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HAND TALK GLOVES FOR GESTURE RECOGNIZING

Kalyani U. Chafle*, Bhagyashree Sharma, Vaishali Patil, Ravi Shriwas
*Research scholar, Department of Electronics and Telecommunication, Jawaharlal Darda institute of Engineering and Technology, Yavatmal.
Assistant Professor, Department of Electronics and Telecommunication, Jawaharlal Darda institute of Engineering and Technology, Yavatmal

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ABSTRACT
The Deaf people have difficulty in communicating with others like who don't understand sign language. In this purpose we are implementing this research. There has been a great development in the past few years on the infusion of technology in the life and curriculum of people with special needs. A techno logy that enables an individual with a learning disability to compensate for specific deficits is indeed an assistive technology. Technology to incorporate would usually range between the simple low-level technologies to the robust emerging technologies. As technology is meant to help humanity, assistive technology relates well to those with special needs. In this paper, we present the structure of our device, highlighting on how the sensors were made. We also discuss the block level implementation of the gesture to speech translator and report a few results of our preliminary testing.

INTRODUCTION
Devices and gadgets that aid the differently-able to lead normal and convenient lives has always been an area that has attracted innovation. Recent advancements in technology, like low-power electronics and wireless devices and ability to design both the analog front-end and digital processing back ends as integrated circuits has inspired a new range of wearable micro-devices. We have developed a glove with a motive to provide a low-cost solution to enable speech impaired persons to communicate using an artificial voice. It is easy for the user to use the device as it converts sign language to speech, and a lot of people who are speech impaired communicate with hand gestures. Our glove also has the additional capability of being able to learn from user gestures, so that it can convert more gestures into speech

In this system we use Radio Frequency Signal to transmit the signal form transmitters to Receptors, in this research we have used microcontroller, a speech IC and also a speaker to produce the output. One of the many areas in which embedded systems show great promise is assistive technologies, which address the special needs of those with impairments. This works presents Hand Talk, a "smart glove" that can recognize basic hand gestures and convert them into speech using low-cost, commercial off-the – shelf (COTS) components. A low-cost, portable gesture-to-speech glove prototype demonstrates that embedded systems don't have to be expensive to be effective.

Many researchers will agree that selecting the most appropriate technology for individuals with learning disabilities, requires a careful and systematic plan. It is important to stress that not all assistive technologies are appropriate for all individuals in all situations. People with learning disabilities have their own unique set of strengths, weaknesses, special abilities, interests, and experience. It will become obvious that there is no such "general purpose" assistive technology. Disability requires careful analysis of the interplay between the individual; the specific task/functions to be performed; the specific technology; and the specific contexts of interaction. A real risk now persists from the flow of the general-purpose assistive technology toys and tools, making it harder for professional to recommend the actual tools due to the very competitive price of the general purpose ones. Each child with special needs is a unique entity with very detailed descriptors that distinguishes him from the others. Only professionals are able to determine those differences and therefore satisfy the need for proper assistance. Robust technologies require the designer to be

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involved with the world he/she is designing for. The gap between humanities and science needs to be bridged to get the scientists to innovations with human use and nature.

LITERATURE REVIEW

The first Hand Talk glove was designed by Ryan Patterson in the year 2001. He began his mission with his Sign Language. Sign Language Translator consists of two separate components, a leather golf glove that has ten flexible sensors sewn into it which monitor the position of the fingers by measuring the electrical resistance created by the fingers as they bend. A small microcontroller on the back of the hand converts the change in the electrical current into digital signals and transmits them wireless to a computer. The computer then reads the numerical values and converts them into the letters which appear on the screen. The main disadvantage with this model was that a computer or a laptop was always required for its functioning which made it less portable.

A group of engineering students at Carnegie Mellon University, Bhargav Bhat, Hemant Sikaria, Jorge L. Meza and Wesley Jin demonstrated their project „Hand Talk" a sensor equipped glove that translates finger and hand gestures into spoken words. This is the first demonstrator model to show the functionality based on a limited vocabulary of 32 words. Sensors in the glove pick up gestures and transmit the data wirelessly via Bluetooth to a cell phone which runs Text to Speech software. The sensor data are converted first into text and then to voice output. A person not knowledgeable in Sign language can listen via the cell phone what the other person is saying in Sign language form. The main advantage with this design was its simplicity and the cheap components these students used to create this amazing and truly interactive glove that could help to improve greatly the communication barrier between deaf persons and people[3]. The latest sensor being used for the Hand Talk glove is the accelerometer. Instead of working in two planes (X and Y) like in the flex sensors, it works in X-Y, Y-Z and X-Z planes. It is more reliable than the flex sensors and only one accelerometer is required for one glove. More number of programs can be fed into it so it can accommodate more number of sounds in it.

In power supply circuit the DC pulsating is removed by electrolyte capacitor (1000 μF) and the noise generated is removed by ceramic capacitors. Our hardware requires 5V DC and hence a voltage regulator of 7800 series (7805) is used. LED"s are used which informs about the supply being activated. A 330Ω resistor is used to drop the voltage and make it 2-2.5V as required by the LED. The deflection of the flex with a minimum angle of 40°, a resistance is obtained which is increased by bending and voltage is obtained. Four flex sensors along with their connection ports are placed.

The Sayre Glove, created by Electronic Visualization Laboratory at the University of Illinois at Chicago in 1977, was the first data glove [3]. One of the first commercially available data gloves was the Nintendo Power Glove in the year 1987. This was designed as a gaming glove for the Nintendo Entertainment System. It had a crude tracker and finger bend sensors, plus buttons on the back. The sensors in the PowerGlove were also used by hobbyists to create their own datagloves [4]. We took this as an inspiration for building our own data gloves with inexpensive materials.

DESIGN AND WORKING

The primary input of the system would be the pose and orientation of the hand. Main module is shown in fig.1. We focus on acquiring to what extent each of the finger joints is bent. Upon acquiring this data it is encoded and transmitted wirelessly to a mobile device. The software in the mobile device would guess the shape and orientation of the hand based on the received data. We achieve the same using a simple implementation of a Minimum means squared estimation. A speech synthesizer adapted from the Android stack articulates the gestured words.

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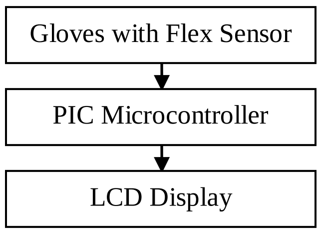

Figure1. Representation of System Module

The glove with sensors sends the data to a microcontroller which sends it to a bluetooth module to transmit wirelessly. The transmitted data is received by cell phone and converted to speech. We aimed at building a low cost solution. The major constraint was the cost of commercially available flex sensors. Hence we built our own flex sensors using ESD materials which changes its resistance depending on the degree of bend. The cost of commercially available flex sensor is $10 per sensor, whereas the flex sensor we built costs less than 1 rupee per sensor.

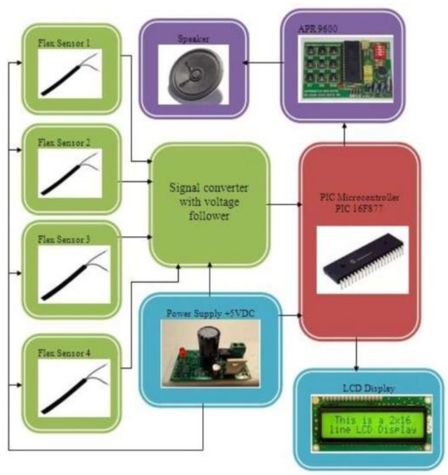

Figure2. Working of Hand Talk Gloves

We are using flex sensors fabricated out of low-cost ESD material as shown in fig.2. The sensors display a change in resistance when bent. These sensors are placed in a resistive divider configuration with a suitable resistance of 500 kilohm which converts the resistance change to a voltage change. We are using 10 sensors on the five fingers of the glove. Two on each of two joints over each finger as shown in fig.3.

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Figure3. Hand Talk Gloves

In general, deaf people have difficulty in communicating with others who don't understand sign language. Even those who do speak aloud typically have a "deaf voice" of which they are self-conscious and that can make them reticent. The Hand Talk glove is a normal, cloth driving glove fitted with flex sensors along the length of each finger and the thumb. The sensors output a stream of data that varies with degree of bend. The output from the sensor is analog values it is converted to digital and processed by using microcontroller and then it will be transmitted through wireless communication (RF), then it will be received in the Receiver section and processed using responds in the voice using speaker.

In the research Flex Sensor plays the major role, Flex sensors are sensors that change in resistance depending on the amount of bend on the sensor. They convert the change in bend to electrical resistance – the more the bend, the more the resistance value. They are usually in the form of a thin strip from 1"– 5" long that vary in resistance from approximately 10 to 50 kilo ohms. They are often used in gloves to sense finger movement. Flex sensors are analog resistors. They work as variable analog voltage dividers. Inside the flex sensor are carbon resistive elements within a thin flexible substrate. Carbon means less resistance. When the substrate is bent the sensor produces a resistance output relative to the bend radius. With a typical flex sensor, a flex of 0 degrees with give 10K resistance with a flex of 90 degrees will give 30-40 K ohms. The bend sensor lists resistance of 30-250 K ohms.

A. Compiler

Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors. I.E the programs written in one of the HLL like 'C' will compile the code to run on the system for a particular processor like x86 (underlying microprocessor in the computer). For example compilers for Dos platform is different from the Compilers for UNIX platform So if one wants to define a compiler then compiler is a program that translates source code into object code. The compiler derives its name from the way it works, looking at the entire piece of source code and collecting and reorganizing the instruction. See there is a bit little difference between compiler and an interpreter. Interpreter just interprets whole program at a time while compiler analyzes and execute each line of source code in succession, without looking at the entire program.

B. Cross Compiler

A cross compiler is similar to the compilers but we write a program for the target processor (like 8051 and its derivatives) on the host processors (like computer of x86). It means being in one environment you are writing a code for another environment is called cross development. And the compiler used for cross development is called cross compiler. So the definition of cross compiler is a compiler that runs on one computer but produces object code for a

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different type of computer. Cross compilers are used to generate software that can run on computers with a new architecture or on special-purpose devices that cannot host their own compilers.

Cross compilers are very popular for embedded development, where the target probably couldn't run a compiler. Typically an embedded platform has restricted RAM, no hard disk, and limited I/O capability. Code can be edited and compiled on a fast host machine (such as a PC or UNIX workstation) and the resulting executable code can then be downloaded to the target to be tested.

Cross compilers are beneficial whenever the host machine has more resources (memory, disk, I/O etc) than the target. Keil C Compiler is one such compiler that supports a huge number of host and target combinations. It supports as a target to 8 bit microcontrollers like Atmel and Motorola etc.

CONCLUSION

The assistive aid that was developed resulted in providing an user friendly approach to the speech impaired people. The user dependent system provided 90 percent accuracy. This system helps the speech impaired people and for the bed-ridden deaf and dumb people to express their need and announce their requirements. As per the experimental results, we developed this proposed concept and thus it is practically possible. Thus this system will help the physically challenged people to a greater extent and also improves the sophistication in driving. This reduces the dependency of the physically challenged people on others, thereby empowering them and making them independent for meeting their basic needs. The instrument is of low cost and affordable. It is easily controlled to patients. Embedded systems don't have to be expensive to be effective. With its small research team and almost no budget, the Hand Talk project illustrates the creative possibilities for innovative developers using inexpensive COTS components. Work continues on the system. The next version of the glove will have between 20 and 30 separate Sensors, including pressure sensors and accelerometers.

Instead of using a computer or a cell phone as used in the earlier inventions, we are using the microcontroller. It makes this easily portable and easier to use. Even though the less advanced flex sensors are used, still a large number of sounds can be pre-recorded in the recorder and can be used through the programming. The flex sensors working in the two planes provide a lot of options for movement of the fingers and the thumb which is later transmitted into voice. It can be seen from figures 5 and 6 that using simulation techniques that the clarity of the signals can be improved.

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