ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 5, Issue 4, April 2016

DESIGN AND DEVELOPMENT OF HAND GESTURE RECOGNITION SYSTEM FOR SPEECH IMPAIRED PEOPLE

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Abstract— The speech impaired people suffers from lack of communication which can be overcome by a hand gesture recognition system. The solution approach consists of a hardware module and software module. The hardware module consists of a flex sensor and MEMS sensor which is arranged in a manner to correctly get positioned in fingers. The concept of decoding of hand gesture movements is made possible by considering the axis orientation of the MEMS sensor with respect to gravity and it will generates some voltage values. The accelerations of a hand motion three perpendicular directions are detected by our MEMS sensor and get transmitted to the microcontroller. Gesture is recognized by comparing the acceleration values with the stored templates values and an automatic gesture recognition algorithm is developed to identify individual gestures in a sequential order. According to the recognize gesture, respective command will be displayed in the mobile that get connected through Bluetooth using an app.

Keywords—PIC micro controller,flex sensor, ADC, MEMS, LCD,UART,Bluetooth.

I. INTRODUCTION

Communication between Deaf ,dumb and normal person have always been a very difficult task. According to a survey conducted ,about nine billion people in the world are deaf and dumb .The people who are deaf and dumb are using sign language for communication. A sign language is a language which is used to communicate with others using the movement of hands and arms by forming shapes to fluently express or communicate with each others. Gesture recognition is the process in which the hand movements made by the user are used to convey the information or for device control. In everyday life, physical gestures provides powerful communication with others. They can be used to convey a rich set of facts and feelings. A primary goal of Gesture recognition research is to create a system which can identify specific human gestures and to convey information using those specific hand movements to other peoples using a device. Gesture recognition is a topic computer science and language technology with the main goal of interpreting human gesture through mathematical algorithms. Gesture can create from any physical motion of the human body but commonly originate from the face or hand. Current research has been in progress in emotion recognition from the face and hand gesture recognition. Previously several approaches have been made using cameras and computer vision algorithms to interpret sign language. The use of gestures is an important area in the development of intelligent human interaction systems. In the field of Gesture recognition we have large number of approaches that have been made to enable intelligent interaction. The gesture signs can be defined as a physical action, through which the information can be passed. Sign language is a language that mainly focused on using hand gestures as communication medium among people having vocal and hearing impairments so that they can communicate with other normal peoples. A person who can talk and hear properly cannot communicate with a deaf and dumb person unless he is aware of the sign language. Many work has been carried out in the field of automation of sign language interpretation to make use of systems effectively to translate signs into information inform of speech or text. Hand gesture is an ideal option for deaf and dumb people in expressing the feelings or thoughts in order to convey something like representing a number, words to other peoples

II. RELATED WORK

AUTHOR[1] Rohitha.U.M The gesture recognition is done with the help of a sensor glove which consists of two flex sensors, a MEMS sensor ,that are best positioned in fingers. The design of glove and the concept of decoding gesture is made possible by considering the axis orientation of the MEMS sensor with respect to gravity and generates some voltage values. Based on the voltage values the corresponding words will be generated from the stored templates. AUTHOR[2] D. Vishnu Vardhan Vision based Hand gesture Recognition system recognizes hand gesture in midair, especially for physically impaired people, and provides recognized character or number as text and corresponding sound. Here the hand gestures will be captured in form of images by the camera. From the captured image, by digital image processing technique for each gesture movements corresponding meaning of actions will be recognized and display in form of text or by voice using loudspeaker

III.PROPOSED SYSTEM

In this project we are going to implement design and development of hand gesture recognition system for speech impaired people. Here we use flex and MEMS sensor in glove. By moving the finger, based on the changes in resistance a reference value will be generated. By this reference value we generate the database .With respect to value we get from the gloves, corresponding information will be sent through wireless communication and we can monitor the values in LCD and information in android app.

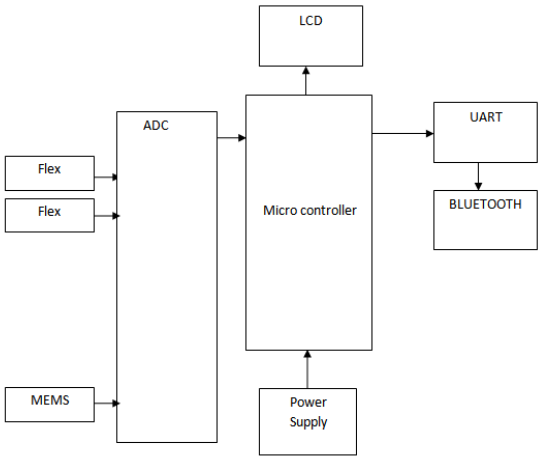


Fig .1 Proposed Block diagram

IV.FLEX SENSOR

Flex sensors are experimental sensors. The flex sensors are normally 2.2’ in length. The flex sensors are component that changes resistance when we bent. These sensors can also bent in either directions. Flex sensor are nothing but consist of analog resistors. When the flex sensors get bent, the resistance value gradually decreases .The operating temperature of the flex sensor ranges from -45F to 125F.These resistors work as changeable analog voltage divider. The flex sensors consist of carbon resistive elements with thin flexible substrate. When there is more carbon, it denotes less resistance. When the substrate is bent the sensor produce output based on the resistance offered due to the bend.

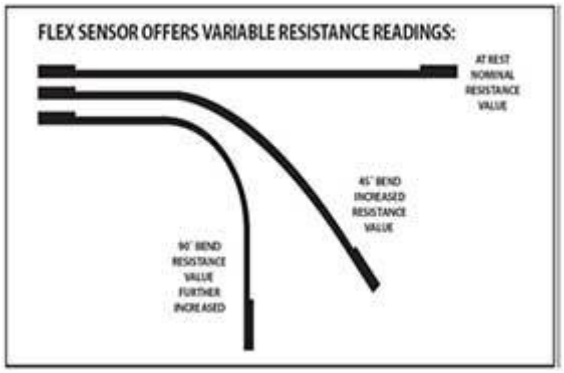


Fig .1 Working of flex sensor

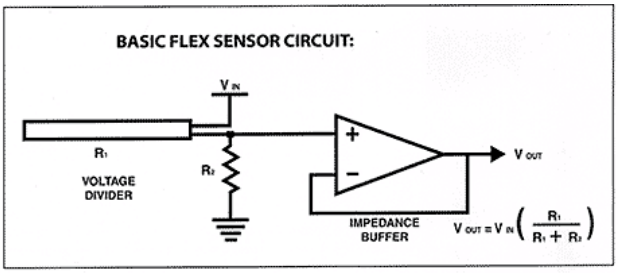


Fig.2 Basic Flex sensor circuit

V.MEMS

The MEMS sensor normally consists of a micro–machined structure on a silicon wafer. The structure is suspended by poly silicon springs which allow the sensor to deflect when it is subject to acceleration in the X, Y and/or Z axis .Deflection causes a change in capacitance between fixed plates and plates attached to the suspended structure. Because of this change in capacitance on every axis, an output voltage proportional to the acceleration on that axis will be generate

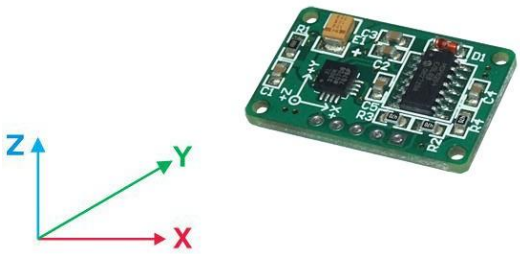


Fig .3 co-ordinates axis

VI.PIC

High-Performance RISC CPU:

Only 35 single-word instructions to learn All single-cycle instructions except for program branches, which are two-cycle Operating speed: DC – 20 MHz clock input DC – 200 ns instruction cycle Up to 8K x 14 words of Flash Program Memory, Up to 368 x 8 bytes of Data Memory (RAM), Up to 256 x 8 bytes of EEPROM Data Memory Pin out compatible to other 28-pin or 40/44-pin PIC16CXXX and PIC16FXXX microcontrollers

Peripheral Features:

Timer0: 8-bit timer/counter with 8-bit prescaler Timer1: 16-bit timer/counter with prescaler, can be incremented during Sleep via external crystal/clock Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler Two Capture, Compare, PWM modules Capture is 16-bit, max. resolution is 12.5 ns

Compare is 16-bit, max. resolution is 200 ns PWM max. resolution is 10-bit Synchronous Serial Port (SSP) with SPI™ (Master mode) and I2C™ (Master/Slave) Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection Parallel Slave Port (PSP) – 8 bits wide with external RD, WR and CS controls (40/44-pin only) Brown-out detection circuitry for Brown-out Reset (BOR)

Analog Features:

10-bit, up to 8-channel Analog-to-Digital Converter (A/D) Brown-out Reset (BOR) Analog Comparator module with:

Two analog comparators Programmable on-chip voltage reference (VREF) module Programmable input multiplexing from device inputs and internal voltage reference Comparator outputs are externally accessible

Special Microcontroller Features:

100,000 erase/write cycle Enhanced Flash program memory typical 1,000,000 erase/write cycle Data EEPROM memory typical Data EEPROM Retention > 40 years Self-reprogrammable under software control In-Circuit Serial Programming™ (ICSP™) via two pins Single-supply 5V In-Circuit Serial Programming

Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation Programmable code protection Power saving Sleep mode Selectable oscillator options In-Circuit Debug (ICD) via two pins

CMOS Technology:

Low-power, high-speed Flash/EEPROM technology

Fully static design Wide operating voltage range (2.0V to 5.5V)

Commercial and Industrial temperature ranges

Low-power consumption

Pin Diagram:

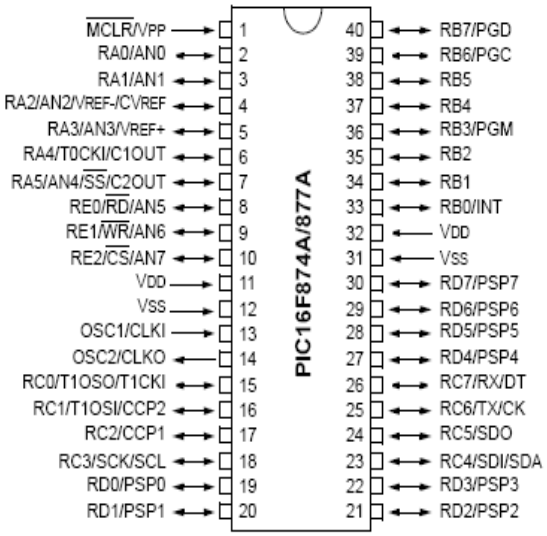


Fig.4 Pin diagram of PIC16F874A/877A

VII.LCD

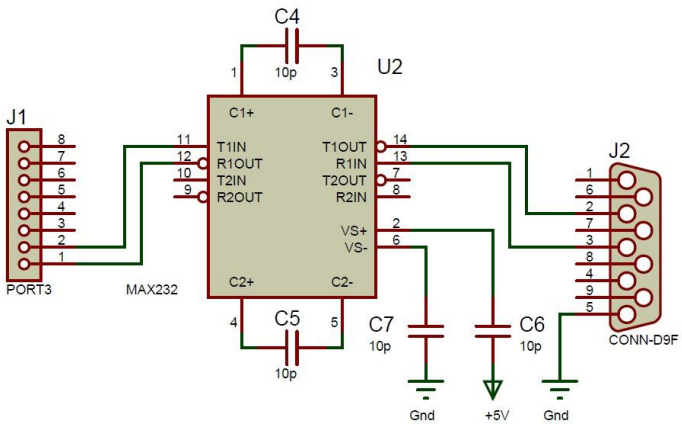
LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. 16×2 LCD module is a very common type of LCD module that is used in 8051 based embedded projects. It consists of 16 rows and 2 columns of 5×7 or 5×8 LCD dot matrices. 16×2 LCD module has a set of preset command instructions. Each command will make the module to do a particular task. Capacitor C3, resistor R3 and push button switch S1 forms the reset circuitry. Ceramic capacitors C1,C2 and crystal X1 is related to the clock circuitry which produces the system clock frequency. P1.0 to P1.7 pins of the microcontroller is connected to the DB0 to DB7 pins of the module respectively and through this route the data goes to the LCD module. P3.3, P3.4 and P3.5

are connected to the E, R/W, RS pins of the microcontroller and through this route the control signals are transferred

VIII.Universal Asynchronous Receiver Transmitter (UART)

The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications subsystem of a computer. The UART takes bytes of data and transmits the individual bits in a sequential fashion. At the destination, a second UART re-assembles the bits into complete bytes. Both forms are described below.Some common acronyms are: UART Universal Asynchronous Receiver/Transmitter USART Universal Synchronous-Asynchronous Receiver/Transmitter. Synchronous Serial Transmission Synchronous serial transmission requires that the sender and receiver share a clock with one another, or that the sender provide a strobe or other timing signal so that the receiver knows when to "read" the next bit of the data. In most forms of serial Synchronous communication, if there is no data available at a given instant to transmit, a fill character must be sent instead so that data is always being transmitted. Asynchronous transmission allows data to be transmitted without the sender having to send a clock signal to the receiver. Instead, the sender and receiver must agree on timing parameters in advance and special bits are added to each word which are used to synchronize the sending and receiving units. When a word is given to the UART for Asynchronous transmissions, a bit called the "Start Bit" is added to the beginning of each word that is to be transmitted.

In addition to the basic job of converting data from parallel to serial for transmission and from serial to parallel on reception, a UART will usually provide additional circuits for signals that can be used to indicate the state of the transmission media, and to regulate the flow of data in the event that the remote device is not prepared to accept more data.



IX. ADC - ANALOG TO DIGITAL CONVERTER

The ADC0808, ADC0809 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible control logic. The 8-bit A/D converter uses successive approximation as the conversion technique. The converter features a high impedance chopper stabilized comparator, a 256R voltage divider with analog switch tree and a successive approximation register.

The 8-channel multiplexer can directly access any of 8-single-ended analog signals. The device eliminates the need for external zero and full-scale adjustments. Easy interfacing to microprocessors is provided by the latched and decoded multiplexer address inputs and latched TTL TRI-STATE outputs.

ALE

ALE is required to load the selected address lines into the ADC. Once loaded the multiplexer sends the appropriate channel to the converter on the chip. The ALE should be pulsed for at least 100ns in order for the addresses to get loaded properly. As with all control signals it is required to have an input value of Vcc - 1.5 up to 15V for a high and 1.5V down to -0.3V for a low. The following control signals are used to control the conversion. Address Lines Because the chip has an 8 channel multiplexer there are three address select lines: A, B, and C. C is the most significant bit and A is the least .

X.BLUETOOTH

Bluetooth technology provides the wireless communication between two user. Through Bluetooth we can transmit and receive data wirelessly between serial input and output devices using UART(Universal Asynchronous Receiver/ Transmitter). UARTcan be used to takes bytes of data and transmits themindividual bits in a sequential pattern

Fig.5 Bluetooth device

XI.CONCLUSION

In this paper, we presented work on gesture recognition through the use of flex and MEMS sensor. This work uses 3 axes acceleration values whereas the existed system uses only 2 axes. Similarly in our work hand movements will be recognized, will get converted in form of messages that can be shared using Android app between devices connected through Bluetooth whereas existed system is based on sharing text messages in form of SMS with the help of GSM technology. The incoming values for each gesture will be compared with values in the stored database. Since the standard gesture pattern are generated by motion analysis and are simple features represented by only acceleration values,big database and complex recognition systems were not required and now needs to collect as many gesture made by different people as possible to improve the recognition accuracy. The advantage of this approach is the potential of mobility. The main aim of the work is to help speech impaired people to communicate with others without the use of complex form of inputs. In this work use gloves for hand gesture recognition which is very easy to wear and it doesn't need any special training, so it is user friendly and can be used by all.

XII. REFERENCE

[1] Hussana Johar R.B, Priyanka A, Revathi Amrut M S, Suchitha K, Sumana K J "*Multiple sign language translation into voice*"International Journal of Engineering and Innovative Technology (IJEIT), Volume 3, Issue 10, April 2014

[2] Solanki Krunal M, "Indian Sign Languages using Flex Sensor Glove," *International Journal of Engineering Trends and Technology (IJETT) - Volume4 Issue6- June 2013* ISSN: 2231

[3] Carlos Pesqueira Fiel, Cesar Cota Castro, Victor Velarde Arvizu, "Design of Translator Glove for Deaf-Mute Alphabet," 3rd International Conference on Electric and Electronics (EEIC 2013)

[4] Jamal Haydar,Bayan Dalal, Shahed Hussainy, Lina El Khansa, Walid Fahs, "ASL Fingerspelling Translator Glove",International Journal of Computer Science issues,Vol.9,Issue 6,No 1,November 2012.

[5] S.F. Ahmed, et al., "Electronic speaking glove for Speechles patients" In the IEEE Jaya, Conference on Sustainable Utilization and Development in Engineering and Technology, Petaling Malaysia, 2010, pp. 56-60

[6] D. Xu (2006), "A neural network approach for hand gesture recognition in virtual reality driving training system of SPG," presented at the 18th Int. Co nf. Pattern Recognition

[7] S. Zhou, Z. Dong, W. J. Li, and C.P. Kwong (2008), "Hand- written character Recognition using MEMS motion sensing technology," in Proc. IEEE/AS ME Int. Conf. Advanced Intelligent Mechatronics , pp.1418– 1423

[8] L. Bretzner and T. Lindeberg(1 998), "Relative from extended sequences of sparse point and line correspondences using the affine trifocal tensor," in Proc.5th Eur. Conf. Computer Vision, Berlin, Germany,1406, Lecture Notes in Computer Science, pp.141–157, Springer Verlag

[9] J.K.Oh,S J. Cho, and W. C. Banget al. (2004), "Inertial sensor based recognition of 3-D Character gestures with an ensemble of classifiers," presented at the 9th Int. Workshop on Frontiers in Handwriting Recognition

[10] T. H. Speeter (1992),"Transformation human hand motion for tele manipulation," Presence, 1, pp. 63–79

[11] Russell,stuart,and peter Norvig. Artificial Intelligence: A Modern Approch. Prentice Hall, Englewood Cliffs, NJ,1995

[12] Rabiner, L.R. "A Tutorial on Hidden Markov Models and Selected Application in Speech Recognition."Proceeding of the IEEE77 (2):267-296,1989

[13]W. T. Freeman and C. D. Weissman (1995), "TV control by hand gestures,"presented at the IEEE Int. Workshop on Automatic Face and Gesture Recognition, Zurich, Switzerland.

[14] Arefin Shamsil and Thilakshan McMaster University"*Motion Tracking Glove for Human- Machine Interaction:Grasp & Release*", 4-23-2010.

[15] Gregory P. Slota, Mark L. Latash, Vladimir M. Zatsiorsky,"Grip forces during object manipulation: experiment, mathematical model, and validation", in *Exp Brain Res* 213:125–139,2011.

[16] S. Cobos, M. Ferre, M.A. Sanchéz-Urán, J. Ortego and C. Peña,"Efficient Human Hand Kinematics for manipulation Task",*IEEE/RSJ International conference on intelligent Robots and Systems*, pp. 2246 – 2250,2008.

[17] Saggio G., Bocchetti S., Pinto C.A., Orengo G, "Wireless DataGlove System developed for HMI. ISABEL", *3rd International Symposium on Applied Sciences in Biomedical and Communication Technologies*, Rome, Italy, November 7-10,2010.

[18] Oz, C., Leu, M.C,"American Sign Language word recognition with a sensory glove using artificial neural networks",*Engineering Applications of Artificial Intelligence 24*, 1204–1213,2011.

[19] V.I. Pavlovic, R. Sharma, T.S. Huang. Visual interpretation of hand gestures for human- computer interaction, A Review, IEEE Transactions on Pattern Analysis and Machine Intelligence 19(7): 677-695, 1997.

[20] J.Davis, M.Shah. Recognizing hand gestures. In Proceedings of European Conference on Computer Vision, ECCV: 331-340, 1994.

[21] D.J.Turman, D. Zeltzer. Survey of glove-based input. IEEE Computer Graphics and Application 14:30-39, 1994.

[22] Starner, T. and Pentland. Real-Time American Sign Language Recognition from Video Using Hidden Markov Models, TR-375, MIT Media Lab, 1995.

[23] R.Kjeldsen, J.Kender. Visual hand gesture recognition for window system control, in IWAFGR: 184-188, 1995.

[24] Prateem Chakraborty, Prashant Sarawgi, Ankit Mehrotra, Gaurav Agarwal, Ratika Pradhan ―Hand Gesture Recognition: A Comparative Study‖ Proc. The International MultiConference of Engineers and Computer Scientist 2008 Vol. 1

[25] Ginu Thomas ―A review of Various Hand Gesture Recognition Techniques‖ Proc. VSRD-IJEECE, Vol. 1(7)2011