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PORTABLE ASSISTIVE DEVICE FOR DEAF DUMB AND BLIND USING AI

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Abstract: Smart hand gloves help physically disabled people to communicate with normal people. As dumb person cannot speak then this smart gloves helps them to convert this hand gesture into text or pre-recorded voice. This also help normal person to understand when he is trying to say and do accordingly this smart gloves has facility of home appliance control from which a physically impaired person become independent to live. The main objective or the implemented paper is to develop a reliable easy to use light weight smart hand gloves system which can minimize the obstacles for disabled people.

1. Introduction

In our daily routine, we will communicate with one another by using speech. Gestures are a lot of preferred and natural to act with computers for human so it builds a bridge between humans and machines. For several deaf and dumb person, linguistic communication is their primary language making a powerful sense of social and cultural identity. The planned system is predicated on vision-based hand recognition approach that is a lot of natural and doesn't need any info to spot the actual gesture. The hand gestures should be known under variable illumination conditions. There are several feature extraction ways and classification techniques are offered and therefore the call on which of them to use could be a difficult task. The planned methodology performs background segmentation of the hand from the information then we tend to assign gesture for a different sentence. It involves feature extraction ways to angle calculation of hand gestures, then finally the gestures are detected and changing these gestures into text and voice. Sign language is the language used by deaf and mute people and it is a communication skill that uses gestures instead of sound to convey meaning simultaneously combining hand shapes, orientations and movement of the hands, arms or body and facial expressions to express fluidly a speakers thoughts. Signs are used to communicate words and sentences to audience. A gesture in a sign language is a particular movement of the hands with a specific shape made out of them. A sign language usually provides sign for whole words. It can also provide sign for letters to perform words that dont have corresponding sign in that sign language. In this paper Flex sensor plays the major role, Flex sensors are sensors that change in resistance depending on the amount of bend on the sensor.

In this paper we propose a Sign Language Glove which will assist those people who are suffering for any kind of speech defect to communicate through gestures i.e. with the help of single handed sign language the user will make

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gestures of alphabets. The glove will record all the gestures made by the user and then it will translate these gestures into visual form as well as in audio form.

This paper uses ATmega328 microcontroller to control all the processes and flex sensors along with accelerometer sensors will track the movement of fingers as well as entire palm

2. LITERATURE SURVEY:

Rathi et al. [1] A framework for perceiving a dynamic hand words motion of Indian signs and change of perceived signal into text and voice and vice versa. Eigenvectors and Eigen esteem method has utilized for highlight extraction. Eigenvalue worth weighted Euclidean Distance based for the most part classifier has utilized.

Geethu and Anu [2] ARM CORTEX A8 Processor board is used. For image characterization, Haar classifier is used though 1-D HMM is utilized for Speech modification. Marking acknowledgment has created its significance in a very few zones like Human computer Interactions (HCIs), mechanical controls, home computerization.

Quiapo et al. [3] it was ready to fulfill the needs of a sign Language Translator. The task was ready to boost the fluctuate of the flex detection parts although as well as new types of detector states for included sifting. The procedure GUI conveyed the bigger a part of the capacities that were needed within the two-way interpretation technique.

Sayan Tapadar et al. [4] this includes training with the acquired alternatives that square measure near particular for different hand motions. In this way, we will be prepared to set up gesture-based communications and thus assemble crippled individuals socially satisfactorily. Use the distinctive feature extraction.

Hamid A. Jalab and Herman .K. Omer [5] a hand motion interface for prevailing media player misuse neural system. The anticipated standard recognizes a gathering of 4 explicit hand signals, to be specific: Play, Stop, Forward, and Reverse. Our standard is predicated on four stages, Image procurement, Hand division, alternatives extraction, and Classification. Geethu G Nath and Arun C [6] Implemented framework for marking recognition for not too sharp people in ARM CORTEX A8 processor board misuse convex sunken body standard and model coordinating principle. The framework is utilized to oversee gadgets like an instrument, car Audio Systems, home apparatuses.

Shweta et al [7] Build up a genuine time framework for hand motion acknowledgment that recognizes hand signals, alternatives of hands like pinnacle figuring and edge computation thus convert motion pictures into voice and contrariwise using image processing.

Ali A. Abed and Sarah A. Rahman [8] the versatile instrument is developed and tried to demonstrate the viability of the anticipated guideline. The instrument movement and route happy with very surprising headings: Forward, Backward, Right, Left and Stop. The ubiquity rate of the automated framework came to with respect to ninety-eight using Raspberry Pi with the camera module and modified with Python. Muhammad Yaqoob Javed et al. [9] Digital Dactylology Converser (DOC) that could be a gadget that changes over a sign language into voice sign and instant message. The anticipated gadget will function admirably and translates the letters, letters in order to content and sound.

Anup Nandy et al. [10] Give efficient acknowledgment exactness to a limited arrangement of dynamic ISL motions. It incorporates the amazing outcomes for Euclidian separation and K-Nearest neighbor measurements.

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3. PROJECT INTRODUCTION

Aim: The aim of the project is to design a Smart Helmet for the Safety Of Riders.

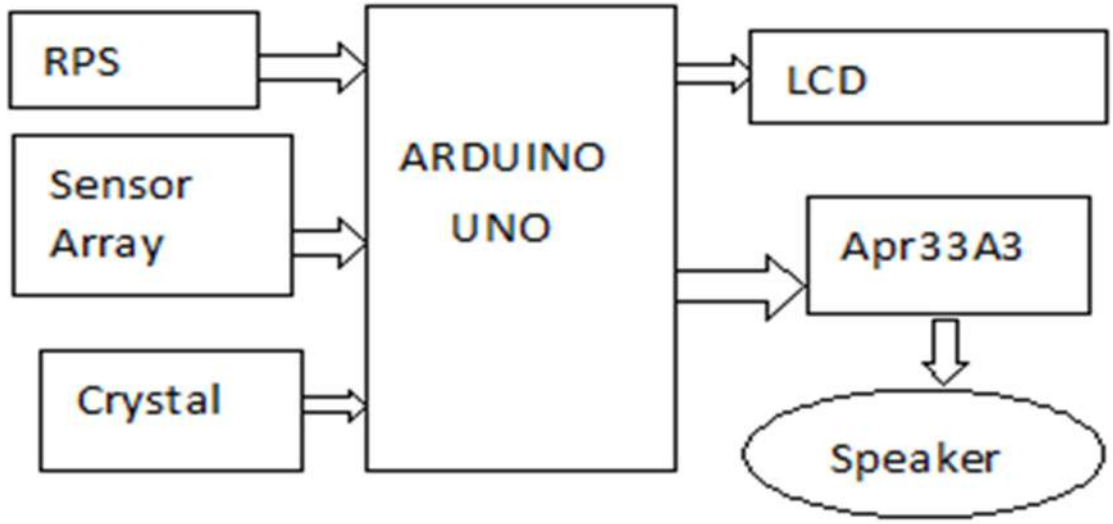
EXISTING SYSTEM

In existing system, there is no circuit is used to announce their thoughts of physically challenged peoples. And gesture based papers or circuits are not available in markets. In existing method is sign language, it couldnt understand all people for communication. There after a circuit is used to design predetermined postures are captured and matching the captured image with deaf & dump peoples sign language.

PROPOSED SYSTEM

In proposed system we are using sensors to converts sign language to voice as well as displays text in LCD display of controller. A gesture based circuit is designed to express the need of speechless patient & physically challenged people. The pre-determined gesture is stored in microcontroller to process what types of gesture is generating and expressed thought is announced as voice.

Block diagram



HARDWARE TOOLS:

- Micro controller
- MEMS Sensor
- Apr33A3(Voice Module)
- Speaker
- LCD

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SOFTWARE TOOLS USED:

- ARDUINO IDE Compiler
- Embedded C

4. ARDUINO

Overview:

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, 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.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

The board has the following new features:

1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

LIQUID CRYSTAL DISPLAY

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).

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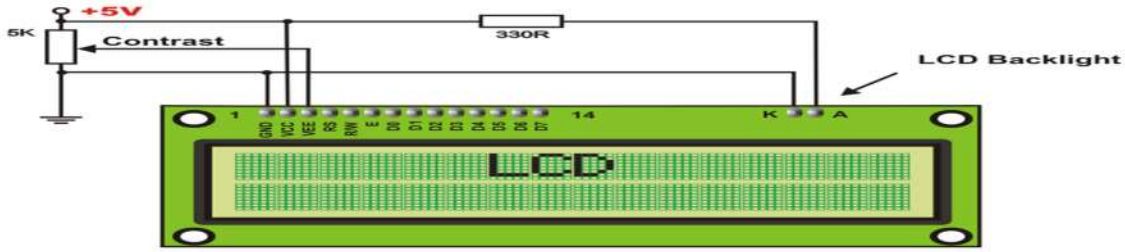

5. MEMS ACCELEROMETER

INTRODUCTION

An accelerometer is a micro-electromechanical device that measures acceleration forces. These forces may be static, like the constant force of gravity pulling at our feet, or they could be dynamic - caused by moving or vibrating the accelerometer. There are many types of accelerometers developed and reported in the literature. The vast majority is based on piezoelectric crystals, but they are too big and to clumsy. People tried to develop something smaller, that could increase applicability and started searching in the field of microelectronics. They developed MEMS (micro electromechanical systems) accelerometers.

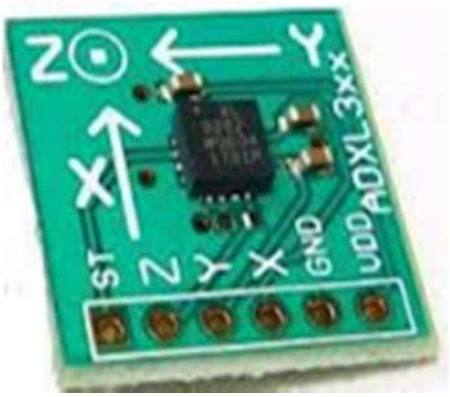

FIG MEMS SENSOR

MEMS accelerometer use nanotechnology in order to enhance the natural abilities common between all accelerators; hence, these devices are extremely fine-tuned and accurate. MEMS stands for Micro Electro Mechanical Systems, and when discussing the technicalities of accelerometers it refers specifically to a mass-displacer that can translate external forces such as gravity into kinetic motion energy. This part of the accelerometer usually contains some type of spring force in order to balance the external pressure and displace its mass, thus leading to the motion that produces acceleration.

Features

- 3-axis single-chip accelerometer
- Built-in IC integrating temperature sensor and self-diagnosis function

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- High sensitivity: up to 1,000 mV/G
- Automatic correction of mounting angle
- Small size: 5.0 x 5.0 x 2.3mm
- Inertial sensing (linear, angular) in small, PCB-capable packaging
- Reliable operation
- Low power dissipation
- Cost effective
- Simple Integration

DESCRIPTION

Most accelerometers function on oneaxis, but two-axis and three-axis(i.e., x, y and z) models have been invented. The three-axis model is naturally more expensive but also far more accurate; if this model isn't used then three one-axis accelerometers will typically be combined after construction, with far less accurate results. There is also a direct relationship between the number of g's that can be measured and the accuracy and sensitivity of the device. Usually the higher the device can measure, the more the accuracy suffers.

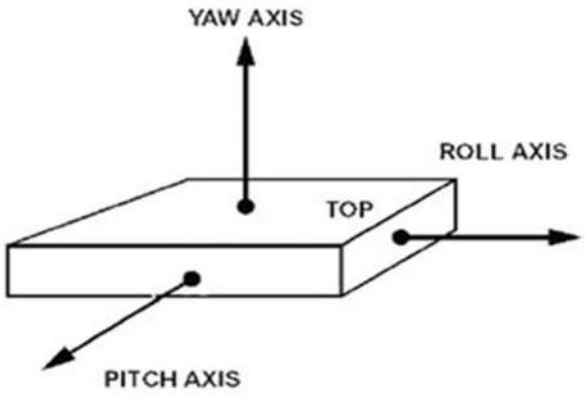

Fig 3.2.3: Mems Sensor Showing Various Direction

Nanotechnology has already enhanced many industrial areas, and now its effects can be seen in devices as specialized as the accelerometer.

One of the crucial uses for MEMS accelerometers in particular has been airbag deployment systems; they literally save lives because they are able to judge when two cars have struck each other and even ascertain the severity of the collision, adjusting airbag size and rate of deployment accordingly.

The mechanism works like this external force is applied and shifts the position of the proof mass from a neutral position to an active position; typically the amount of this deflection is measured by analog or digital readouts. The variations can be charted by using a set of beams that are fixed in place contrasting with a set of beams that have been attached to the surface of the proof mass somehow. Such a simple system makes the accelerometer not only reliable but also relatively inexpensive to manufacture.

Applications

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- Accelerometers can be used to measure vehicle acceleration. They allow for evaluation of overall vehicle performance and response. This information can then be used to make adjustments to various vehicle subsystems as needed.
- Navigation system
- Automotive stability system
- Roll-over system
- Stability control of industrial machinery
- Industrial and home appliances
- Humanoid robots

IMPLEMENTATION

The work of this paper start from movement of hand gloves where the sensors are attached, and the value of sensor changes when its experiences the bending. The mems sensor is another type of potentiometer are attach to the fingers when we bend the figure the value of the sensor get changes. The changing value of the sensor is depend upon the resistance and applied angle of the bending when we bend the sensor at some particular angle we can see the value of the resistance is increase and accordingly the output get reduced . On the other way we can say that its like a inversely proportional when the resistance of the sensor is increase at that instant the value of output decrease and accordingly we can make paper by getting the advantage of this process.

The Atmega328 Microcontroller is used in the arduino board and it contains on board power supply and USB port to communicate with PC. In this circuit diagram the LCD is connected in digital IO ports of 4 to 7 for displays what action is going or expressing and the mems sensor are connected to analog inputs. The sensor is fixed with glows which are wearing to disabilities of partial disabilities. The actions are pre-defined and it is already fixed in microcontroller. When the action is implemented by the people the voice play back will activate and announce the pre-recorded action sequence. We can change the action voice through voice recorder using microphone in the voice playback board. The sign language action determines the need of disabilities to express what they though and what they need or what necessary things they need. The action expression will change through microcontroller coding and we can add more expression action by increasing more sensors.

6. **ADVANTAGES**

- A gesture based circuit is used for speechless patient & physically challenged people.
- Pre-determined gesture is used to express their thoughts and announced as voice.
- It requires fewer components so its cost is low
- Small in size; due to small size we can place its hardware on our hand easily
- Light weight
- Flexible to users
- Easy to operate; anyone can operate it easily

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DISADVANTAGES

- Accuracy and processing of system may be slow
- We may have some difficulty in operating the glove
- These gloves cannot capture the facial expression
- Many deaf people may not want to carry around the glove or may find that the computer processing is too slow or unnatural

7. **APPLICATIONS**

- Useful for physically challenged people
- Conveying information related operations
- Provides easy communication between the speech impaired people and the natural people
- Used for disabilities
- Handicaps
- Panic switch helps in tracking the location of the user in emergency

8. SOFTWARE DESCRIPTION

Arduino IDE compiler:

Arduino is an open-deliver electronics platform based mostly on smooth-to-use hardware and software utility. Arduino boards can observe inputs - slight on a sensor, a finger on a button, or a Twitter message - and flip it into an output - activating a motor, turning on an LED, publishing a few components online. You could tell your board what to do by sending a hard and fast of commands to the microcontroller at the board. To do so that you use the Arduino programming language (based totally mostly on Wiring), and the Arduino software (IDE), based on Processing.

Over the years Arduino has been the brain of lots of obligations, from regular gadgets to complex medical gadgets. A worldwide community of makers - college students, hobbyists, artists, programmers, and specialists - has collected spherical this open-deliver platform, their contributions have brought as much as a terrific amount of available know-how that can be of terrific assist to novices and experts alike.

Arduino has become born on the Ivrea interaction format Institute as a clean tool for instant prototyping, geared towards university college students without a historic past in electronics and programming. As quickly as it reached a miles wider community, the Arduino board started converting to conform to new dreams and traumatic situations, differentiating its provide from smooth eight-bit boards to merchandise for IoT

Programs, wearable, three-d printing, and embedded environments. All Arduino boards are without a doubt open-deliver, empowering clients to assemble them independently and ultimately adapt them to their unique dreams. The software program, too, is open-supply, and its miles growing thru the contributions of customers globally.

The advantages of the Arduino IDE utility are

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1. much less steeply-priced
2. The clean smooth programming surroundings
3. Extensible software program application utility and hardware

9. Conclusion

The planned system is simple to implement as there's no complicated feature calculation. This system was implemented using Arduino Uno module. The system was used to acknowledge sign language utilized by deaf and dumb community. This system is used to overcome the communication gap between mute person and ordinary person. There's a necessity for research within the area feature extraction and illumination therefore the system becomes a lot of reliable. The system was used to acknowledge sign language utilized by deaf and dumb parsons. The deaf and dumb person will use the hand gestures to do linguistic communication.

10. Future Aspects:

For further development of this project we can make this application using Raspberry pi and image processing for gesture based recognition system.

We can add alphabets of different languages and more gestures in real-time..

Assistance can be provided to deaf and dumb in case of emergencies.

Panic switch can be attached to the device to track the location of the user in emergency.

Copper wires could be efficiently used instead of flex sensors.

Mobile phones could be connected with the Bluetooth module for audio.

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