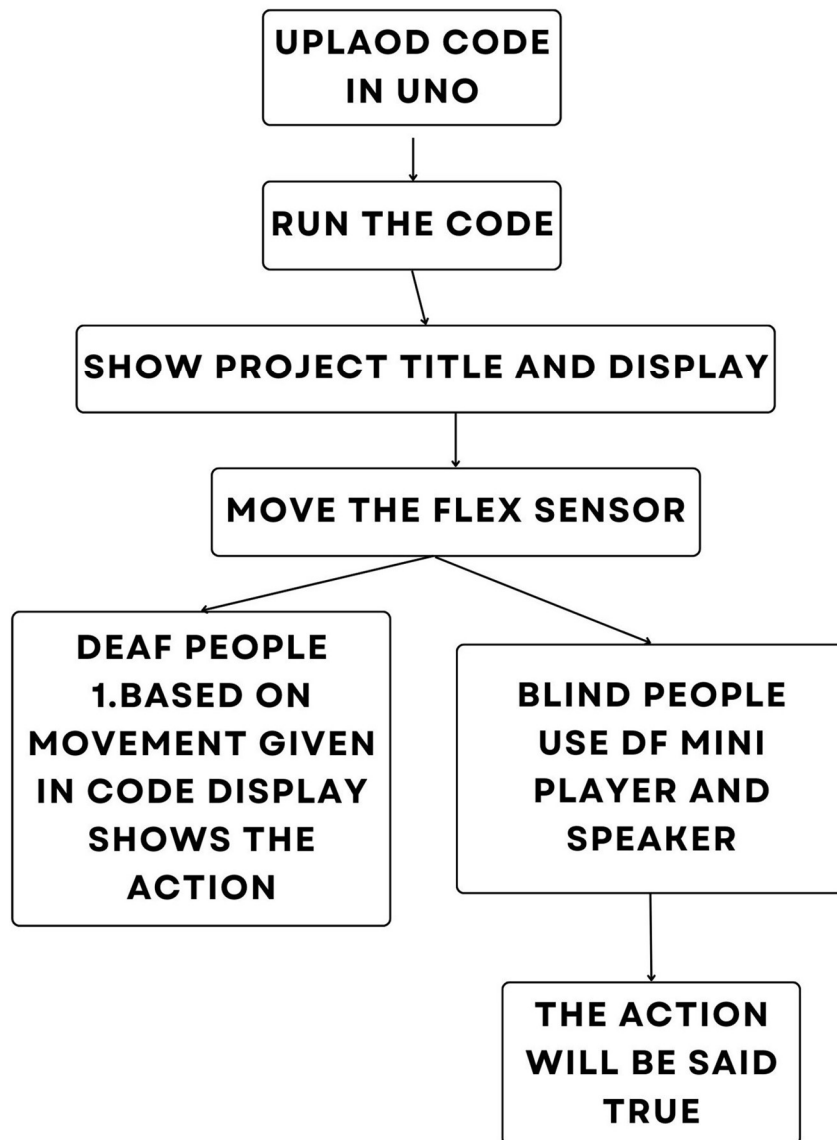
```
{  
  digitalWrite(green, HIGH);  
  digitalWrite(blue, LOW);  
  digitalWrite(red, LOW);  
  Serial.println("Give Me Water");
```

```

    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Cmd 3");
    lcd.setCursor(0, 1);
    lcd.print("Give Me Water");
    myDFPlayer.play(3);
    delay(1000);
}
else // Larger Bend; RED LED Glows
{
    if (f > 100)
        digitalWrite(red, HIGH);
        digitalWrite(green, LOW);
        digitalWrite(blue, LOW);
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("No Sign Language");
    }
    delay(50);
}

```

Methodology



RESULTS

Sign language is a visual language that uses a combination of hand gestures, facial expressions, and body language to convey meaning. The process of converting sign language into speech involves capturing the visual information of the sign language and then translating it into spoken language using various methods.

While sign language to speech conversion has made significant progress in recent years, there are still many challenges to overcome, such as variations in sign language across different regions and cultures, and the need for more accurate and efficient translation methods.

FUTURE SCOPE

There can be more works that can be done along with this system. In this system the prediction of the need of mute person is happening but there can be future works that could communicate with the mute person's mobile device and the system that learns the needs, thereby provisions can be made to develop recommendatory systems as they have the data of the things that mute person does and could easily learn these data through neural network model.

Enables peoples to Communicate Effectively

Decreases Frustration.

Sign language Is for Everyone.

6.1 CONCLUSION

The system is a bridge between normal and dumb deaf people; it fills the gaps of communication between dumb deaf people and normal people. The gloves are independent and it is portable with minimum weight and low power. The system converts the hand gestures to the text and further to speech. If in some conditions the person can't hear the sound produced there is a provision provided into the system of text due to which the person can read and understand what the another person wants to convey. Deaf-mute people face difficulty in communicating with normal people who do not understand sign language. To overcome this barrier this work proposes a sensor-based system for deaf-mute people using glove technology. It requires fewer components such as flex sensor, Arduino and accelerometer and hence its cost is low compared to vision-based gesture recognition system. In this system the deaf-mute people wear the gloves (with the resistors and sensors attached to it) to perform hand gesture. First the system will convert the gesture to the corresponding text and then the speech is synthesized for the corresponding text by using the text-to-speech synthesizer. The system consumes very low power and it is portable. The sensor glove design along with the tactile sensor helps in reducing the ambiguity in gestures and shows improved accuracy. This paper can further be developed to convert words, phrases and simple sentences by concatenating the alphabets. More number of short flex sensors can be employed to recognize more gestures.

- [1] D. J. Sturman and D. Zeltzer, "A survey of glove-based input," IEEE Comput. Graph. Appl., vol. 14, no. 1, pp. 30-39, Jan. 1994.
- [2] T. Takahashi and F. Kishino, "Hand gesture coding based on experiments using a hand gesture interface device," SIGCHI Bull., vol. 23, no. 2, pp. 67-74, Apr. 1991.
- [3] K. Murakami and H. Taguchi, "Gesture recognition using recurrent neural networks," in Proc. Conf. Human Factors Comput. Syst., 1991, pp. 237-242.
- [4] J. L. Hernandez-Rebollar, R. W. Lindeman, and N. Kyriakopoulos, "A multi-class pattern recognition system for practical finger spelling translation," in Proc. IEEE Int. Conf. Multimodal Interfaces, 2002, pp. 185- 190.
- [5] J. S. Kim, W. Jang, and Z. Bien, "A dynamic gesture recognition system for the Korean sign language (KSL)," IEEE Trans. Syst., Man, Cybern. B, Cybern., vol. 26, no. 2, pp. 354- 359, Apr. 1996.
- [6] W. Kadous, "GRASP: Recognition of Australian sign language using instrumented gloves," Bachelor's thesis, Univ. New South Wales, Sydney, Australia, 1995.
- [7] P. Vamplew, "Recognition of sign language gestures using neural networks," presented at the Eur. Conf. Disabilities, Virtual Reality Associated Technol., Maiden
- [8] W. Gao, J. Ma, J. Wu, and C. Wang, "Sign language recognition based on HMM/ANN/DP," Int. J. Pattern Recognit. Artif. Intell., vol. 14, no. 5, pp. 587-602, 2000.
- [9] C. Wang, W. Gao, and S. Shan, "An approach based on phonemes to large vocabulary Chinese sign language recognition," in Proc. IEEE Int. Conf. Autom. Face Gesture Recognit., 2002, pp. 393-398.

