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# A Wireless Scheme to Establish a Communication between One Disable with Multiple Disables: A Survey

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***Abstract*— This topic presents the development of a sensory data glove using infrared receivers/transmitters as finger-bend measurement sensors. Here the sensors are used namely IR and RF. These sensors are used for transmitting and receiving purpose. This glove provides a lofty capability for the disable people which are not able to communicate with normal ones. Here, it uses the digital format for generating the output. To make the glove easy for use, a four-stage calibration procedure jointly with the creation of the calibration device is realized. It uses the binary pulse code generation for the synthesized speech recognition. In order to speed up the training process, it proposes a "Make and Break" method. So far, the experimental results of this method are very satisfactory and high accuracy.**

***Keywords*— Gesture Recognition, Hand Glove, IR and RF sensor, Arduino Uno and Speaker.**

## I. Introduction

There are so many visually impaired people about 285 million in the world and 900,000 deaf and mutes. These people use sign language to communicate with other people. But it's very hard to use and know this sign language as it contains approximately 6000 gestures [1].

Sign language is the nearly everyone commonly used when the transmission of audio is almost unworkable or forbidden, or when the act of typing and writing is difficult, but the possibility of vision exists. Moreover, sign language is the communicative way and natural language for the hearing impaired. Since sign language is gesticulated fluently and interactively like supplementary spoken languages, a sign language identifier must be able to identify continuous sign vocabularies in real-time.

Special type of sensors known as 'flex-sensors' are implant into a hand glove in order to achieve the goal. In this research a prototype of a reasonably priced and technically advanced wheelchair is to be designed and developed. This is to aid the transmission of severely disabled people and enhance the manoeuvring of the vehicle with the use of hand movements. The proposed prototype will be communicating wirelessly between the controller and hand glove control [2]. This model uses 26 gestures of hand to communicate alphabets and 10 more gestures to communicate numbers.

## II. Literature Survey

The Sayre Glove, created by Electronic Visualization Laboratory at the University of Illinois at Chicago in 1977, was the first data glove. One of the first commercially available data gloves was the Nintendo Power Glove in the year 1987. This was planned as a gaming glove for the Nintendo Entertainment System. It had a crude tracker and finger curve sensors and also buttons on the back. The sensors in the Power Glove were also used by hobbyists to create their personal data gloves. This system considers this as an inspiration for building our own data gloves with low-priced materials [3]. This system proposes a method to design an Electronic Hand Glove which would help hard of hearing and blind people to be in touch easily. The Glove that the model uses is an Electronic Hand Glove [1]. It is equipped with five Flex sensors, one on each finger that senses the bend in the finger and thumb and one Tilt sensor (Accelerometer) on the wrist which senses the twisting of the hand. This would help the deaf person to communicate with others by typing text on LCD screen through hand gestures. The conversion of text into speech is performed so that the blind person could hear and communicate. The data collected by these six sensors are combined together and a 8-bit code is generated and the corresponding alphabet to this code is displayed on the LCD screen which is then converted in speech through speech synthesize module.

David J Sterman and David Zelter [4] provided a basis for thoughtful the field by describing the key hand-tracking technologies and applications using glove-based input. They present a cross section of field to date. Richard A. Bolt [5] introduced a put-that-there architecture for voice and gesture with the graphics interface. In this building the test is performed on the conjoint use of voice-input and gesture recognition to command events on large format raster scan graphics display. The work involves the user commanding the different shapes about a large screen graphics display surface.

## III. Methodology

The hardware of system consists of three parts: Input Unit, Processor Unit and the Output unit. Figure (1) shows the block diagram of the designed system. The left section of the diagram shows the part of input which contains flex sensors and a tilt sensor [1]. The Hand Gesture is captured From Input unit as an input data which is fed to the Processor Unit. 8-bit code word is generated for the particular input Hand movement data by Arduino Uno which consists of microcontroller processes the input data. This code word is harmonized with the predefined alphabet or number.

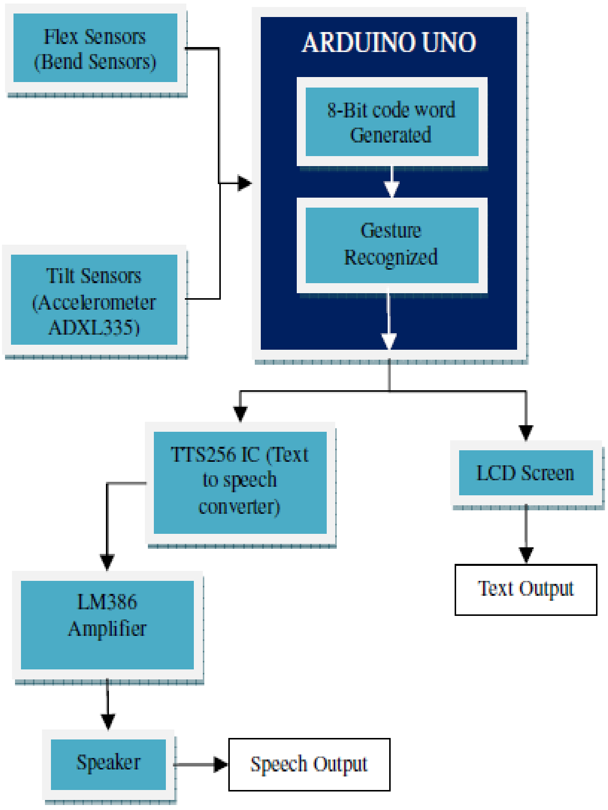


Fig. 1 Electronic Hand Glove System

If the Hand gesture is legitimate then matching character is provided to the output unit and displayed on the LCD screen (Text Output which can be easily read by a deaf and dumb person). There is one text to speech converter IC (TTS256) which converts the character string into speech. One output goes to that IC(TTS256) from processor unit. LM386 amplifier amplifies this speech and fed to the speaker. This output can simply be heard by a blind person.

### *A. Flex Sensors*

There are total five flex sensors and each finger consist one flex sensor. The resistance of this sensor changes on bend and hence it is a variable resistor. If the bend of radius is smaller, then resistance is higher. One end of this resistor is connected to 5V supply and other is ground when it is connected with Processor unit (Arduino uno). If the bend of finger is higher, then resistance is lower and output voltage is greater.

Bend of the Finger ->Resistance of flex sensor changes -> Output voltage from the sensor changes ->Analog output->Converted to Digital by an ADC -> output range assigned Logic 1 and Logic 0

### *B. Tilt Sensors*

Accelerometer ADXL335 is used as a three axis tilt sensor. This accelerometer calculates the acceleration in three directions x, y and z. The range of output value is between 1.5V to 3.5V. The processor unit converts this analog voltage into logic 0 and logic 1. To create 8-bit code word, the combination of three outputs of tilt sensor and five outputs of flex sensors is paced on the wrist of the hand. Tilt sensor gives following two types of output:

1) *Single Character*: Only one character is displayed on the LCD screen and converted into speech.

2) *Multiple Characters (String):* (00000000) is the combination for start gesture and (00011011) is the combination for end gesture. When the processor gets these two gestures the word formed by the gestures between these two is read. Hence, a character string is displayed and converted into speech.

### *C. Speech Synthesis Module*

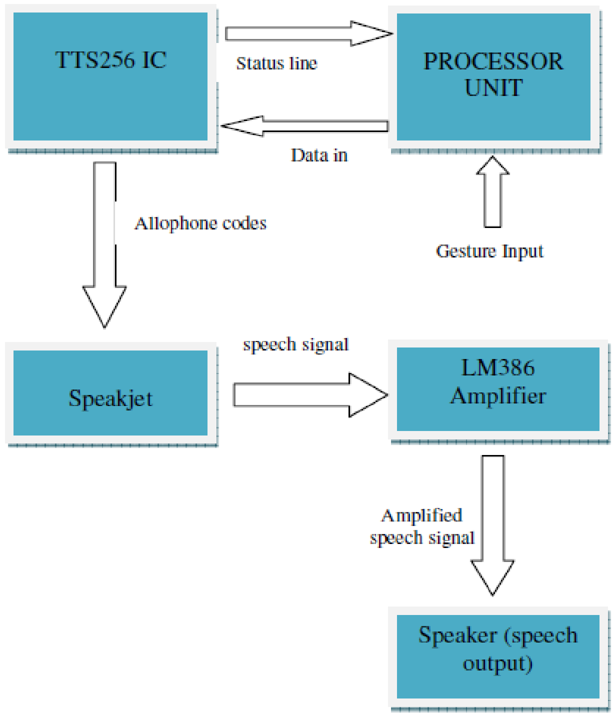


Fig. 2 Speech Synthesis Module

It consists of Text to Speech convertor IC (TTS256), Speakjet[6], an amplifier(LM386) and a speaker. Figure 2 shows various blocks of the speech synthesis module of the system. The TTS256 IC converts the ASCII character into allophone codes. These allophone codes are then fed to speakjet for equivalent sound adaptation. This voice is amplified by LM386 amplifier and finally the output is obtained through speaker.

### *D. The JhaneGlove*

The human hand consists of 27 degrees of independence: four in each finger, three for extension and flexion and one for abduction and adduction. The thumb is extra intricate: it consists of five degrees of independence, and six degrees of independence for rotation of wrist and translation [7]. The JhaneGlove (Figure 3) was created using three types of sensors: 5 flex sensors, 8 contact pads sensor, and an accelerometer and gyroscope. There are three states for each flex sensor. Each sensor has a facility to turn on or off. Each sensor enables 20 degrees of independence, allowing extra hundred different gestures.

Fig. 3 The JhaneGlove

### E. *The Sign Language*

This system currently permits the definition of 30 signs that can be processed by the identifier of the system. In addition to these signs, this system consist the *space* sign which marks the end of a word, and the *dot* sign which marks the end of a sentence. These are essential for the identifier to generate the words. Once the words are captured, the text-to-speech agent can convert them into speech. If 26 letters of English alphabet are entered by the system then extra four signs are remaining which are assigned to repeatedly occurring words or either full sentences. Full words or sentences can be assigned to 30signs when system defines domain-specific language and a custom sign language is created.

### F. *Calibration and Training*

*1) Calibration:* The user has to calibrate the glove of system to use it. First of all user has to record the min/max values which can emit with the glove. In this process, user has to move the hands in all directions and has to bend and unbend all the fingers. The min/max values are stored on the Arduino board. The normalization (0-128) is performed by the pre-processing software and this software is embedded in the Arduino board for the values whose range is in between (-200,200) for flex sensors and (4000-8000) for the gyroscope. All the data which is emitted by the glove is sent to this system's server from that point in a normalized form and then it is processed by the gesture recognition agent. This software provides a simple user interface from user's point of view. The user presses the "Start calibration" button to calibrate the data glove. Till the "Stop calibration" event generated by the stop button, the raw data is sent to the server and the calibration signal is kept by the glove. When the "Stop calibration" event is generated, the system keeps the timestamp of shutdown and loads all the data from database. This database was received from the user during the start-stop time range. These values are then sent back to the glove. After receiving the last bit of calibration data, the glove send a "Ready" message to the server and continue to send the calibrated sensor's data to the server by using the new set of minimum/maximum values.

*2) Training:* The user can train the system after calibration to identify the signs. The training process consists of simple user interface and it is comparatively perceptive. In this user interface, each sign must be entered four times. The user manages the training progress: user can take a break whenever required and can finish the training at a later time. This system is solving a multiple class classification problem. The input dimension matches with the sensors input: 20 dimensions with various input ranges for every sensor, multiplied by the number of incessant values recorded for every gesture. The recognition engine gives better performance if the user gesture is precise. The probability of resemblance is higher when there are many gestures.

## IV. PROPOSED SYSTEM

The primary input of the system would be the pose and orientation of the hand. We focus on break position of finger. Upon acquiring this data is encoded and transmitted wirelessly to a computer device. The computer device would convert this position in to a text message and voice message [2]. The glove with IR sensors sends the data to a RF transmitter which sends it to a RF receiver module to transmit wirelessly. The transmitted data is received by computer and converted to text and speech. We aimed at building a low cost solution. The major constraint was the cost of commercially available flex sensors. Hence we use IR transmitter and receiver to receive the signals of a finger break point. The cost of commercially available flex sensor is $10 per sensor, whereas the IR and RF sensors are more accurate easy to understand and cost effective.

The Arduino Uno is a microcontroller board built on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as outputs of PWM), 16 MHz ceramic resonator, 6 analog inputs, a USB connection, a power jack, an ICSP header, and a reset button. It encompasses everything required 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.

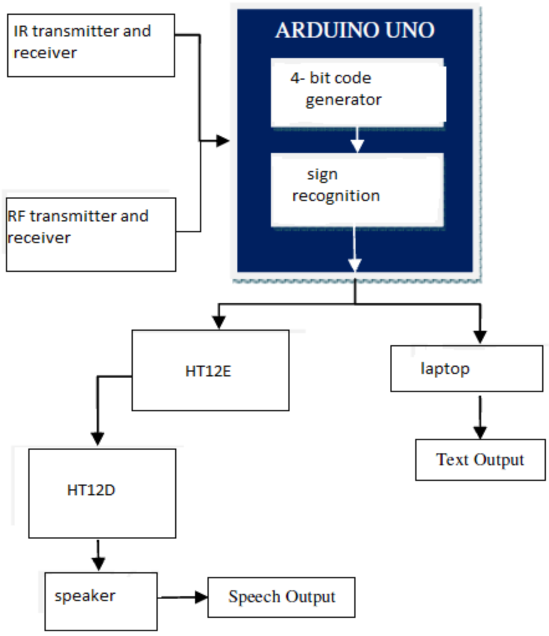


Fig. 4 Architecture of Data Glove System

Here the sensors are used namely IR and RF. These sensors are used for the transmitting and receiving purpose. This glove provides a high facility for the disable people which are not able to communicate with normal ones. Here it uses the digital format for generating the output. To make the glove easy for use, a four-stage calibration procedure together with the construction of the calibration device is realized. It uses the binary pulse code generation for the synthesized speech recognition. In order to speed up the training process, it propose a "Make And Break" method. Proposed system contains Arduino board and computer/laptop at receiver side. One transmitter is also present at receiver side which is connected to Arduino board. This Arduino board is connecte to laptop through USB. In proposed system, a switch case algorithm is used to display an output using VB.net. So far, the experimental results of this method are very satisfactory and high accuracy.

## V. CONCLUSIONS

In this study, this system proposed a framework for constructing the fingerspelling gesture recognition model based on the data acquired from a wireless sensor glove. The glove consists of 4 IR sensors providing a measure of finger bending, as well as motion and orientation of the hand based on the framework. Pangram indicates that the model with rules for accuracy enhancement outperforms the original multivariate Gaussian model. A straightforward method for further improving the recognition accuracy is to compare each detected word against a close vocabulary set. Any people who cannot listen they can also use this prototype.

## REFERENCES


[1] Dhiraj Gupta," Design And Development Of A Low Cost Electronic Hand Glove For Deaf And Blind", 978-9-3805- 416-8/15/$31.00_c 2015 IEEE.

[2] Rini Akmeliawati," Design and Development of a Hand-glove Controlled Wheel Chair", 2011 4th International Conference on Mechatronics (ICOM), 17-19 May 2011, Kuala Lumpur, Malaysia.

[3] S Celestine Preetham," Hand Talk- Implementation of a Gesture Recognizing Glove", 2013 Texas Instruments India Educators' Conference.

[4] Sturman, David J., and David Zeltzer. "A survey of glovebased input." *Computer Graphics and Applications, IEEE* 14.1 (1994): 30-39.

[5] R. A. Bolt, "Put-that-there: Voice and Gesture of the Graphics Interface," *Computer Graphics* (Proc. Siggraph), Vol. 14, No. 3, July 1980, pp. 262-270.

[6] Ahmed, Syed Faiz, Syed Muhammad Baber Ali, and Sh Saqib Munawwar Qureshi. "electronic speaking glove for speechless patients, a tongue to a dumb." *Sustainable Utilization and Development in Engineering and Technology (STUDENT), 2010 IEEE Conference on*. IEEE, 2010.

[7] Olga Katzenelson" A Sign-to-Speech Glove", IUI 2014 Workshop: Interacting with Smart Objects, February 24, 2014, Haifa, Israel *FLEXChip Signal Processor (MC68175/D)*, Motorola, 1996.