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Sign Language Translating Glove

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Abstract: *A Sign Language Translating Glove is designed by us that takes hand gestures as input and convert them into Text and/or Speech output. The Device contains flex sensors on hand to measure static gestures. The sensors are connected to Arduino to search a library of gestures that generate output signals that can be used to produce written text.*

Keywords: Sign Language, Gestrures, Arduino

INTRODUCTION

A set of 26 unique distinguishable postures makes up the alphabet in ISL used to spell names or uncommon words that are not well defined in the dictionary. Indian Sign Language (ISL) is the native language of some 300,000 to 500,000 people in India. It is, therefore, appealing to direct efforts toward electronic sign language translators.

Linguists have proposed different models of gesture from different points of view, but they have not agreed on definitions and models that could help engineers design electronic translators. Existing definitions and models are qualitative and difficult to validate using electronic systems.

As with any other language, differences are common among signers depending on age, experience or geographic location, so the exact execution of a sign varies but the meaning remains. Therefore, any automatic system intended to recognize signs have to be able to classify signs accurately with different "styles" or "accents". Another important challenge that has to be overcome is the fact that signs are already defined and cannot be changed at the researcher's convenience or because of sensor deficiencies. In any case, to balance complexity, training time, and error rate, a trade-off takes place between the signer's freedom and the device's restrictions.

A sign language translating glove is a device that recognizes hand sign gestures, look it up in database and convert them to text output and voice output.

As the hand gestures are given as input, the sensors will be activated by own and as the letters have already been programmed in microcontroller, it will detect the letter according to sign of hand.

So the output will be shown on LCD display and if also the voice output is activated than the text output will be converted into voice output.

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ARCHITECTURE OF SIGN LANGUAGE TANSLATING GLOVE

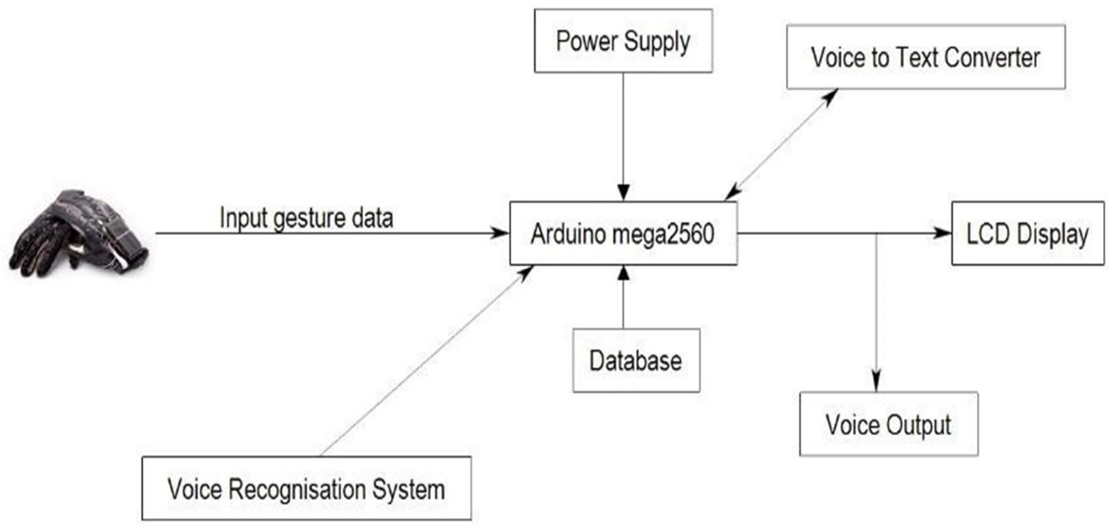

Figure 1 Block Diagram

DATA GLOVE

Data Glove is basically a glove that different components like Resistive Sensors, Accelerometer, ARDUINOATmega2560, LCD display, Speaker, etc. implemented on it. It is to be noted that the figure show below is only conceptual and may differ from the original model.

The Conceptual Image of Data Glove is shown below:

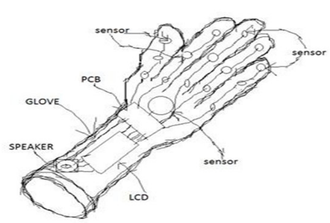

Fig.2 Conceptual Image of Glove

TEXT TO SPEECH CONVERTER

PWM combined with an analog filter can be used to generate analog output signals, i.e. a digital to analog converter (DAC). A digital pulse train with a constant period (fixed base frequency) is used as a basis. To generate different analog levels, the duty cycle and thereby the pulse width of the digital signal is changed. If a high analog level is needed, the pulse width is increased and vice versa.

Averaging the digital signal over one period (using an analog low-pass filter) generates the analog signal. A duty cycle of 50% gives an analog signal with half the supply voltage, while 75% duty cycle gives an analog signal with 75% supply voltage. Examples on filtered output signals are shown at the end of this document.

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The analog low-pass filter could be a simple passive RC-filter for instance. The filter removes the high PWM base frequency and lets through the analog signal. The filter crossover frequency must be chosen high enough to not alter the analog signal of interest. At the same time it must be as low as possible to minimize the ripple from the PWM base frequency.

In the AVR, the timer/counters are used to generate PWM signals. To change the PWM base frequency, the timer clock frequency and top counter value is changed. Faster clock and/or lower top value will increase the PWM base frequency, or timer overflow frequency. With full resolution (top value 255) the maximum PWM base frequency is 250 kHz. Increasing the base frequency beyond this frequency will be at the expense of reduced resolution, since fewer step are then available from 0% to 100% duty cycle.

Altering the value of the Output Compare Registers (OCR) changes the duty cycle. Increasing the OCR value increases the duty cycle. The PWM output is high until the OCR value is reached, and low until the timer reaches the top value and wraps back to 0. This is called Fast- PWM.

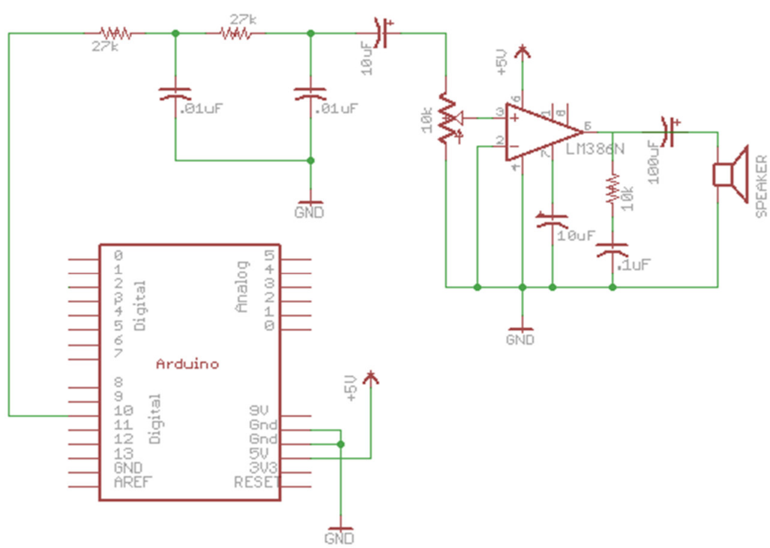

Fig. 3 Circuit Diagram of Amplifier

FLEX SENSOR

They work as variable analog voltage dividers. Inside the flex sensor are carbon resistive elements within a thin flexible substrate. More carbon means less resistance. Usually a flex sensor is used in voltage divider configuration. It is shown below:

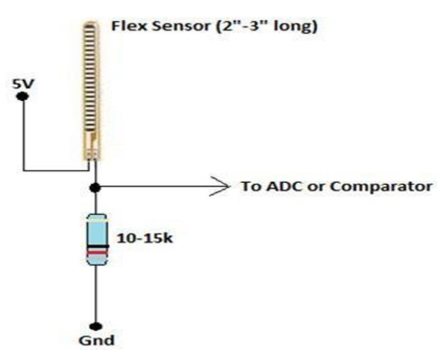

Fig. 4 Circuit Diagram Connection

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As shown in figure above the flex sensor is attached in series with a resistor of suitable value, which is taken as reference. The voltages across flex sensor are measured according to the voltage divider rule. As we know that a flex sensor is a type of variable resistor, as the resistance of flex changes, the voltage across it also change. This change in voltage is measured with respect to the bending of the flex sensor.

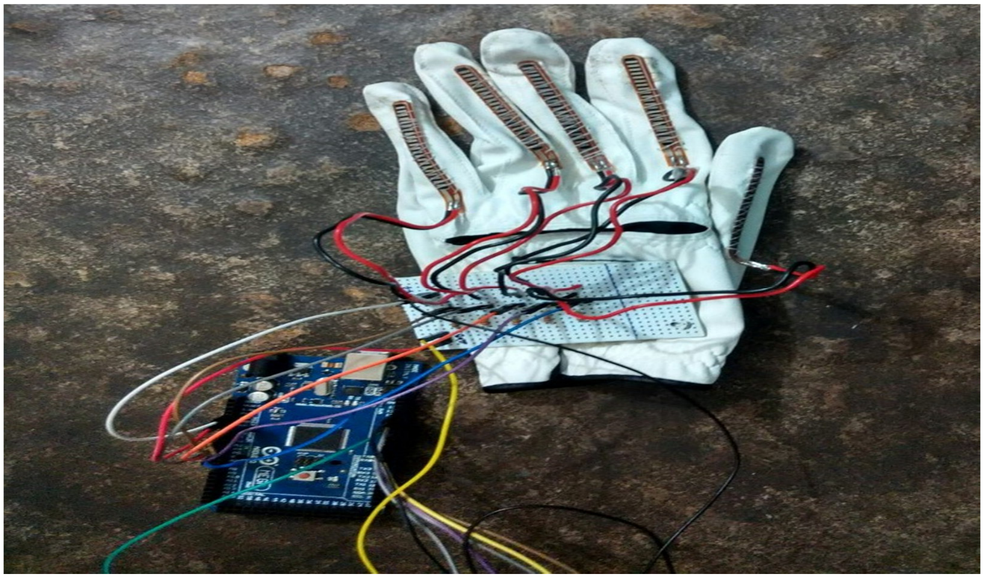

Fig 5 Glove with Flex sensors interfaced to Arduino

The input is taken from between flex sensors and reference resistors to analog pins A0, A1, A2, A3, and A4 of the Arduino board.

SIGN LANGUAGE GESTURES

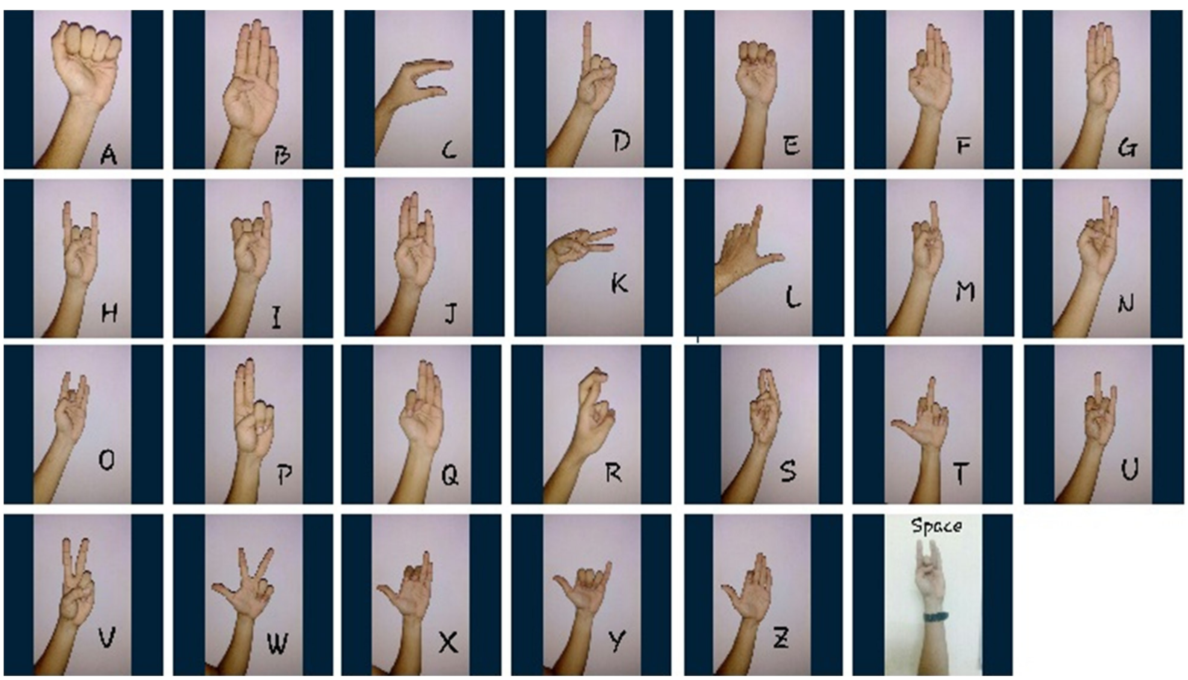

Fig. 6 Sign language gestures

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FINAL IMPLEMENTED DEVICE

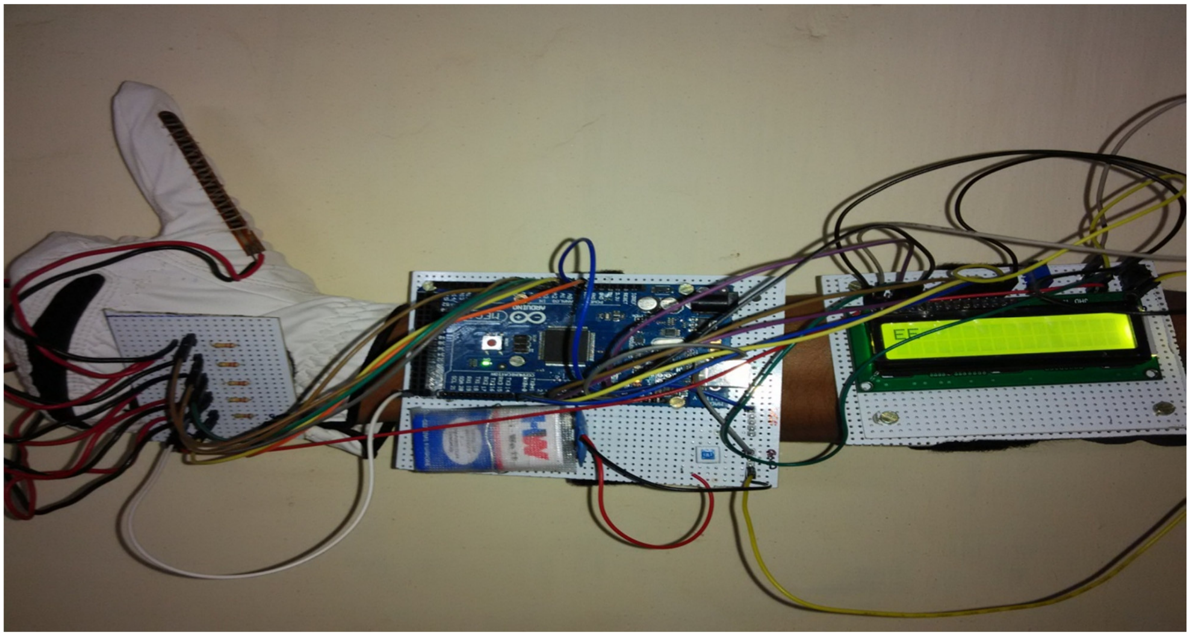

Fig.7 Final Implemented Device

FUTURE SCOPE AND APPLICATION

The main application of this device is for deaf and dumb people. The device will be useful for better communication between deaf/dumb and normal people. We will try to convert the text output into various languages other than English. We will add a voice recognition feature that takes voice input and convert them to text. We will try to advance the device to recognize static as well as dynamic gesture.

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