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Smart Hand Glove for Sign Language Translation into Text and Speech

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ABSTRACT

Among the most exciting research areas is the recognition of sign languages. Various new techniques have been developed from this perspective in recent years. Deaf-dumb people mainly use Sign Language to communicate. In this paper, we demonstrate the recognition of 26 English letters by using hand gestures with help of flex sensors. Using standard symbols, ASL (American Sign Language) script can be converted into 26 English alphabets, which can then be displayed on a smartphone screen.

Key words - ASL script, Hand Gesture, Gloves.

I. INTRODUCTION

Gesture based communication is a characteristic way for typical and deaf people to impart. Most of communication through signing depends available motion acknowledgment. It very well may be challenging for normal individuals to see signs and information what they are attempting to communicate. Subsequently, the gloves' motivation is to make the existences of the not too sharp individuals simpler. The gloves convert hand signals to text and afterward discourse, permitting normal individuals to peruse the perceived motion, hear the voice, also, understand what the individual is attempting to express, bringing about more viable correspondence. Physical and non-physical correspondences are both piece of the framework. The gesture based communication fluctuates from country to country and isn't all inclusive. The US made American Sign Language (ASL), the United Kingdom made British Sign Language, etc. The ASL is utilized in most of nations, and our strategy is the same. Involving Arduino as the framework's cerebrum, the gloves change exact developments to message and at last to discourse [1].

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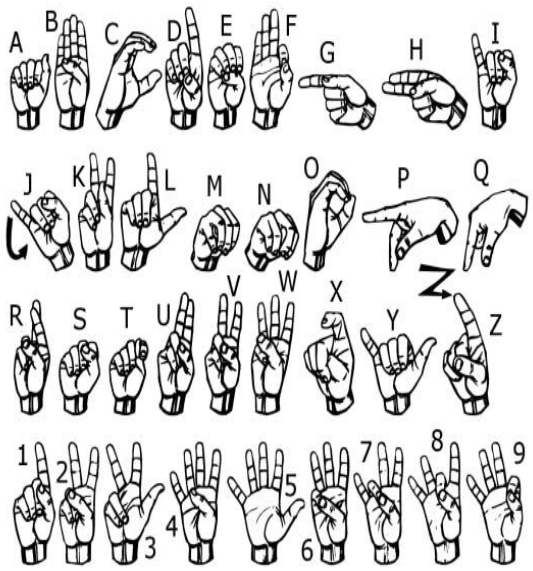

Fig.1 American Sign Language

The figure 1 [2] shows the American sign language for representing alphabets and numbers. The framework, which is appended to the gloves, utilizes flex sensors to transform motions into obstruction, which is then switched over completely to message utilizing an Arduino Nano. The flex sensors are a sort of adaptable sensor. For precise result, flex sensors are joined with accelerometers also, contact sensors. The accelerometer is utilized to follow hand movement, while contact sensors are created to follow finger contact. The sensors are picked in view of the accompanying measures. The sensors' result is handled on an Arduino Nano to produce text for show on a cell phone. Furthermore, the information is meant voice utilizing text-to-discourse frameworks. There is no business technique for switching communication through signing over completely to discourse available. Notwithstanding, work is in progress to make an interpretation of communication via gestures to discourse that is compact, productive, and very exact.

II. LITERATURE SURVEY

In [2] the author demonstrates, sign language to text and speech translation in real time using convolutional neural network and natural language understanding. In [3] Bukhari et al., discussed about American Sign Language translation through sensory glove; sign speak using wireless bluetooth link and arduino device. Data gloves for sign language recognition system using flex sensors and recognized using hand gestures are presented in [4]. In [5] the researchers reviewed about various types of sign language recognition system for deaf and dumb people using image processing using leap motion controller with USB. In [6] the authors reviewed on Systems-Based Sensory Gloves for Sign Language Recognition State of the Art between 2007 and 2017.In [7] the researcher discussed on Affordable Sign Language Glove which is used to communicate between speakers and non-speakers.

III. DESIGN METHODOLOGY

The framework shown in figure.2 consists of wearable glove includes flex and accelerometer which will be controlled by the movements of the human hand. An accelerometer measures the inclination of fingers. The Arduino Nano microcontroller is able to determine which set of values represent which symbol and transfer the appropriate result value over Bluetooth to the visual interface having the ability to display and speak the generated symbol. There was nothing too difficult about representing the first few symbols, but there were a few that were especially difficult to differentiate, such as the "U" and "V" symbols, which are very slightly different from one another but give almost the same value. Early prototypes failed horribly to accomplish that, but the problem was solved with the use of a metallic strip between the fingers, which was used to check whether they were in contact. Data sets for every symbol were updated continuously from time to time to increase accuracy.

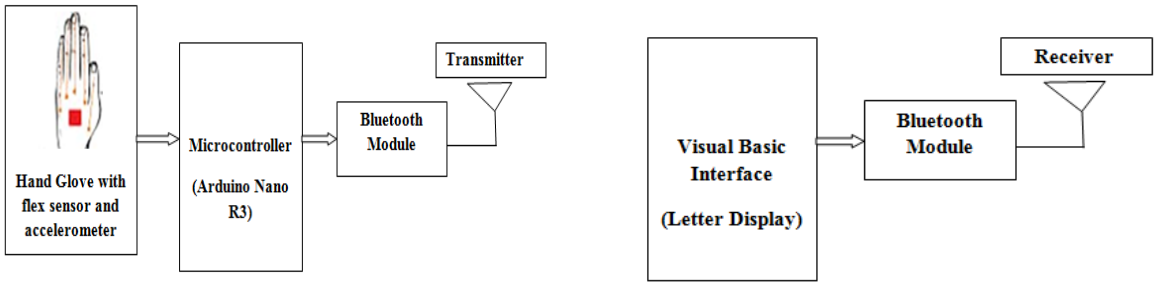

Fig.2. Block Diagram

Fig.3 Wearable Glove model

The upsides of the flex sensors and accelerometer are the principal contributions to the Arduino Nano. When the hand is in a specific motion as per gesture based communication, the information from the flex sensors and accelerometer are gotten. The microchip changes the opposition change into voltage, which it then, at that point, processes. The particular worth of a sign is inside the reach. This image is shown for help in the recognizable proof of letter sets and words. After an association is made, the letters in order is remotely sent, and the On the Android application, the letters in order/word is shown and voiced.

IV. HARDWARE USED

a) Flex Sensor

A sensor that measure the amount of deflection or bending of a surface, usually the sensor is stuck to a surface and resistance of a sensor element is varied by bend in the surface. Since the resistance is directly proportional to bending, it is used as goniometer and often called flexible potentiometer. A data glove is a human-computer interaction device that is made possible by flex sensor in the human machine interface or HMI interface. Deflection of a data glove is measured via flex sensors embedded in the glove.

b) Adafruit Analog Accelerometer : Adx L335

At a heart of the module is a small, low power triple, access MEMS accelerometer from analog devices with extremely low noise – ADX L335. The sensor measure the static acceleration due to gravity in tilt sensing application ,as well as dynamic acceleration resulting from motion , shock or vibration . the IC includes 3 analog output for X,Y and Z axis measurement ,2 supply pins and a self – test pin which allow you check the functioning of the final application.

c) Arduino Nano R3

The Arduino Nano has a numbers of facilities for communicating with a computer, another Arduino or other microcontroller. the Atmega 328 provides UART TTL(5v) serial communication, which is available on digital pins 0 (Rx) and 1(Tx-). Serial binary allows for serial communication of any of the Nano's digital pin. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board.

d) HC-05 Bluetooth Module

The HC-o5 Bluetooth module are easy to use and simple, its price is low and these type of module and interfaced with the Arduino , raspberry-pi, and microcontroller through the serial UART interface .the frequency is about ISM band of 2.4 GHz. The footprint of this Bluetooth module is as smallest 12.7 mm x 27 mm. this module are designed for the transparent wireless connection setup and it is very easy to use Bluetooth serial port protocol. It is used to detect finger gestures (sign) and transmit those messages to ADC or comparator.

V. RESULT AND DISCUSSION

The movement in the fingers is estimated utilizing an accelerometer. Flex sensors permit the development of each finger and the thumbs of the gloves. The flex sensors convey a progression of information that fluctuates relying upon at which you twist. A glove has five twist sensors, four for the fingers and one for the thumb. The flex sensors will be associated through resistors also; the resistors will be of 1Kohms. This assists us with knowing the obstruction of the flex sensors as indicated by movements of the client's fingers. The resistors will change values on flexing of the sensors and this way we get the result of values. These sensors measure the curve in the fingers, thumb, and palm, and the Arduino Nano microcontroller figures out which set of values

address which image in view of the twist point esteem, and sends the fitting outcome worth to the Android application by means of Bluetooth, which shows and talks the produced image.

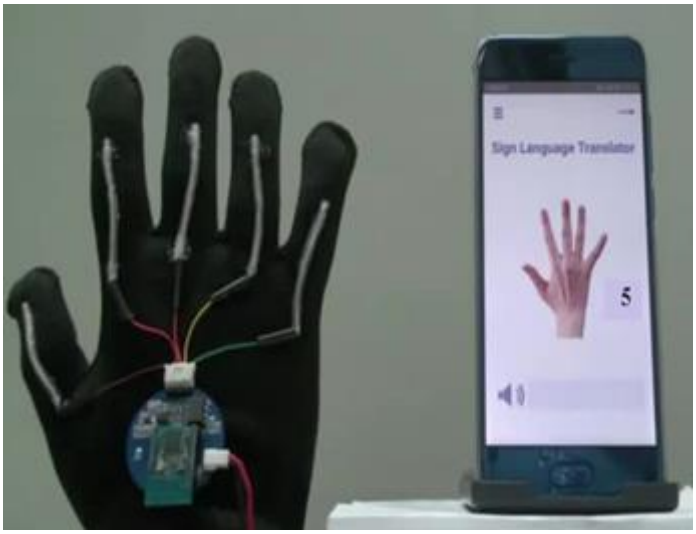

Fig.4 All the fingers are straight representing- 5

The output of the number "5" is represented in figure "4," and the resulting movement recognizes the number "5." The number “5” will be displayed on mobile screen and then speech output is obtained.

VI. CONCLUSION

This strategy permits hard of hearing and blind people to speak with each other. Dumb individuals talk in their own language, which is hard for visually impaired and regular individuals to comprehend. The communication via gestures is additionally interpreted into a composed organization to assist with deafened individuals. This text shows up on a PC screen. Hard of hearing individuals should be recuperated. We'll involve it to notice the hand movements for the hard of hearing and blind. Hand developments are switched over completely to text and afterward to voice by the framework. On the off chance that an individual can't hear the sound made because of those challenges, an arrangement has been executed into the text framework with the goal that the individual actually perused and comprehend what the other individual is attempting to say.

VII. REFERENCES

[1]. Kirpan, P., Mhaskar, M., Gavit, A. and Patil, M., Wearable Glove that Translate Sign Language into Text and Speech.

[2]. Mehdi, S.A. and Khan, Y.N., 2002, November. Sign language recognition using sensor gloves. In Proceedings of the 9th International Conference on Neural Information Processing, 2002. ICONIP'02. (Vol. 5, pp. 2204-2206). IEEE.

[3]. Bukhari, J., Rehman, M., Malik, S.I., Kamboh, A.M. and Salman, A., 2015. American sign language translation through sensory glove; signspeak. International Journal of u-and e-Service, Science and Technology, 8(1), pp.131-142.

[4]. Lokhande, P., Prajapati, R. and Pansare, S., 2015. Data gloves for sign language recognition system. International Journal of Computer Applications, 975, p.8887.

[5]. Kakde, M.U., Nakrani, M.G. and Rawate, A.M., 2016. A review paper on sign language recognition system for deaf and dumb people using image processing. International Journal of Engineering Research & Technology (IJERT), 5(03).

[6]. Ahmed, M.A., Zaidan, B.B., Zaidan, A.A., Salih, M.M. and Lakulu, M.M.B., 2018. A review on systems-based sensory gloves for sign language recognition state of the art between 2007 and 2017. Sensors, 18(7), p.2208.

[7]. Cloutier, P., Helderman, A. and Mehilli, R., 2016. Prototyping a Portable, Affordable Sign Language Glove. Worcester Polytechnic Institute.

[8]. Menaga, S., Paruvathavardhini, J., Kalaivani, P. and Haribabu, S., 2019. Air quality monitoring system using vehicles based on the IoT. International Research Journal of Engineering and Technology (IRJET), 6(03).