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ARDUINO BASED HAND GESTURE FOR DUMB

Abhishek J., Aneeta Thomas, Anushma P.S., Ganesh B.S., UG Scholars, Dept. Of ECE, LMCST.
Shammy Arun Mathew K., Assistant Professor, Dept. Of ECE, LMCST.

Abstract— Sign language is the language used by mute people and it is a communication skill that uses gestures instead of sound. By simultaneously combining hand shapes, orientations and movement of the hands, arms or body and facial expressions one can express thoughts. In this, we propose to develop an electronic device that can translate sign language into speech in order to make the communication take place between the mute communities with the general public possible. In this work, Flex Sensor plays the major role. Flex sensors are sensors that change in resistance depending on the amount of bending of the finger. A gloves is used in such a way that the flex sensors are attached with the gloves. Dumb people can use this gloves and by performing gestures the bending of flex sensors occur and further processes takes place. As a result, speech signal is generated.

Index Terms— Flex sensor, Arduino, GSM, GPS

I. INTRODUCTION

Gesture recognition has been a research area which received much attention from many research communities. A gesture may be defined as a movement, usually of hand or face that expresses an idea. Sign language is a more organized and defined way of communication in which every word or alphabet is assigned some gesture. Sign language is mostly used by the mute, dumb or people with any other kind of disabilities. Our work is based on a system that can understand the sign language accurately so that the signing people may communicate with the non signing people without the need of an interpreter. It can be used to generate speech or text. There has not been any system with these capabilities so far. By implementing this technology these disabled communities become independent in life so that they can also be a part of this growing technology world.

A gesture is a particular movement of the hands with a specific shape used by the dumb people to convey their thoughts to the public. But most of the times they find difficulty in communicating with others who don't understand sign language. It is based on the need of developing an electronic device that can lower the gap or barrier between the mute people and normal society.

Various available sign languages are American Sign Language (ASL), British Sign Language (BSL), Turkish Sign Language (TSL), Indian Sign Language (ISL) and many more. In this paper, the image of the hand is captured using a simple web camera. The acquired image is then processed and some features are extracted.

Our work is based on a system that can understand the sign language accurately so that the signing people may communicate with the non signing people without the need of an interpreter. Here we are using an Arduino UNO board as Atmega 328 controller board to interface all other devices.

II. LITERATURE SURVEY

In 2006, Nguyen Dang Binh et.al proposed "A NEW APPROACH DEDICATED TO HAND GESTURE RECOGNITION" in this they were used Thai sign language recognition which used the method 5DT Data glove 14 ultra-data glove which was attached with 14 sensors, 10n sensors for figures and rest 4 sensors between the fingers which measures fluctuation and abductions respectively. But he got the 94% result set. He used a new Pseudo 2-D hidden markov model (P2DHMM) structure dedicated to the time series recognition. In this technique T-com P2DHMM structure was used to develop a complete vocabulary of 36 gestures including the ASL letter spelling alphabets and digits and got 96% result set. [6]

J.Bhattacharya et.al proposed "Shape Texture and Local Movement Hand Gesture Features for Indian Sign Language Recognition" used a hand region which is segmented and detected by YCbCr skin colour model references. The shape, texture and figure features of each hand are extracted using principle Curvature Based Region (PCBR) detector, wavelet packet decomposition (WPD-2) and complexity defect algorithm for hand posture recognization process. To classify each hand posture multiclass nonlinear support vector machines (SVM) is used for which a recognization rate of 91.3% is achieved. And dynamic gesture rate is 86.3% [1].

Daniel B. Dias et.al proposed "Hand Movement Recognition for Brazilian Sign Language: A Study Using Distance-Based Neural Networks" and team used a artificial neural network model based on distance including neural fuzzy models the experiment explore

there shows the usefulness of this model to extract a helpful knowledge about the classes of movement and supporting work and got the 94.92% accuracy result [2].

Cao Xin-yan et.al proposed "Gesture Segmentation Based on Monocular Vision Using Color and Motion Cues" and team used a gesture segmentation from the video images sequence based on manicular vision is present by the skin color and motion case. Gestures are separated from video image sequence reliably and complexity using the mathematical morphologic method. The experimental results show the technique is capable of segmenting the gestures quit effectively [3].

M.K. Bhuyan et.al proposed "Hand Pose Identification from Monocular Image for Sign Language Recognition" and his team used a novel approach for hand pose reorganization analyzing the textures and key geometrical features of the hand. A skeletons hand model is constructed to analyze the abduction/adduction movements of the fingers and subsequently, texture analysis is performed to consider some inflexed finger. Measures are computed between input gestures and remodeled gesture patterns from a database by considering intra class abduction/adduction angle variation and inter class inflexed variation. [4].

R. Elakkiya et.al research proposed "Frame work for recognizing sign language gestures from continuous video sequence using boosted learning algorithm". In this paper a frame work for segmenting and tracking skin objects from singing video is described. A boosting algorithm to learn a subset of weak classifiers for extended future to combine them into a strong classifier for each sign is then applied. A joint learning strategy to share sub unit across sign classes is adopted the result they got was 85% [5].

III. PROPOSED SYSTEM

In this the proposed system consist of flex sensors, arduino, LCD display, audio play back recorder, GSM and GPS.

i. Flex Sensor

A flex sensor or bend sensor is sensor that measures the amount of deflection or bending. Usually the sensor is stuck to the surface, and resistance of sensor element is varied by bending the surface. Since the resistance is directly proportional to amount of bend.

ii. AXDL335

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer 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. 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). It is suitable in cost sensitive, low power, motion- and tilt-sensing applications and can be used in mobile systems, gaming systems, disk drive protection, image stabilization, sports and health devices.

iii. Arduino Uno

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 crystal oscillator, 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 an AC-to-DC adapter or battery to get started. Here ATmega 328 is used as microcontroller and its operating voltage is about 5V. The recommended range of input voltage is 7-12V and its range limits from 6-20V. In this microcontroller a flash memory of 32 KB is used of which 0.5 KB is used by boot loader

iv. LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters , animations and so on .A 16*2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

v. WTV 020 Module (MP 3 Module)

This module with MP3 mode, key mode (control 3 group of voice with volume adjustment or 5group of voice), two-line serial mode, and Loop play mode (after power on, the module will play loop, with memory function in the mode) they are optional. Customers can choose one of the modes in a module. Also can be customized. It Support 1GB SD card maximum or SPI flash of 64MB maximum.it also supports 4 Bit ADCPM format files. For AD4 voice format its sampling rate ranges from 6 KHz to 36 KHz where as in case of WAV voice format, the sampling rate ranges from 6 KHz～16 KHz. The system will provide 16 Bit DAC / PWM audio output. The user can choose any of the key mode either MP3 mode or two-line serial mode. Here the PC copy voice files to SD card. The DC working voltage ranges from 2.7～3.5V. The quiescent current is about 3A

vi. GSM Sim 900

This is an ultra-compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mmx24mmx3mm, SIM900A can fit in almost all the space requirements in user applications, especially for slim and compact demand of design.

vii. GPS

EM-506 GPS module features high sensitivity, low power and ultra small form factor. This GPS module is powered by SiRF Star IV, it can provide you with superior sensitivity and performance even in urban canyon and dense foliage environment. With SiRF CGEE (Client Generated Extended Ephemeris) technology, it predicts satellite positions for up to 3 days and delivers CGEE-start time of less than 15 seconds under most conditions, without any network assistance. Besides, Micro Power nearly continuously while consuming very little power.

viii. Memory Card

A memory card or flash card is an electronic flash memory data storage device used for storing digital information. These are commonly used in portable electronic devices, such as digital cameras, mobile phones, laptop computers, tablets, MP3 players. A flash memory card (sometimes called a storage card) is a small storage device that uses nonvolatile semiconductor memory to store data on portable or remote computing devices. Such data includes text, pictures, audio and video. Most current products use flash memory, although other memory technologies are being developed, including devices that combine dynamic random access memory (DRAM) with flash memory.

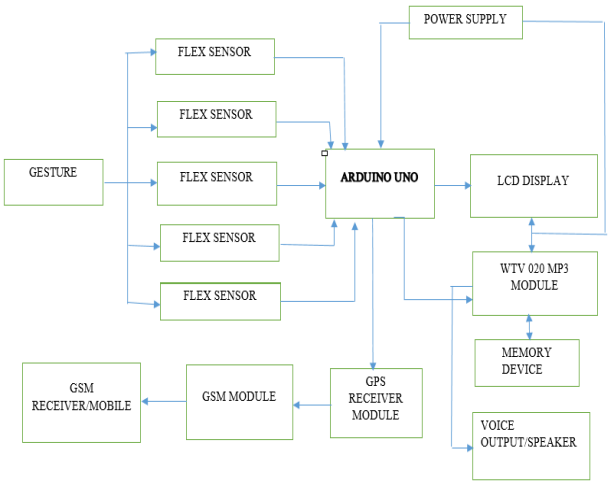

Fig 1: Block Diagram of the proposed system

IV. PROPOSED ALGORITHM

In this electronic support system glove is used as the main feature of the user. In this system data glove is implemented to capture the hand-gestures of a user. At first the kit is started by using a nine volts battery. The hand glove is fitted with flex sensors along the length of each finger. The flex sensors output varies with degree of bend and gives change in voltage. The analog outputs from the sensors are then fed to the Arduino UNO. It processes the signals and perform analog to digital signal conversion. The corresponding resistance value is taken as the signal and it is transmitted to the audio decoding system. Whereas a memory device is attached to this audio decoding system form where the audio signal corresponding to the gesture is transmitted via speaker. The components used are flex sensor, Arduino Uno, battery, LCD display, WTV 020 module, Memory card, mini woofer, ADXL 335, GSM and GPS.

Flex means ‘bend’ or ‘curve’. Sensor refers to a transducer which converts physical energy into electrical energy. Flex sensor is a resistive sensor which changes its resistance as per the change in bend or curvature of it into analog voltage. By increasing the curvature from 0° to 90°, resistance changes from 45K to 75K. Arduino is an open-source platform that creates microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The paper is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards

(termed shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++. Based on the bending of fingers, Flex sensor resistance values are changed and these range of resistance values correspondingly provide data about the gesture movement, accordingly different words or phrases are voiced out through the speaker with the help of WTV 020, which is a MP3 module that uses external memory device to store the words or phrases that has to be pronounced. A memory card or flash card is an electronic flash memory data storage device used for storing digital information. Here we also use a LCD module to display the corresponding word or phrases that are voiced out through the speaker.

Here we use GSM and GPS to transmit location of the user to ensure security in case of emergency. We use different hand signals to demonstrate different ideas or to convey different messages, out of which one signal is used as safety mode signal. The true purpose of that signal is to send the location or to track the user to whom the user wants. For that purpose, we use GPS to find the location of the user and that data was send as a form of message to the person user wants with the help of GSM.

V. APPLICATIONS

Data gloves can only capture the shape of the hand and not shape or motion of other parts of the body e.g. arm, elbows, face, etc. so only postures are taken and moving gestures are ignored it is very useful for physically, communication between mute people and normal people and also can be used in medical applications

VI. RESULT

We hereby propose a design model as hand gesture for dumb which is able to convert gestures into corresponding speech output. The target person must have an idea of the sign language which is not possible always and by this technology reduces the barrier between mute people and normal community.

VII. CONCLUSION

Sign language is one of the useful tools to ease the communication between the deaf and mute communities and normal society. Though sign language can be implemented to communicate, the target person must have an idea of the sign language which is not possible always. Hence it lowers such barriers. This paper was meant to be a prototype to check the feasibility of recognizing sign language. With this, deaf or mute communities can use the gloves to form gestures according to sign language and the gestures will be converted to speech.

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