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HANDTALK ASSISTANCE TECHNOLOGY FOR DUMB

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Abstract:

Dumb people always have difficulty in communicating with normal people. Handtalk assistance technology helps dumb people in communicating with others. This technology uses hand gestures as a main source of communication. MEMS sensors are fitted along with the hand gloves which are worn by the dumb person. The hand directions are recognised by the MEMS sensors, as it measures the variations in the bend. They are then processed by the micro-processor and corresponding voice are produced by the voice processor APR9600.Thus corresponding finger gestures are converted into voice commands.

Keywords:MEMS,handgloves,voice

1. INTODUCTION

Sign language are used by dumb people for the means of communication .sign languages are used to convey different symbols, different objects etc. They also conveys combination of words and symbols. Gestures are different postures made by the finger curls and bends .gestures are the medium for their communication. in our project we use the gestures as the basic necessity which are required as the input. Here we are using mems sensor. The MEMS sensor calculate the different X,Y,Z values for different directions. Based The particular values of xyz corresponded voice is generated through the speaker. This project uses PIC microcontroller to control all the processes and flex sensors along with accelerometer sensors will track the

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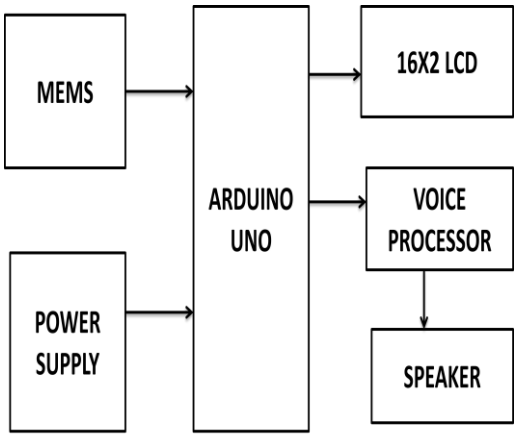
movement of fingers as well as entire palm. Here we are using a voice processor -APR 9600 is which is used for providing respective voices corresponding to the bend of the MEMS sensors. A LCD will be used to display the users gesture and a speaker to translate the gesture into audio signal is planned if possible for execution.

2. BLOCK DIAGRAM

The main blocks of this system are:

- MEMS Sensor
- Voice processor(APR9600)
- Arduino UNO
- 16x2 LCD
- Speaker

The block diagram contains mainly five blocks those are mentioned above.In this project we are using the Arduino UNO board as a microcontroller. This UNO board interface with the MEMS sensor, Voice processor, LCD. it takes the input from the MEMS sensor and produce outputs to the LCD and Voice processor. the voice stored in Voice processor is produced by the Speaker. MEMS gives Analog inputs to the Arduino UNO. It converts Analog data into Digital data.



A.MEMS Sensor

Micro-Electro-Mechanical Systems, or MEMS, is a technology that in its most general form can be defined as miniaturized mechanical and electro-mechanical elements (i.e., devices and structures) that are made using the techniques of micro fabrication.

The critical physical dimensions of MEMS devices can vary from well below one micron on the lower end of the dimensional spectrum, all the way to several millimeters. Likewise, the types of MEMS

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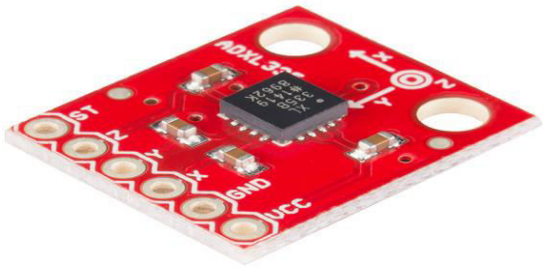
devices can vary from relatively simple structures having no moving elements, to extremely complex electromechanical systems with multiple moving elements under the control of integrated microelectronics. The one main criterion of MEMS is that there are at least some elements having some sort of mechanical functionality whether or not these elements can move. The term used to define MEMS varies in different parts of the world. In the United States they are predominantly called MEMS, while in some other parts of the world they are called "Microsystems Technology" or "micro machine devices". The ADXL335 is a small, thin, low power, complete 3-axis accel-erometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 *g*. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. User selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis.

The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package (LFCSP_LQ).



Working

The ADXL335 output is ratiometric, therefore, the output sensitivity (or scale factor) varies proportionally to the supply voltage. At VS = 3.6 V, the output sensitivity is typi- cally 360 mV/*g*. At VS = 2 V, the output sensitivity is typically 195 mV/*g*. The zero *g* bias output is also ratiometric, thus the zero *g* output is nominally equal to VS/2 at all supply voltages. The output noise is not ratiometric but is absolute in volts; therefore, the noise density decreases as the supply voltage increases. This is because the scale factor

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(mV/*g*) increases while the noise voltage remains constant. At VS = 3.6 V, the X-axis and Y-axis noise density is typically 120 µ*g*/√Hz, whereas at VS = 2 V, the X-axis and Y-axis noise density is typically 270 µ*g*/√Hz. At VS=2V, the self-test response is approximately −96 mV for the X-axis, +96 mV for the Y-axis, and −163 mV for the Z-axis. The supply current decreases as the supply voltage decreases. Typical current consumption at VS=3.6V is 375µA, and typi-cal current consumption at VS = 2 V is 200 µA.

FEATURES

- 3-axis sensing
- Small, low profile package
- 4 mm × 4 mm × 1.45 mm LFCSP
- Low power : 350 µA (typical)
- Single-supply operation: 1.8 V to 3.6V
- 10,000 *g* shock survival
- Excellent temperature stability
- BW adjustment with a single capacitor per axis
- RoHS/WEEE lead-free compliant

APPLICATIONS

- Cost sensitive, low power, motion- and tilt-sensing applications
- Mobile devices
- Gaming systems
- Disk drive protection
- Image stabilization
- Sports and health devices

B. APR 9600 VOICE PROCESSOR

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. Integrated output amplifier, microphone amplifier, and AGC circuits greatly simplify system design. The device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications.

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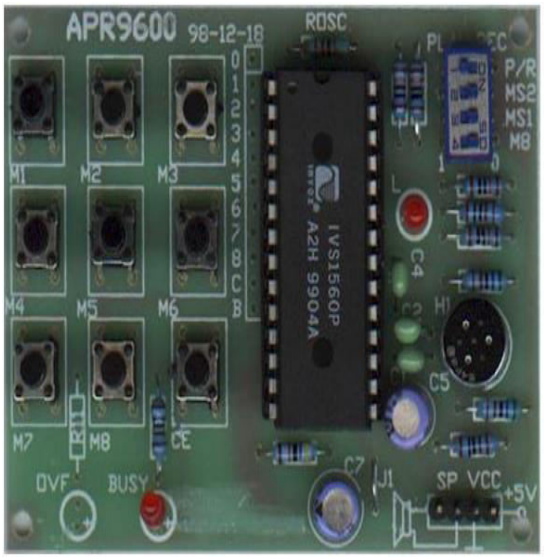


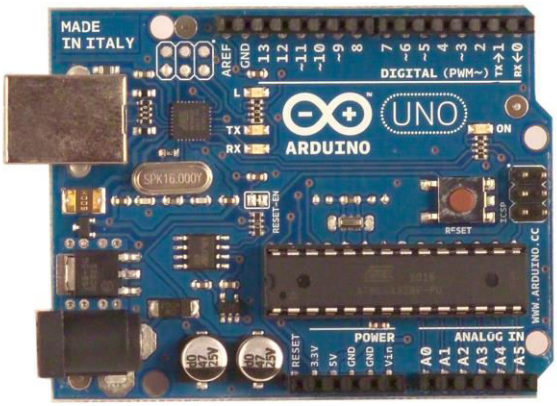
Fig: Voice Processor (APR9600).

FEATURES

- APR9600 is a low-cost high performance sound record/replay IC incorporating flash analogue storage technique.
- Recorded sound is retained even after power supply is removed from the module.
- The replayed sound exhibits high quality with a low noise level. Sampling rate for a 60
- Second recording period is 4.2 kHz that gives a sound record/replay bandwidth of 20Hz to 2.1 kHz.
- However, by changing an oscillation resistor, a sampling rate as high as 8.0 kHz can be achieved.
- This shortens the total length of sound recording to 32 seconds.
- Total sound recording time can be varied from 32 seconds to 60 seconds by changing the value of a single resistor.
- The IC can operate in one of two modes: serial mode and parallel mode.

C. ARDUINO UNO

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P (datasheet). 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. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without working too much about doing something wrong, worst case scenario you can replace the chip.

Fig: Arduino UNO.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.For controlling the signals from various sensors, and combine modules Arduino has been used in SFF. Arduino is a physical computing platform for managing and handling electronics. It has an open source platform independent IDE, that facilitates programmer to process the electronics signal from the attached components and control them. Most popular Arduino board Arduino Uno consists of 8-bit Atmel AVR microcontroller clock speed 16 MHz. Using Arduino sensor modules and components are programmed in SFF and algorithm logic is implemented.

There are some other alternatives to Arduino board for hardware prototype system design such as: Netduino, Rasberry Pi, PIC controller etc. But one of the biggest advantage about Arduino is there are numerous examples are given in online. Moreover, most of the sensors, modules are available in the market is Arduino compatible. Also the board is not expensive, freeware and has very active developers community.

D.LIQUID CRYSTAL DISPLAY

A liquid crystal display or LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid

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crystal to produce a visible image. Liquid crystal displays are super-thin technology display screen that are generally used in laptop computer screen, TVs, cell phones and portable video games. LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology. A LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays are super-thin technology display screen that are generally used in laptop computer screen, TVs, cell phones and portable video games. LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology.

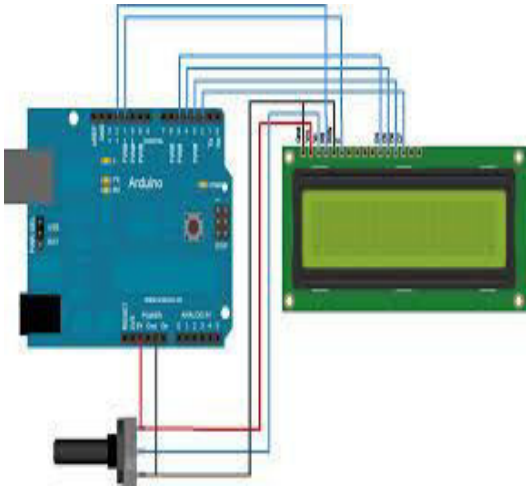

Fig: LCD Interfacing with Arduino.

3. OPERATIONAL DISCRIPTION

In this project data glove is implemented to find the hand direction of a user. The data glove is fitted with MEMS sensor. The MEMS sensor output a stream of data that varies with degree of bend. The analog outputs from the sensors are then fed to the Arduino UNO. It processes the signals and perform analog to digital signal conversion.

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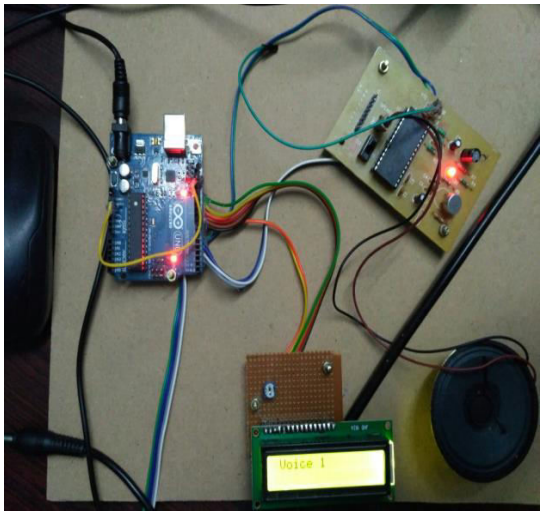

Fig: Model of Project.

The resulting digital signal is displayed in the LCD. The direction is recognized and the corresponding text information is identified. Text to speech conversion takes place in the voice section and plays out through the speaker. The user need to know the direction of particular sentence and he need to stay with the direction for two seconds. There are no limitations for signs it is hard to build a standard library of directions. The new direction introduced should be supported by the software used in the system. The system can also be designed such that it can translate words from one language to another. A pair of gloves along with sensors enables mute people to interact with the public in the required language. The performance accuracy of this device can be improved by increasing the number of sensors in the series. These sensors are attached along the fingers and thumb. The degree of bending of fingers and thumb produces the output voltage variation which in turn on converting to analog form produces required voice.

4. CONCLUSION

Sign language is a medium of communication for dumb people .This is the only source for them to communicate. But it is not necessary that the message is easily conveyed to normal person. This 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 the gloves to perform sign language and it will be converted in to speech so that normal people can easily understand and the message is conveyed to other person.

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ADVANTAGES

- Requires fewer components so its cost is low.
- It is economical.
- It is small in size, due to the small size we can place its hardware on our hand easily.
- The whole apparatus carries less weight. Hence they are portable and flexible to users.
- It takes less power to operate system. Only 5V is required to operate the system.
- It is easy to operate, Anyone can operate it easily
- Easy to define gestures, we can add or define our own gestures.
- Communication is possible in any language.

5. FUTURE SCOPE

This prototype suggests that sensor gloves can be used for partial sign language recognition. More sensors can be employed to recognize full sign language. A handy and portable hardware device with built in translating system, speakers and group of body sensors along with the pair of data gloves can be manufactured so that a deaf and dumb person can communicate to any normal person anywhere.

- High quality sensor can use.
- The range can be increased

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