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TACTOGLOVE PRESENTING TACTILE SENSATION FOR INTUITIVE GESTURE INTERACTION

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ABSTRACT

A Sign Language(also signs language) is a language which , instant of acoustically conveyed sound pattern , uses visually transmitted sign patterns (manually communication, body language) to convey meaning simultaneously by combining the movement of the hands and hand shape. The arms, body and facial expression are to express a speaker thought. These sign languages are developing for the physically challenged people. Their complex spatial grammars are entirely different from the spoken languages. Thousands of sign languages are in around the world for the use of physically challenged cultures. Some sign languages are in the form of legal recognition while other sign language has no status at all. Sign languages are rich and complex in linguistic terms. Despite the common ones are not “real languages”. Many sign languages are studied by professional acoustics they exhibit the fundamental properties and these properties exist in all languages. This project is mainly designed to convey the message of sign to all. Sensors and actuators are activated according to the information coming from the real world and from a physical model that represents the virtual object. For this the values are transmitted and using the camera the conveyed message is observed and operations are performed according to the sign so as to satisfy the needs of the person.

Keywords: tactoglove, microcontroller, image processing, hand gesture.

INTRODUCTION

Tactoglove utilizes the visually transmitted sign patterns to convey meaningful messages. This system works on simultaneously combining hand shapes, orientation and movement of the fingers to express a speaker's thoughts. It can also serve for those who were dumb and for people who are physically challenged. Based on the output of the glove, microcontrollers are used to trigger the devices. However the limitations are distortion due to variable channel interference, energy loss, due to energy loss the throughput of the system is affected. The tactile sensors are fixed on a glove that is worn by the person. Based on the bending angles of each finger the domestic appliances are controlled, to convey meaningful messages over text/voice using tactile sensation. It consists of a receiver and transmitter module. The transmitter sends the tactile sensations to the receiver. The receiver receives the tactile signals and converts them into meaningful messages. The physically challenged people face a problem of conveying information to the other people. The tactile glove can be worn by them and the hand gestures are converted into messages.

PROJECT OVERVIEW

There are 3 phases in this project. In the first phase, RF transmitters and receivers are used. The electrical appliances are controlled using the RF signals. In the second phase, the IR sensors are attached facing each other on the gloves. When the finger is bent the signals are not transmitted. Using this few electrical appliances are controlled. In the third phase, a camera module is used. Using the peak points the gestures are converted to messages and the messages are displayed on a screen. A simple block diagram of this module is given below. The transmitter end consists of flex sensors, accelerator and RF module which are given to the micro controller unit and transmitted using RF signals.

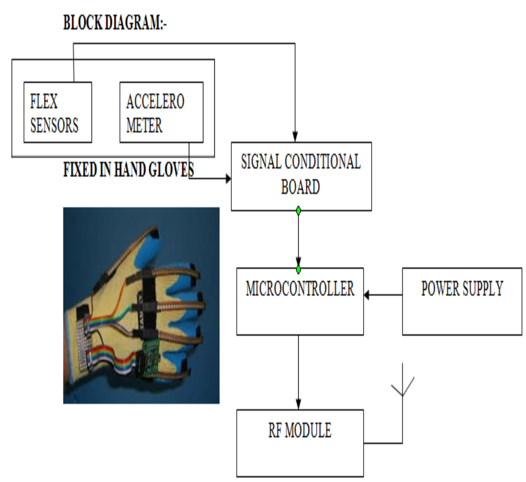

Figure-1. Block diagram of Transmitter.

The receiver end consists of an LCD screen to display the messages, a receiver to receive the RF signals that are sent by the transmitter and a micro controller unit. The block diagram of the receiver end is given below.

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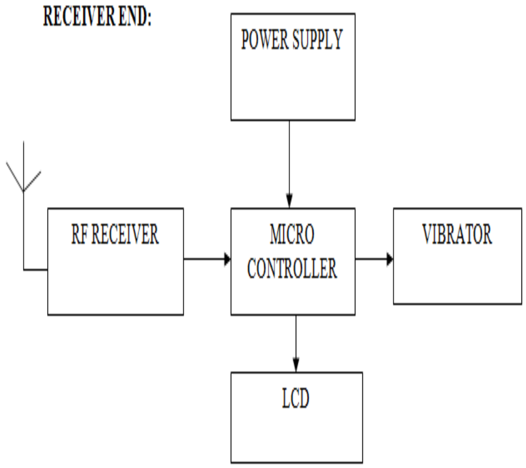

Figure-2. Block diagram of Receiver.

Phase 1

In Phase 1 the energy transmission between 2 nodes with variable channel shifting and controlling of 256*4 combinational outputs by a single transmitter and 256 precedent receivers is tested. It consists of a RF transmitter and receiver. A transmitter and receiver consist of 8 channels which can send or collect 4 bit data only when the channel is matched between 2 nodes. Here RF signals are used to control a bulb and a buzzer. The transmitter end consists of push buttons. Each push button turns on a device when it is pressed and turns off when it is released. The receiver end which consists of a bulb and a buzzer that are controlled is shown below.

Figure-3. Prototype for Receiver.

The transmitter is similar to a remote which consists of 3 push buttons.

Phase 2

The above stated system can be upgraded by implementing using tactile glove. We implement this using the IR sensors as there is no bending loss and use of ADC channels can be eradicated. Photodiode of the IR sensor receives IR signal which is transmitted from the IR led. Based on the signal variation in the photo diode, the output can be controlled. The values are transmitted via 4 bits of 433MHz RF transmitter and received by the adjacent receivers. The IR sensors are placed adjacent to each other such that if the finger is bent, no signals are received. This signal variation is transmitted and they are used to control the electrical appliances. For eg, if the thumb finger is bent, the IR photodiode doesn't receive any signal. Hence one of the appliances i.e., the bulb is turned on. The Tactoglove along with the IR sensors are shown below.

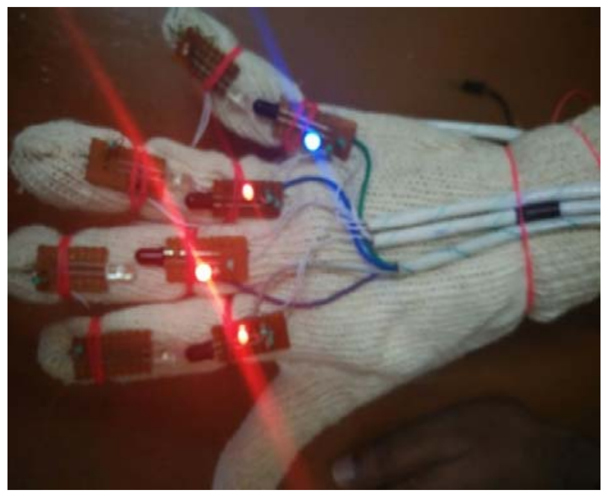

Figure-4. Prototype for Tactoglove.

The led indicates that the finger is not bent and the photodiode in the IR sensor receives signals. As it is shown in the above figure that if the finger is bent, the photodiode receives no IR signals. Using this information a bulb or a buzzer can be turned on or off.

Phase 3

In the Phase3 the Tactoglove is implemented using the camera module. Based on the number of fingers displayed in front of the camera the electrical appliances can be controlled. The image obtained from the camera is processed using the MATLAB code. The skin is detected in the obtained image the noise and corners are filtered. Then the numbers of objects are counted. Using this count the appliances are turned on and off. The output from the matlab is sent to the microcontroller via a serial port. Electrical appliances like bulb, buzzer etc are connected to the microcontroller through the relay. The controller is programmed using Embedded C to turn on and off devices based on the output obtained from the MATLAB.

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The input image is given and it is captured through the camera for recognising .The input given is two Fingers and it is recognised successfully.

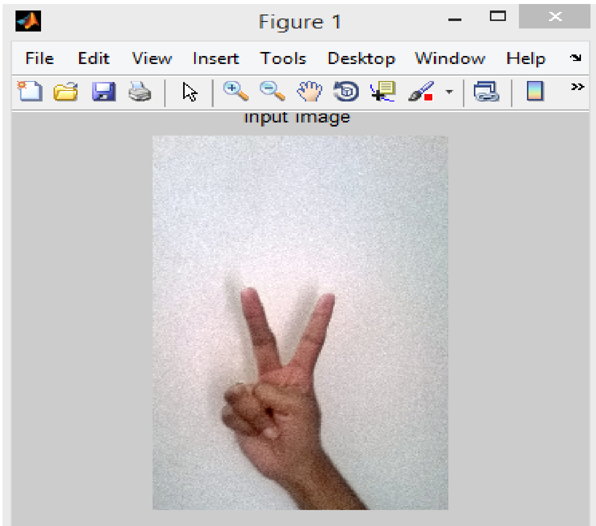

Figure-5. Input image.

By using skin detection method it compares both the foreground pixels and background pixels and it suppress the background and by enhancing foreground only finger can be detected. Noise is reduced by using filters.

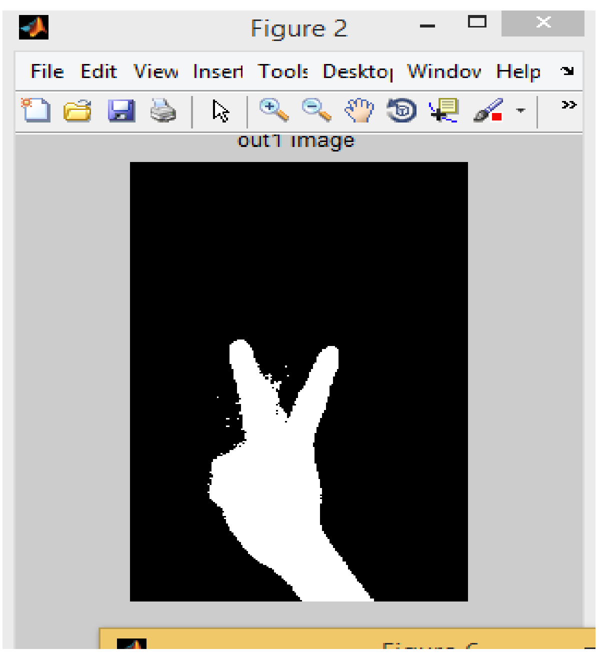

Figure-6. Noisy image.

To improve the image quality for better output performance dilation and erosion is performed. The filtered image is shown in Figure-7.

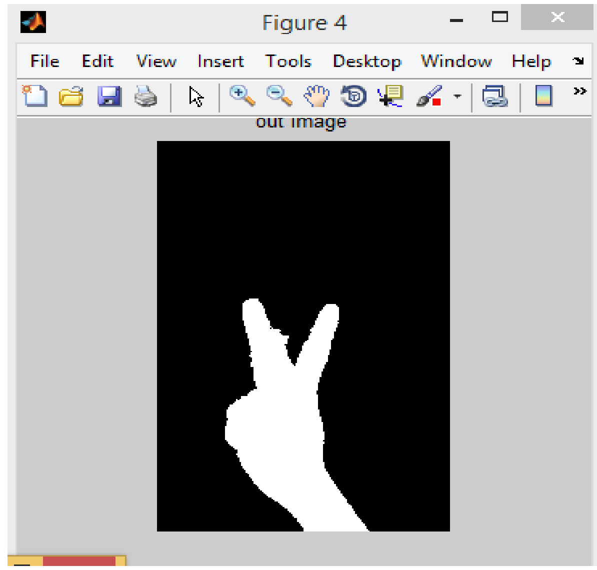

Figure-7. Filtered image.

By using the canny edge detection boundaries are taken in account for recognising. And it is interface through hardware.

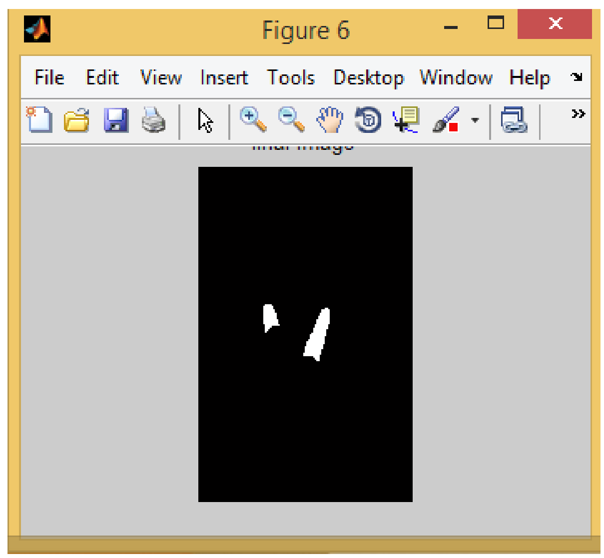

Figure-8. Object detected image.

CONCLUSIONS

The tactoglove approach for conveying the messages of the physically challenged person can be very useful. The Devices can be switched through wireless mode of transmission by the use of RF/Bluetooth. It is a highly flexible mode of communication. It can cover the range around 1km approximately. Nearly 5-10 devices can be controlled reliably around a short distance.

REFERENCES

Prince Nagar, Ashwani Sengar and Mayank Sharma: 2013. Hand shape based gesture recognition in hardware. Archives of Applied Science Research. 5(3): 261-269:

Mokhtar M. Hasan and Pramod K. Mishra. 2012. Hand gesture Modeling and recognition using Geometric Features: A Review. Canadian journal on image processing and computer vision. 3(1).

Meenakshi Panwar. 2012. Hand Gesture based Interface for Aiding Visually Impaired. Centre for Development of Advanced Computing Noida, Uttar Pradesh, India.

2011. M.S. Dias, R. Bastos, J. Fernandes, J. Tavares, P. Santos. International Conference on Recent Advances in Computing and Software Systems. Using Hand Gesture and Speech in a Multimodal Augmented Reality Environment.

Shaun K. Kane, Jacob O. Wobbrock. 2011. Usable Gestures for Blind People: Understanding Preference and Performance. The Information School, DUB Group University of Washington Seattle, WA 98195 USA {skane, wobbrock}@uw.edu.

Shahzad Malik. 2003. Real-time Hand Tracking and Finger Tracking for Interaction. CSC2503F Project Repor.

Mohammed Hafiz. 2012. Real Time Static and Dynamic Hand Gesture Recognition System.

Kuznetsova A., Leal-Taixe L., Rosenhahn B. 2013. Real-time sign language recognition using a consumer depth camera. In: Proceedings of the IEEE International Conference on Computer Vision Workshops. pp. 83-90.

Mesch J.: Signed conversations of deafblind people.

Rehg J.M., Kanade T. 1994. Digiteyes: Vision-based hand tracking for humancomputer interaction. In: Motion of Non-Rigid and Articulated Objects, 1994. Proceedings of the 1994 IEEE Workshop on. pp. 16-22. IEEE.

Wachs J.P.; Kölsch M.; Stern H.; Edan Y. 2011. Vision-based hand-gesture applications. Commun. ACM. 54, 60-71.

Wu Y.; Huang T.S. 2000. View-independent recognition of hand postures. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, Hilton Head Island, SC, USA. 2: 88-94.

S. P. Priyal, P. K. Bora. 2010. A study on static hand gesture recognition using moments. In Proceedings of International Conference on Signal Processing and Communications (SPCOM). pp. 1-5.

J. Lee-Ferng, J. Ruiz-del-Solar, R. Verschae and M. Correa. 2009. Dynamic gesture recognition for human robot interaction. In: Proceedings of 6th Latin American Robotics Symposium (LARS). pp. 1-8.

Nisha Sharma, Swati Uppal, Sorabh Gupta. 2011. Technology Based on Touch: Haptics Technology. IEEE.