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Iot Based Sign Language Conversion

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Abstract: Communication between speakers and non- speakers of Sign Language can be problematic, inconvenient, and expensive. This project attempts to bridge the communication gap by designing a portable glove that captures the user's sign language gestures and outputs the translated text on a smart phone. The glove is equipped with flex sensors, contact sensors, and a gyroscope to measure the flexion of the fingers, the contact between fingers, and the rotation of the hand. The glove's Arduino UNO microcontroller analyzes the sensor readings to identify the gesture from a library of learned gestures. The Bluetooth module transmits the gesture to a smart phone. After this work, one day speakers may sign language be able to communicate with others in an affordable and convenient way.

Key Words: Flex Sensor, Internet of Things, Arduino Atmega, Sign Language etc.

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I. INTRODUCTION

huge population of the world are suffering from hearing aids or are week in communication whether it can be hearing or speaking. We often come across these people in our day to day life. Several time we noticed their communication with normal people and a question always arises in our mind how hard is for them to communicate with us? Well, it's a very serious problem as compared to communication between a blind and a normal. Deaf and dumb community have a language of their own known as sign language. Sign language uses your face expressions, body and hand movements to communicate. But it also has some disadvantages like it do not have a proper origin so it lacks a proper conversion method and hence no particular movement can be translated into a specific word. From here we came up with the idea of developing a device which can study all those movements and convert them into words using sensors and translators.Converters uses a glove-based technique with flex sensors. For each specific hand gesture's, a specific signal is made which gets compared to the dataset already present in the storage of SD

Our Proposed System-our entire system is divided into two parts. One part teaches sign language and the other part expresses the message that the user wants to pass. I go through two methods.

1 Common Steps for both Approach (Message passing and learning)

First, we have sorted the sensor according to the size of different hands. This is the first way a user needs to use our glove. At this stage, the user must hold his arm several times and take a rest. Within the program it only takes the maximum and minimum value of the sensor. In addition, it provides only the maximum and minimum values of sensors in serial monitor.

2 Teaching the Classifier

First, we've taken a special hand gesture that we know separately. For example, we've taken the "A" symbol five times. By pressing the controller button, the Arduino program asks you to enter the label for the real time hand position. Enter a letter that is labelled Enter to save on SD card in SD card.

Research

Main objective of our development is ASL, ASL and ASL is a way to learn ASL for unknown people. As a result, they will be able to communicate through this sign language. In this answer, we can eliminate obstacles to communicating with the deaf and mute people in our community. In the starting of research we looked for some subordinate resources based on this. From where we will be able to find its functions we have, and now we just have to set the boundaries.

Lin and Villalba demonstrated us the Machine Learning (ML) score, which is designed to make a description of the gesture-based conversation in English. Each person's hand is a novel size and shape, and we intend to make a gadget that provides reliable interpretations that give little attention to those differences. Our gadget uses five-spectra-symbol flex-sensors, how each finger is shattered and can detect the introduction and rotation of the MPU-6050 (three-hub accelerometer) hand. These sensors are absorbed, reaching the centre, and

ATmega1284p commits the elements used by the microcontroller. These items are then gradually sent to a client's PC to work with Python content. The client ultimately makes the data information indicators for each movement to be deleted and the customer prepares more than these datasets to estimate in runtime while marking this quality. The point of inquiry is to give the whole lecture without knowledge of gesture-based communication. This program has two sections. Right bat-off, the voice receipt utilizes lecture management methods. It takes the sound voice flag and turns to the computerized motion on the PC and then shows the client Images of the resulting images. In addition, the Movement Receipt utilizes image management strategies. It uses the Microsoft sensor, and the client will later serve as a voice.

Real Time Detection and Recognition Of Indian And American Sign Language: Author proposed a real time vision based system for hand gesture recognition for human computer interaction in many applications. The system can recognize 35 different hand gestures given by Indian and American Sign Language or ISL and ASL at faster rate with virtuous accuracy. RGB-to-GRAY segmentation technique was used to minimize the chances of false detection. Authors proposed a method of improvised Scale Invariant Feature Transform (SIFT) and same was used to extract features. The system is model using MATLAB. To design and efficient user-friendly hand gesture recognition system, a GUI model has been implemented [20].

Phonetics, in comparison, describes the physical structure of a sign, not only the features with contrastive meaning. Either way, it is important to note that breaking down signs into smaller units aids in the scalability of the translation process. A dictionary-like approach, basing recognition on whole words or phrases of signs is not scalable, whereas using a unite set of smaller units for recognition is [14].

According to the Journal, this frame describes the hand-glove frame capable of tack, which passes for communication information and the gesture-based dialogue to voice. This frame has a handy handover to discuss, which can be worn by the hearing / bored person, which encourages progressively progress with other people. Once the content has been gained once in the LCD, a voice yield is finally obtained after completion of the conversation change operation. Moreover, content pick up can also be seen in an LCD or any convenient hand-held gadget. Our main purpose is to establish an interface between deaf or dumb and improve the long-term capabilities of ordinary people so that they can conveniently discuss with others. We mount the introduction switch sensor on the discussion handwriting and the Proposal and Product Strategy by signing the Arduino UNO Assistance on these communications. This framework loses the interaction of hearing or intimate individuals with people who are ready for general interfaces without the need for a human translator.

II. HARDWARE

A. Arduino Board

Arduino is an open source platform based on simple microcontroller board. The controller used in the device is Arduino duemilanove with inbuilt Atmega328P in it. Atmega328P has 32KB on-chip flash memory for storing codes of which 2KB used for boot loader. It also includes a 2KB of SRAM and 1KB of EEPROM. The program that is developed is to be stored on the flash memory of the controller. The Arduino software also includes a serial monitor which allows data to be sent to or from the Arduino board.

B. Flex Sensor

One of the most important components used on our device is the Flex Sensor. The angle of angle from the curve takes up the measurement when it bends. It is commonly used in areas such as robotics, gaming (virtual motion), medical devices, computer particulars, musical instruments, physical therapy, simple construction, and la profile. It has two types of shapes. One in 2.2 inches and the other is 4.5 inches. It has a temperature range of -35 ° C to + 80 ° C. Flat resistance is about 25K oz and resistant tolerance is about 30%. It is bend resistance range from 45K to 125K ohm (depending on the bend radius). The life cycle of these sensors is more than 1 million.

Figure 2: Flex Sensor

III. WORKING & ALGORITHM

There are a total of 5 Flexion (Bend) sensors (for the 5 fingers) used in each glove which are used to detect the movement of joints in fingers and thumb. As the sensor is flexed, the resistance across the sensor increases. Also, a single tri-axial accelerometer is fitted on the back of the palm of each glove so as to capture the orientation of the hands along with

Making New Gloves

1. Materials

At the beginning of this phase we had new gloves because we did not have the previous gloves mark. We have chosen one of the many gloves made of rubber, cotton, plastic and medical gloves, rubber and cotton. The upper part is made from cotton and lower last rubber. The reason for choosing these gloves is more flexible and capable of attaching to different hand sizes. The combination of cotton and rubber materials gives it a thorough stretching effectiveness.

2 Design

In the last step, we've made some changes in the design. We removed rubber padding between flex sensors and gloves. The replacement of the plastic hose in place of it is only the tilt area of the hand. Therefore, rubber should not be used. The filter sensors are now stable, which are eaten by metal coating and covered with glue gum, so that the solder does not break.

With the help of super glue, small pieces of plastic hose were added to gloves. And the end of the bend sensors was stitched with plastic tube and glue gum.

This shift was made by the gloves more simplistic and the value we took from the gloves was more accurate.

Another notable change is that we remove 2.2-inch flex sensors from the wrist and added two 4.5 inch Flex sensors in those places. We have done so because FLEX sensors have a much better result when covering and categorizing more area.

Fig.1 The range of gloves from where one is selected

Fig.2 Old Gloves vs New Gloves

Simulation Tools

1.Firebase

Firebase technology allows you to develop applications SPP (Server-Programming Program), thereby making it faster and easier to develop. It acts as a virtual time database, such as storage and synchronisation of the data between user and the device in real-time using the cloud-hosted. The update data gets synchronised with your device with which it is connected in no time and data is available even if the app is offline which provides a great user experience without the requirement of any internet connectivity. It supports cloud storage and hosting.

2. IDE (Integrated Development Environment)

We've used multiple IDEs to write and compile our codes. Usually, IDE is a software program that provides comprehensive facilities for computer programmers for software development. An IDE usually consists of the source code editor, automation tools, and debugger. The IDEs we have used in our projects are described below:

3. Arduino IDE

Arduino Software (IDE) is an open source IDE, which contains several libraries. It's open source, it's easy to write code and upload it to the board. It runs on Windows, Mac OS X and Linux. The environment is written in Java and is based on processing and other open source software.

To write code on the Arduino Mega Board, we have used many libraries. The SD library is used by using the methods from Build in the SD Library of Arduino. The SDI library is used to communicate with SD card. With the help of these libraries we can read and write on SD card. The software serial provides some additional libraries, which helps to communicate between Arduino board and Node MCU. Serial communication was established by TX-

There are three ways to write in node MCU ESP8266. The main format is code with a loova-based scripting language. But Node used Arduino to write on MCU, which is not a traditional way. But we've used it for our convenience. In the node MCU we have used many libraries for many purposes. Arduino works as an arduino mega master in the relationship between mega and node MCU and serves as node MCU slave.

Arduino Mega

The Microcontroller Development Board is based on the Arduino Mega ATMega1280 we used. It has 54 digital input / output pins (14 of which can use 14 PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), 16 MHz crystal oscillator, one USB connection, a power jack, an ICSP header, and reset button.

Flex sensor

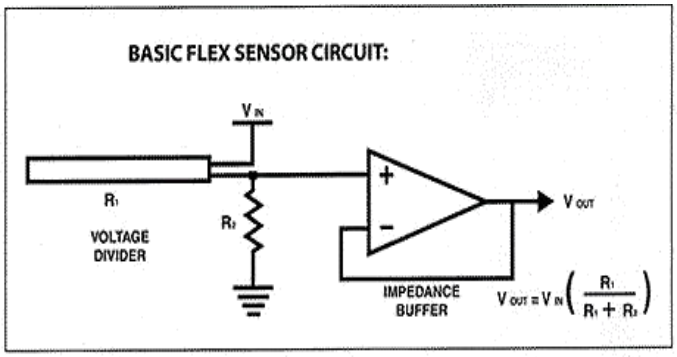
Flex sensor is one of the most important components used on our device for the measurement of angle when it bends. It is most commonly used in robotics, medical devices musical instruments, physical therapy, simple construction gaming etc. It is available in two different sizes one is 2.2 inches and other is 4.5 inches with a temperature range of -35 deg. Celsius to +80 deg. Celsius.

Fig.3. Flex Sensor

Research Methodology

1 Flex Sensor and Arduino

Flex sensor Arduino acts as a voltage divider circuit. A leg of the sensor is connected to 5v and connected to another leg area. The other foot of the barrier is connected to the ground of Arduino. A wire Mountain connects the normal node and the Flex sensor to the Arduino analog pin. When the sensor is bend, its resistance varies. Depending on this, the broken voltage also varies. Arduino voltage collects the amount depends on the bending of the bend sensor. In our system, we have used 8 flux sensors. Elephants are connected to the Arduino board from A0-A7. A0 A3 in the curved line, A2 in the index, A3 in the middle, A4 in the ring, A5 in the A5 and A7 at the top of the A7. We used 22k resistor for all the bend sensors in our gloves.



Result Analysis

1 Taking Raw Values from Sensor

In the initial stage of the project we took raw values from the sensors and tried to find out the values from each sensor in a given position showing the required sign. But the value difference was very unpredictable and unstable and also the range was very big. Thus, working with the raw flex sensor value was not an effective process. To overcome this difficulty, we moved to fixing scale for every sensor. This is known as calibration. Taking raw value was an unsuccessful approach.

2 Calibrating the flex sensors

We migrated to flex calibration after facing difficulty with raw sensor values. We took a range from 1 to 20. For every flex sensor the highest bending point is 20 which is the position where the flex is not bent at all and the lowest bending point is 1 which is the position where the flex is maximum bent. Now whatever value a person shows will be in between 1-20. Through flex calibration the value became much more stable and classification became easier. The flex calibration does retain until the last of the project. Flex sensor calibration was hence successful.

3. Gyro integration and calibration

We used gyro to detect angular rotation and implement the BSL. We also thought that the value of gyro will be used to form the states of hidden markov model. But we then decided to switch to ASL so we did not need gyro sensor anymore as it made the classification much more complex. Though gyro worked pretty well but we did not continue with gyro till the end. So working with gyro was not completely successful.

4 Algorithm

There is five flex sensor is used and voltage required for each flex sensor is +5v.When power is ON, Each flex sensor get +5v supply. When user made letter or word and press a button, then five signals coming from each five flex sensor are amplified using amplification circuit, and then its goes in microcontroller which are then converted analog signals to digital values. And then display the output in the LCD. If there is no letter matches current state of the hand, there is no output shown in the LCD

Problem Analysis and Discussion

While going through the whole process of the project, we faced many difficulties. The major difficulties are discussed in this section. Initially while calibration we figured out those different hands has different values while calibration. So, for every time a new person wears the gloves he has to calibrate once again. We also noticed that, even in case of same hand the values of calibration are never same. So no matter how many times a person calibrates the accuracy in value will not be satisfactory. This is a major drawback of it. Moreover, every individual has different size and shape of hand. So we have to make separate gloves for separate persons as the flex will not be in the correct position and will not bend in the similar ways in case of different size of hands. Another problem that we faced is that, the value of the sensor is never completely stable. And again, the Gloves flexibility is also not stable. It is either more or less rigid while wearing depending on the hand. But if we attach glue with it its flexibility changes. These are the drawbacks related to gloves. Now in case of sensors we faced some major difficulties. The sensors are not reliable. They used to get broken very easily. The metal shouldering of the flex sensors created immense problem as it broke down after getting slightest pressure. Moreover, the sensors are very expensive and the qualities of the sensors are not up to the mark.

IV. CONCLUSION

By using this proposed system we can make the disabled deaf and dumb people to be interactive to our environment. It helps need of person who is monitored continuously 24x7 with the help of human power. And also the patient can access their needs in a time without any struggle in conveying their thoughts. This helps them more with ease and it takes away the need of continuous monitoring. By implementing these they can feel

free to share their needs and requirements in time and without any struggle and delay. It eliminates the need of a person at all times.

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