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INTEGRATION OF SIGN TO LANGUAGE CONVERTOR AND WIRELESS COMMUNICATION FOR DEAF AND DUMB, AGED PATIENTS

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ABSTRACT

In the society, there are many disabled people or patient's and need help for communication. These disabled people use sign language to communicate with normal people. For this purpose the hand gesture recognition system is develop by integrating sign language converter and wireless sensor network which is useful for patients in ICUs.this system divide in two parts, first part is to develop "E-Hand Glove "which consists of flex resistors that sense the change in gestures and send to AVR microcontroller which processes, and send data to LCD which shows the respective resulting letter. Second part is to develop continuous Monitoring and controlling of patients parameter such as heart beat & the body temperature. System gives alarms when parameter exceeds the provided threshold value. Also controlling the operation of electrical appliances using hand signs such as fan and Light in ICUs rooms using Zig-bee wireless technology. This system helps patients to perform some daily activity interactive manner.

Keywords - E-Hand Glove; Flex Resistors; LCD; Sign to Language Convertor; Zig-bee.

I INTRODUCTION

Communication is an essential element of human life, for speech and hearing impaired disabilities, non-verbal form of communication is very important. Facial expression, lip motion, sign language, to hand-writing such a various forms are use for communication. In particular, sign language, such as body or hand gestures are used to communicate with normal people. There are many ways to recognize and analyse the Hand movements, by using Hand Glove-based Technique, Vision-based Technique, hybrid Hand Gesture Recognition Techniques. In world there are many disabled people (deaf, mute, blind, etc) who face lot of problems while communication

with society, to solve their problem, it's proposed to design and implement system using integration of "E-hand gloves " and Wireless Sensor Network for "Central Health Monitoring and controlling System" to perform easy and secure daily activity. For that purpose the system develop for deaf and dumb Patient at ICUs in Hospitals, to provide hand gesture recognition system using "E-Hand Glove" and Central Health Monitoring and controlling System for continuous measurement of various parameters like body temperature, heart beat rate. And also control the various operations as per patient requirement using Wireless Sensor Network. This system involves "E-Hand Glove" and Wireless Sensor Network, where the "E-Hand Glove" is use for hand gesture recognition which consist of hand wearing the glove, which have flex resistors it's substrate is bent, the sensor produces a resistance output correlated to the bend radius that sense the change in gestures, AVR 16-Bit Microcontroller gathers, processes, and sends data to the LCD, which shows the respective resulting letter. and Wireless Sensor Network is use for monitoring, continuous observation of deaf and dumb Patient at ICUs is essential to measure parameters like body temperature using LM35 Precision Centigrade Temperature Sensors and Heart beat Pulse Sensor it Attach to finger and get Analog out from the sensor based on heart beat pulse, read the analog output with microcontroller ADC and then calculate readings like heart beat per minute. And controlling performs various basic daily activity of Patient as per requirements such as to operate electrical appliances and other facility using Zig-Bee technology, to help Patient to ease their work and provide them safe, sound and secure living.

II RELATED WORK

Over the years a number of attempts have been made to address the problem of communication between speech and hearing impaired people at public places in expressing themselves to normal people."Communication is easily overlooked, but the ability to communicate effectively is necessary to carry out the thoughts and visions of an organization to the people. The importance of words, through a paper or a speech voice in a communication medium, is to convey directions and to provide synchronization" [1]. According to the Word Federation of the Deaf, there are around 72 million deaf, mute, or deaf-mute people in the world today [2] And while many of them can communicate with each other through sign language, there is a linguistic wall between them and people who can speak and write but do not know signs. Furthermore, most people suffering from hearing impairment prefer sign language**;** Gestures are used for verbal or non-verbal communication in our day to day life. As per Webster's Dictionary, gesture is "the use of motions of the limbs or body as a means of expression; a movement usually of the body or limbs that expresses or emphasizes an idea, sentiment, or attitude [3]. For that purpose an assistive device for speech- and hearing impaired disabilities has been developed based on the Body Sensor Network (BSN) technology [4].Research on hand gesture recognition has been conducted for various languages, real-time recognition of American Sign Language (ASL) finger spelling gestures is performed based on input signals acquired from a wireless sensor gloves. The recognized gestures will then be mapped into corresponding sounds using speech synthesizer [5]. In 1977, Thomas Defanti and Daniel Sandin developed the first sensor based hand glove known as 'Sayre Glove' which was equipped with a photocell at

one end and a light source at other [6].System illustrates different types of Hand Gloves till date with the name of the sensors they are equipped with. The Glove that the model uses is an Electronic Hand Glove. 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 [7]. Glove-Talk is another example of a system that translates the recognized hand gesture into speech by allowing the hand to act as an artificial vocal tract that produces speech in real-time.. The system, however, is wired-based, difficult to control and requires a lot of prior training [8]. Vision based techniques can be used to overcome this restricted interaction. However, vision based techniques faces the problems of background subtraction, occlusion, lighting changes, rapid motion or other skin colored objects in a scene [9] A similar work has adopted a gesture based appliance system for smart homes. It presents a robust system that can work in complex backgrounds. The method involves the use of TRS moment invariants merged with the Viola-Jones detection framework. They demonstrated this by controlling a pedestal fan [10]. Thus there were various limitations on the previous researches done so far in the field of Sign language interpretation system. Some of them were usage of the image processing method, as it will be restricted to only individual images. Therefore in this project, the gestures for words in Indian sign languages have been used and eight commonly used words are produced as alphabetic letters on the LCD.

III SYSTEM ARCHITECTURE

This work proposes the development of system by integrating sign language converter and wireless sensor network useful for patients in ICUs using AVR microcontroller.

A. Modules for proposed system

Design of system divide in two parts first part is to develop “E-Hand Glove” and Second part is to develop Central Health Monitoring and controlling System.

B. E-hand glove

This system consists of flex resistors that sense the change in gestures, a controlling unit is use for gathers information from input section then process on it and send data to display on LCD, which shows the respective sign gesture.

C. Central health monitoring and controlling system

This section is used for continuous measurement of various Monitoring and controlling parameters like body temperature, heart beat rate etc. The device gives alarms when the heart beat & the body temperature exceed the provided threshold value. Also controlling the operation of electrical appliances using hand signs such as fan and Light in ICUs rooms using Zig-bee wireless technology. Aimed to help patients with wrist impairments to perform some daily activity in a joyful and interactive manner. Fig.1 shows transmitter section of proposed system.

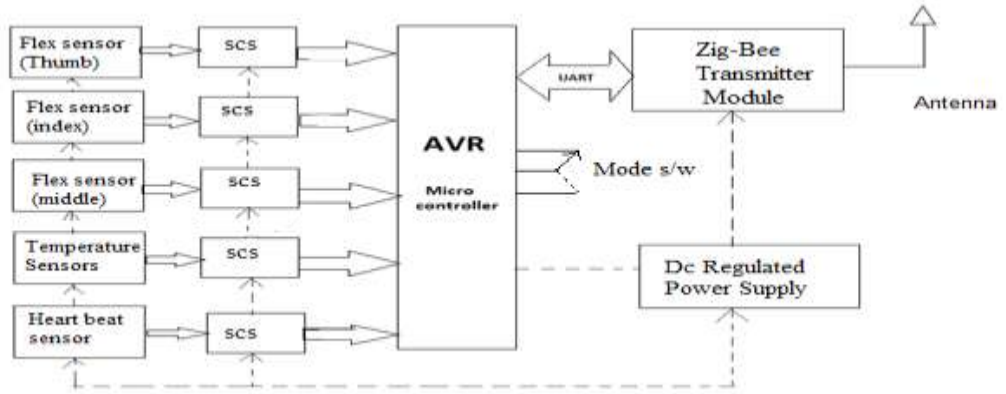

Fig.1 Model of Transmitter Section

In transmitter section input is collected from flex sensor, temperature sensor, heart beat Sensor. The Flex Sensor use patented technology is based on resistive carbon elements. Flex sensor have thin flexible substrate, when substrate is bend the resistance output change depend upon bend radius, when radius decrease as resistance value is increases. for this system three flex sensors are use to provide gestures information which are connected to middle, index and thumb in hand warring glove. Glove is used to make gestures. For continuous measurement of body temperature of patients LM35 temperature sensors are use, whose output voltage is linearly proportional to the Celsius. Which Provide accurate body temperature of continuous observation to provide treatment, along with body temperature Heart beat also measure for that purpose Heart beat sensor are use heart beat sensor consists of super bright red LED at for transmission and light detector for detection. LED provide Maximum light pass or spread in finger and detected by detector. When the pulse of blood is pumped by the heart through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With the change in heart pulse the detector signal varies which gets converted into electrical pulse. Amplifier is use to amplify this electrical signal. Amplifier provides 0 to +5V logic level signal in analog form. This sensor use principle of light modulation when blood flow through finger at each pulse. This all input data from Flex sensor, temperature sensors and heart beat sensor are process and control using processing unit. Microcontroller AVR Atmega328Arduino collects all input data and processes it. Ardunio is an open source platform based on simple microcontroller board. For storing code this Atmega328 has 32KB on-chip flash memory and 2 KB SRAM with 1KB of EEPROM.Arduino software provides serial communication with board. All processing data then transmitted through Zig-bee. For proposed system XBee-PRO (S2) module is selected ,which have Indoor rang Up to 300 ft. (90 m) and outdoor rang Up to 2 miles (3200 m), provide Serial Interface Data Rate 1200 bps - 1 Mbps. This Zig-bee operate on Frequency Band is ISM 2.4 GHz. All collected data such as hand sign and body temperature and heart beat is transmitted for further processing and controlling purpose. Fig.2 shows Receiver section of proposed system.

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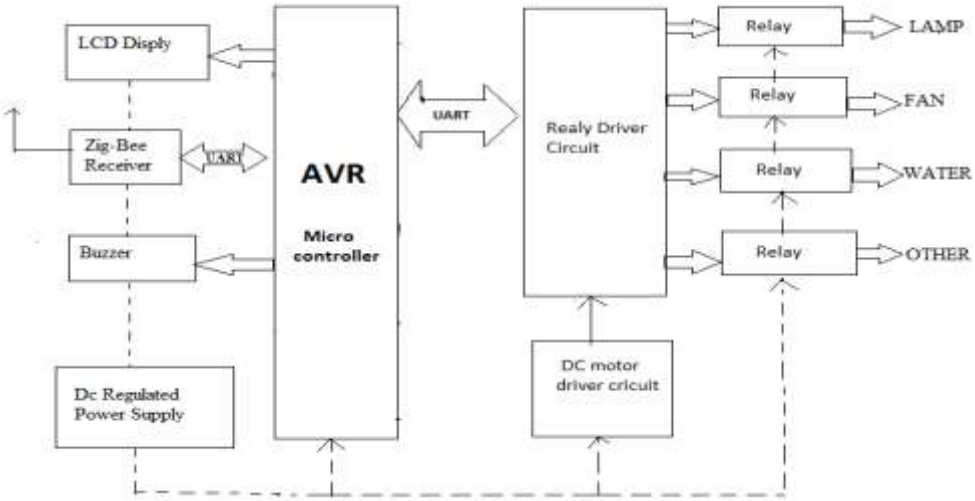

Fig.2 Model of Receiver Section

In the receiver section all hand gesture sign are received along with body temperature and heart beat and appropriated action are perform. Such as fan/light on or off, patient's water requirement and any other facility along with buzzer indication, the device also gives alarms when the heart beat & the body temperature exceed the provided threshold value. A 16x2 LCD display is connected with the Arduino. When the gesture is being made Arduino recognize it gesture is displayed on LCD, also display continuous measurement of various parameter like body temperature, heart beat rate etc.

IV SYSTEM OVERVIEW

A.GLOVES

The material used for the cloth of gloves is a special type of nylon which increases the easiness of moving finger. The material is also free from allergic and hence can be used for any person's hand.

B. Flex sensor

In this system the hand gestures are recognized using flex sensor. These sensors are attached to the gloves. Flex sensor are similar to potentiometer, i.e. variable resistor. The resistance of the sensor varies according to the amount of its bending, which intern depends on the movement of finger.When the sensor are bent the resistance offered by them increases. The sensor size is so chosen that its size is greater than the size of the finger so that the bending can be precisely measured. Flex sensors of 2.2 inches were used for measuring the bending movements.

Fig.3 Flex sensor

To detect a contact, a simpler logic of using conductive plates connected to the input voltage through pull-up resistors was used. Whenever any conductive plate connected to ground was touched to positive plate, a contact was detected. Hence, whenever one finger was in contact with the other, value of contact sensor (which was initially 1 due to pull-ups) for that particular finger became zero. The Flex Sensor patented technology is based on resistive carbon elements. As a variable printed resistor, the Flex Sensor achieves great form-factor on a thin flexible substrate. Flex sensor based on angle Displacement Measurement which Bends and Flexes physically with motion device. The impedance buffer in the [Basic Flex Sensor Circuit] (above) is a single sided operational amplifier, used with these sensors because the low bias current of the op amp reduces error due to source impedance of the flex sensor as voltage divider. op amps are the LM358 or LM324."

C.signal conditioning cricuit

Many applications involve environmental or structural measurement, such as temperature and vibration, from sensors. These sensors, in turn, require signal conditioning before a data acquisition device can effectively and accurately measure the signal, Filtering stage; goal is to eliminate the undesired noise from the signal of interest. Usually low-pass, high-pass, or band-filter is implemented to eliminate unwanted signal. In Amplifying stage, the goal is to increase the resolution of the input signal and increase the Signal-to-Noise Ratio (SNR).

D. Arduino Nano

After making the gesture the signal is fed into the Arduino board. This combines a micro-controller along with all of the extras to make it easy for you to build and debug. The ATmega328 AVR is supported with a full suite of program and system development tools including: C Compilers, Macro Assemblers, program simulators, In-circuit Emulators and Evaluation kits. It provide 8K bytes of In-System Programmable Flash with Read-While-Write capabilities, arduino have internal and external interrupts, a serial programmable USART, a byte-oriented 2-wire Serial Interface, an SPI serial port, a 6-channel 10-bit ADC.

E. Zig-bee module

Zig-Bee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios. Zig-Bee is based on an IEEE 802.15 standard. Though its low power consumption limits transmission distances to 10–100 meters line-of-sight, Zig-Bee is typically used

in low data rate applications that require long battery life and secure networking (Zig-Bee networks are secured by 128 bit symmetric encryption keys.) ZigBee has a defined rate of 250 Kbit/s, best suited for intermittent data transmissions from a sensor or input device. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi ZigBee provides facilities for carrying out secure communications, protecting establishment and transport of cryptographic keys, ciphering frames and controlling devices. Some of the characteristics of ZigBee include:

_ Global operation in the 2.4GHz frequency band

_ Regional operation in the 915Mhz (Americas) and 868Mhz (Europe).

_ Frequency agile solution operating over 16 channels in the 2.4GHz frequency

_ Incorporates power saving mechanisms for all device classes

_ Discovery mechanism with full application confirmation

_ Pairing mechanism with full application confirmation

_ Multiple star topology and inter-personal area network (PAN) communication

_ Various transmission options including broadcast

_ Security key generation mechanism

_ Utilizes the industry standard AES-128 security scheme

_ Supports Alliance standards (public application profiles) or manufacturer specific profiles

F. LCD Display

A 16x2 LCD display is connected with the Arduino board When the gesture is being made Arduino recognize it and then Saved text command for that gesture is displayed on LCD. Along with body temperature, heart beat rate etc.

V IMPLEMENTATION AND RESULT

This system is designed as explained in above section and arduino development kit is use as processing unit which is program using ardunio programming language with ATmega328 AVR. Fig.4 shows complete input section model with Flex sensor, body temperature, heart beat sensor, along with zig-bee transmitter.

Fig.4 Input section of proposed system

In receiver section all parameter are analyzed and display using LCD. Depending upon input gesture appropriate action take palce.Fig.5 shows the output section of proposed system in which all parameter are display and corrected action is perform. This system helps deaf and dumb Patient at ICUs in Hospitals to perform some daily activity interactive manner. So communication between a normal person and a speech impaired person become easier. The system provides accurate data collection and data output with facility for portability and easily install and safe to use.

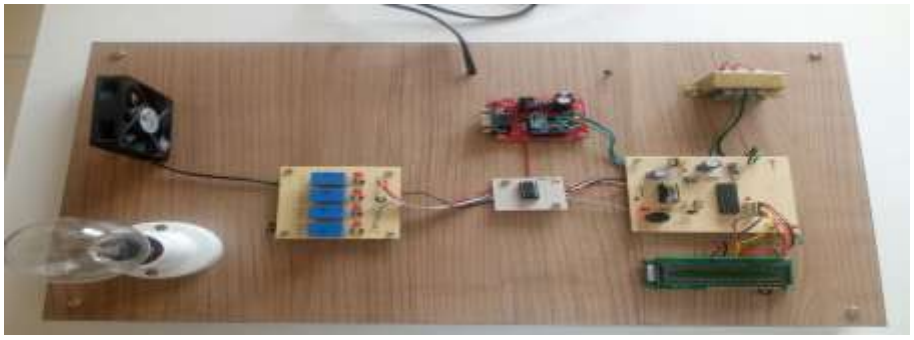

Fig.5 Output section of proposed system

In Table. I six gestures and their commands are shown. These six gestures are designed for user input purpose as per patient's requirement. Where M: middle I: index T: thumb C: close (300-500) O: open /stretch (550-750)

Table I. Gesture and Commands Accordingly

Finger position			**Operation**	**Gesture sign**
M	I	T		
O	O	C	FAN ON	
C	C	C	FAN OFF	
C	O	O	LIGHT ON	

C	O	C	LIGHT OFF	
C	C	O	WATER	
O	O	O	OTHER	

VI CONCLUSION

Hand gesture recognition system is integrated with wireless sensor network is design and developed for deaf and dumb ,aged persons for easy communication with working environment using an E- hand glove and Central Health Monitoring system for measurement of various parameters like body temperature, heart beat rate etc to perform easy and secure daily activity. The detailed relevant system is designed, implemented and tested using Arduino Software and hardware. The result of system is presented in the form of execution of various commands generated by the Deaf and Dumb, Aged Patients. System is portable and easy to use along with easy to install and safe to use.

REFERENCES

[1] Yang, G.-Z. Body Sensor Networks *Springer-Verlag, City, 2006*

[2] Fel, S. and Hinton, E. G. Glove-TalkII - A neural-network interface which maps gestures to parallel formant speech synthesizer controls. *IEEE Transactions on Neural Networks*, 1993

[3] Kam, David, *"The Importance of Communication,"* Marketing Deviant -Marketing Business Strategies, June, 2009

[4] S. Mitra and T. Acharya, "Gesture recognition: a survey", *IEEE Transactions on Systems, Man, and Cybernetics (SMC) Part C: Applications and Reviews, pp. 311-324,* Vol. 37, no.3, 2007.

[5] V. I. Pavlovic, R. Sharma and T. S. Huang, "Visual interpretation of hand gestures for human computer interaction", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 19, no. 7, pp. 677-695, Jul. 1997

[6] K. Kario, *et al.* Ambulatory Blood Pressure Monitoring for Cardiovascular Medicine. *IEEE Engineering in Medicine and Biology Magazine*. 81-88,2003.

[7] Hildreth, Evan. *"Optical flow based tilt sensor"* U.S. Patent No. 7,379,566. 27 May 2008

[8] J. Suarez, and R. R. Murphy, "Hand Gesture recognition with depth images: A Review", *IEEE international Symposium on Robot and human Interactive Communication,* pp. 9-13, 2012

[9] C. C. Y. Poon, *et al.*, "M-Health: The Development of Cuff-less and Wearable Blood Pressure Meters for Use in Body Sensor Networks," in *Proceedings of IEEE/NLM Life Science Systems and Applications Workshop*, 2006.

[10] F. Zitzelsberger and M. Shafae, "Markerless Performance Captures of Hand Gestures", *ISAST Transactions on Computers and Intelligent Systems*, California State University,Fullerton vol. 4, no.I, ISSN 1798-2448,2012

[11] R. C. King, et al., "Development of a wireless sensor glove for surgical skills assessment",*IEEE Transaction on Information Technology in Biomedicine*, 2009

[12] Kamalpreet Sharma, Naresh Kumar Garg; "Hand Gestures Recognition For Deaf And Dumb" *International Journal of Computer Application and Technology* (s), May - 2014

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