



Recognizing Hand Gesture and Controlling Remote Units Using Flex Sensor

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ABSTRACT: In today's world, without any knowledge of sign language it is difficult to understand the language of dumb people. The idea is to convert the sign language into text and also to show these values in thingspeak (IOT open source). The proposed electronics system recognizes a particular hand gesture that is performed through bending flex sensor & transmitted signals wirelessly through Wi-Fi module. This paper is implied for 5 alphabet i.e. A, C, D, O, X.

KEYWORDS: Flex Sensor, arduino uno, IOT, Wifi module.

I. INTRODUCTION

There are many dumb people in the world which is near about nine billion. The communication between a dumb person and hearing person is always challenging task as compared to communication between blind people and normal people. Therefore communication with them becomes a task which is essential part of human being. Sign language is one of the powerful tools for dumb people and hearing. It uses gestures instead of sound to elaborate their meaning. These people use the different parts of the body, such as palm, movement of finger and hand also its orientation, arms or body, facial expressions and lip-patterns for elaborating messages. It is not universal, and just like spoken language, it has distinct forms of languages spoken in particular geographical areas. There are different languages in the world which are used for communication such as American Sign Language (ASL), British Sign Language (BSL), and Indian Sign Language (ISL) etc. Gesture recognition is classified into two main categories i.e. vision based and data glove based. There are some disadvantages of vision based techniques includes such as noise interference while capturing the data, complex algorithms for data processing. There is one more challenge in image and video processing includes variation of lighting conditions, also background suppression. The data glove based technique achieves the higher accuracy, fast reaction speed also it offers greater mobility. This paper is presenting a system that can efficiently translate Indian Sign Language gestures to both texts. In this paper, a flex sensor based technique is being used which takes the output of the flex sensor and then send it to arduino. Arduino detect the output from sensor and detect the text. This signal is then transmitted to internet through GSM module. This value can be seen into site from any place in the world. Here a flex sensor is used which produces an output voltage value directly proportional to the bending which is applied to the sensor itself. Flex sensor also known as bend sensor or variable resistance sensor and it varies depending upon the bend. As more the sensor bends, more resistance generates. The amount of bending is compared to initial value and then text is displayed.

II. TECHNIQUE USED

Now days, a lot of work has been done in hand recognition through Flex sensor. In this paper, the concept of hand recognition through flex sensor and IOT is combined. The idea is to receive the signals given through hand movement from any place in this world.

- A. *Flex Sensor*-Flex sensor Flex sensor also known as bend sensor or variable resistance sensor and it varies depending upon the bend. As more the sensor bends, more resistance generates. Flex sensors are normally attached to the glove using needle and thread. These sensor devices have three pin connectors (ground, live, and output). The resistance is between 10k Ω to 50k Ω and the input voltage ranges is between 3.5V to 12V. When the sensor is straight the output voltage from the signal condition circuit should be around 75% of V+

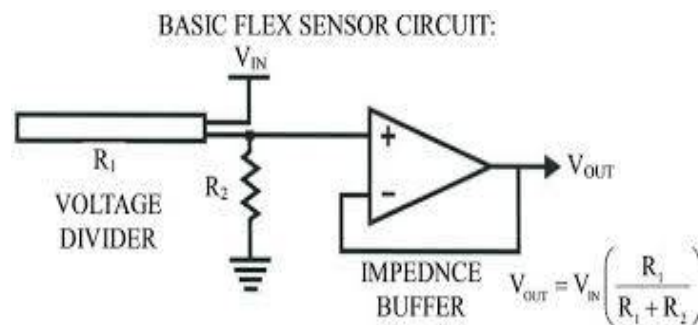
International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2016

and when the sensor is bent it should be around 83% of V_+ . The RM should be chosen in such a way that it is midway between the entire ranges of the Bend sensor.

Flex sensor as voltage divider- output voltage increases with the bend. The impedance buffer in the circuit is a single sided operational amplifier, used with this sensor because the opamp are generally operates at low bias current so it reduces error due to source impedance of the flex sensor as voltage divider.



- B. *IOT* -The internet of things (IoT) is the network of physical objects—devices, vehicles, buildings and other items—embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit; when IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020.
- C. *Arduino Uno* –The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed 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. Tinker can be done with UNO without worrying too much about doing something wrong. In worst case scenario, the chip can be replaced for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

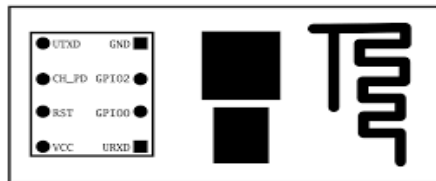
- D. *ESP8266 Wifi module*-The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime.

International Journal of Innovative Research in Computer and Communication Engineering

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Vol. 4, Issue 6, June 2016



ESP8266 WiFi Pinout
Top View (Not to scale)

- E. *CH340G USB to TTL Converter*-This is USB to serial module that is based on the CH340G. It is commonly used to debug various TTL serial devices, upgrade the firmware of routers and burn program onto Arduino Pro Mini, LilyPad Arduino directly.

CH340 is a USB bus convert chip and it can realize USB convert to serial interface, USB convert to IrDA infrared or USB convert to printer interface. In serial interface mode, CH340 supplies common MODEM liaison signal, used to enlarge asynchronous serial interface of computer or upgrade the common serial device to USB bus directly. More detail about USB convert to printer interface please referring to the second manual CH340DS2. In infrared mode, add infrared transceiver to CH340 can compose USB infrared adapter, realize SIR infrared communication

Features:

1. Full-speed USB interfaces, compatible with USB 2.0 interface.
2. Operates with a minimum amount of external components: a crystal and a minimum of four capacitors.
3. Provides a virtual serial port for upgrading existing serial port devices or adding serial ports to a PC.
4. Supports all existing applications using serial ports without the need of changing existing code.
5. Hardware full-duplex serial interface with internal FIFO. Baud rate range from 50bps to 2Mbps.
6. Supports common flow control signals RTS, DTR, DCD, RI, DSR and CTS.
7. Supports RS232, RS422 and RS485 with external level shifting components.
8. Uses CH341 driver.
9. Supports 5V and 3.3V operation.
10. RoHS-compliant narrow body SO-16 package.

- F. *Sign Language*-A sign language (also signed language) is a language which chiefly uses manual communication to convey meaning, as opposed to acoustically conveyed sound patterns. This can involve simultaneously combining hand shapes, orientation and movement of the hands, arms or body, and facial expressions to fluidly express a speaker's thoughts. Sign languages share many similarities with spoken languages (sometimes called "oral languages", which depend primarily on sound), which is why linguists consider both to be natural languages, but there are also some significant differences between signed and spoken languages. They should not be confused with body language, which is a kind of non-linguistic communication.

III. PROPOSED ALGORITHM

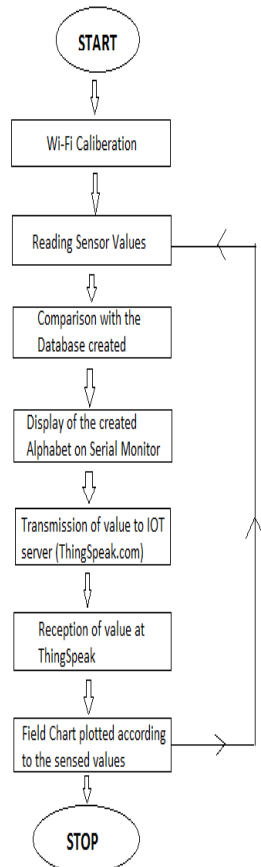
This paper will help to Recognize Hand Gesture and Controlling Remote Units Using Flex Sensor. It presents a system that can efficiently translate Indian Sign Language gestures to text. In this system, a flex sensor based technique is being used which takes the output of the flex sensor and then send it to arduino. Arduino detect the output from sensor and detect the text. This signal is then transmitted to internet through GSM module. This value can be seen into things speak website from any place in the world. The flex sensor produces an output voltage value directly proportional to the bending which is applied to the sensor itself. Flex sensor also known as bend sensor or variable resistance sensor and it varies depending upon the bend. As more the sensor bends, more resistance generates. The amount of bending is compared to initial value and then text is displayed.

eq. (3)

International Journal of Innovative Research in Computer and Communication Engineering

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IV. RESULT

Results are successfully plotted from sensor on think speak (IOT open source). The alphabets used in sign language using database are successfully determined that was created itself in the code of the project. Five of the existing 26 American Sign Language alphabets have been determined. These are A,C,D,O,X. Rest all alphabets will be possible when all five fingers will have one flex sensor each associated with them.





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Vol. 4, Issue 6, June 2016

V. CONCLUSION

A low cost embedded system that can be executed in a common PC is being implemented. Hand gesture images are being used in this paper and achieved higher average precision. But the drawback in this method is that the hand should be properly moved so that the flex sensor can detect easily. If the hand is not moved properly the gesture is not recognized appropriately. Gesture made in this method involves only one hand and this reduces the number of gestures that can be made using both hands. Only 5 alphabet i.e. A,C,D,O,X is being experimented. But it can further be extended to all alphanumeric value to understand the language of blind and dumb people. This is a most efficient method.

VII.APPLICATION AND FUTURE SCOPE

This project can further be extended to produce voice information on LCD based on the hand gesture of the user. Gesture Recognition technology can also be used to make the robots understand the human gesture and make them work accordingly. This is more useful for specially challenged people to communicate their thoughts exactly as normal humans do. Controlling a robot, in real time, through the hand gestures is a novel approach and whose applications are myriad. An inflammation of service robot to domestic users and industries in the upcoming years would need such methods extensively. Use of more efficient wireless communication technique and a camera on the robot unit would improve the performance of system to a great extent and can be incorporated in the future work.

REFERENCES

1. V. Padmanabhan, M. Sornalatha "Hand gesture recognition and voice conversion system for dumb people," International Journal of Scientific & Engineering Research, Volume 5, Issue 5, May-2014.
2. Anuja V. Nair, Bindu.V "A Review on Indian Sign Language Recognition" International Journal of Computer Applications (0975 – 8887), Volume 73, Issue.22, July 2013.
3. Jun Cheng, Can Xie Wei Bian, Dacheng Tao "Feature fusion for 3D hand gesture recognition by learning a shared hidden space," Pattern Recognition Letters ,Volume 33, Issue 4, March 2012, Pages 476–484.
4. Giovanni Saggio "A novel array of flex sensors for a goniometric glove," Sensors and Actuators A: Physical, Volume 205, 1 January 2014, Pages 119–125.
5. Steven Daniel Lovell "A System for Real-Time Gesture Recognition and Classification of Coordinated Motion," DSpace @MIT: Massachusetts Institute of Technology. Retrieved at July 28, 2011.
6. A. Ibarguren , I. Maurtua ,B. Sierra "Layered architecture for real time sign recognition: Hand gesture and movement," Engineering Applications of Artificial Intelligence ,Volume 23, Issue 7, October 2010, Pages 1216–1228.
7. Elisa Morganti ,Leonardo Angelini , Andrea Adami ,Denis Lalanne , Leandro Lorenzelli , Elena Mugellini "A Smart Watch with Embedded Sensors to Recognize Objects, Grasps and Forearm Gestures" Procedia Engineering , International Symposium on Robotics and Intelligent Sensors 2012 (IRIS 2012), Volume 41, 2012, Pages 1169–1175.
8. Allen, J.M , Asselin, P.K. ; Foulds, R. "American Sign Language finger spelling recognition system," Bioengineering Conference, 2003 IEEE 29th Annual, Proceedings of ,23 March 2003, Page(s) 285 – 286.

BIOGRAPHY

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