ARDUINO BASED SMART GLOVE FOR HUMAN INTERACTION

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ABSTRACT

The Smart Glove for Human Interaction Project aims to revolutionize communication for the Physically and mentally impaired community by creating a wearable technology that translates sign language into spoken or written words. This innovative project has the potential to break down communication barriers and empower individuals with physical disabilities. The gloves convert the specific gestures to text then to speech using Arduino as heart of the system. The flex sensors are used in the system which is attached on to the gloves which convert the gesture into resistance which is further converted to the text through Arduino Nano. The flex sensors come from flexible sensors family, which are flexible enough. The output of the sensors i processed on Arduino Nano to get text as an output displayed on LCD. Further that text is sent to voice module. Further that data are converted into speech via predefined voice phrases. There is no such commercial system available in the market to convert sign language into speech. In addition to this we are adding heart rate sensor and SOS button to monitor the position of the person wearing the glove. whenever the person presses the sos button or heart beat increases the gps co-ordinates will be sent via gsm the corresponding attendent

Keywords: Smart Glove, Arduino Nano, LCD, SOS button

1. INTRODUCTION

An embedded system can be defined as a computing device that does a specific focused job. Appliances such as the air-conditioner, VCD player, DVD player, printer, fax machine, mobile phone etc. are examples of embedded systems. Each of these appliances will have a processor and special hardware to meet the specific requirement of the application along with the embedded software that is executed by the processor for meeting that specific requirement. The embedded software is also called “firm ware”. The desktop/laptop computer is a general purpose computer. You can use it for a variety of applications such as playing games, word processing, accounting, software development and so on. In contrast, the software in the embedded systems is always fixed listed below: mEmbedded systems do a very specific task, they cannot be programmed to do different things. . Embedded systems have very limited resources, particularly the memory. Generally, they do not have secondary storage devices such as the CDROM or the floppy disk. Embedded systems have to work against some deadlines. A specific job has to be completed within a specific time. In some embedded systems, called real-time systems, the deadlines are stringent. Missing a deadline may cause a catastrophe-loss of life or damage to property. Embedded systems are constrained for power. As many embedded systems operate through a battery, the power consumption has to be very low. Some embedded systems have to operate in extreme environmental conditions such as very high temperatures and humidity. Embedded systems often reside in machines that are expected to run continuously for years without errors and in some cases recover by themselves if any error occurs. Therefore the software is usually developed and tested more carefully than that for PC, and unreliable mechanical moving parts such as Disk drives, switches or buttons are avoided.Specific reliability issues may include:

- The system cannot safely be shut down for repair, or it is too inaccessible to repair. Solutions may involve subsystems with redundant spares that can be switched over to, or software “limp modes” that provide partial function. Examples include space systems, undersea cables, navigational beacons, bore- hole systems and automobiles.
- The system must be kept running for safety reasons. “Limp modes” are less tolerable. Often backups are selected by an operator. Examples include Aircraft, Navigation, Reactor control systems, safety-critical Chemical factory controls, Train signals and engines on single-engine Aircraft.
- The system will loose large amounts of money when shutdown: Telephone switches, Factory controls, Bridge and elevator controls, funds transfer and market making, automated sales and service.

Physically, embedded systems ranged from portable devices such as MP3 players, to large stationary installations like traffic lights, Factory controllers. In terms of complexity embedded systems can range from very simple with a single microcontroller chip to very complex with multiple units, peripherals and networks mounted inside a large chassis or enclosure

2. Project overview

Sign language is a natural way of communication between normal and dumb and deaf people & patients .Sign language is mostly dependent on hand gesture recognition.It is sometimes not easy for normal people to recognize the signs properly and understand what they want to say. So the intension of the gloves is to make the life style of the patients, dumb and deaf people easy.The gloves translates the hand gestures to text and further speech so that the normal people can read the recognized gesture and hear to the voice and understand what that person wants to tell, which will make the communication more efficient. The system consists of both physical and non-physical communication.

Sign language differ f rom country to country it is not universally same. America developed American Sign Language (ASL); British developed British Sign Language and so on Most of the countries follow the American Sign Language and our system is also based on the same.

2.1 Block Diagram

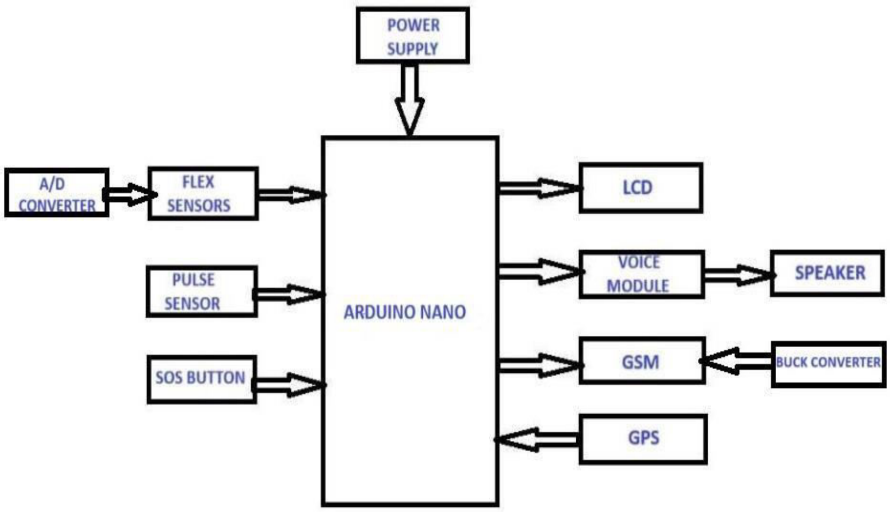

Fig 1:- block diagram for arduino based smart glove for human interaction

2.2 OPERATION

The working will begins with the flexible sensors are installed to the glove, after that flexible sensors are inserted to the "ARDUINO NANO "board.The flexible sensors which have the resistive ink whenever we bends the flex sensors the resistive ink acts as input to the Arduino Nano board.We are using the analog to digital converter to get accurate values from the flex sensors.As the Arduino Nano board has the connection with the LCD(Liquid crystal display) and the voice module.The LCD display which has the 32 bit space for displaying the needs of the person.The LCD was display the needs of the person and the voice module is to record the voice through the Mic and produces sound in voice form by the speaker.The speaker produces the sound in voice form for knowing the needs of the person.We are using the two Arduino Nano boards for the hardware equipment.

The another Arduino Nano board is the connected to the Pulse Sensor, GSM, GPS, Buck converter .The Pulse sensor was to detects the Heart beat and Pulse of the person.Whenever the Sudden drop in pulse (or) Heart beat with the GSM we can sense the condition of the person .The GPS(Global position system) will sends the location of the person through the GSM.The GSM stands for the Global system for mobile communication which will helps for the communication with the person.The buck converter is also used for this project to regulate the voltage for the GSM.When the flex sensor was bends at certain degrees then the resistive ink is input to the Arduino board .The Arduino board take the input and gives the output on the LCD display.The SOS Button was connected to the Arduino board whenever the SOS button is pressed the person condition will send by the GSM Module.

3 Hardware Implementation

3.1 ARDUINO NANO

An Arduino board historically consists of an Atmel 8-, 16- or 32-bit AVRmicrocontroller (although since 2015 other makers' microcontrollers have been used) with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which let users connect the CPU board to a variety of interchangeable add-on modules termed *shields*. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I²C serial bus—so many shields can be stacked and used in parallel. Before 2015, Official Arduinos had used the Atmel megaAVR series of chips, specifically the ATmega8,ATmega168, ATmega328, ATmega1280, and ATmega2560. In 2015, units by other producers were added. A handful of other processors have also been used by Arduino compatible devices. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the LilyPad run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an externalprogrammer. This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer. Currently, optiboot bootloader is the default bootloader installed on Arduino UNO.[9]

At a conceptual level, when using the Arduino integrated development environment, all boards are programmed over a serial connection. Its implementation varies with the hardware version. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor– transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB),implemented.

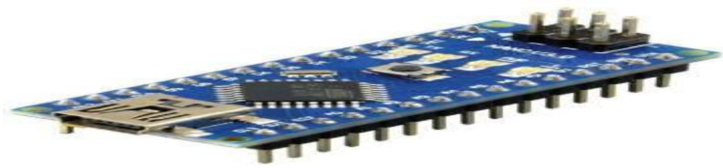

Fig 2 Arduino nano

4. Proposed METHODOLOGY

The APR9600 block diagram is included in order to give understanding of the APR9600 internal architecture. At the left hand side of the diagram are the analog inputs. A differential microphone amplifier, including integrated AGC, is included on-chip for applications requiring its use. The amplified microphone signal is fed into the device by connecting the Ana_Out pin to the Ana_In pin through an external DC blocking capacitor. Recording can be fed directly into the Ana_In pin through a DC blocking capacitor, however, the connection between Ana_In and Ana_Out is still required for playback. The next block encountered by the input signal is the internal anti-aliasing filter. The filter automatically adjusts its response according to the sampling frequency selected so Shannon's Sampling Theorem is satisfied. After anti-aliasing filtering is accomplished the signal is ready to be clocked into the memory array. This storage is accomplished through a combination of the Sample and Hold circuit and the Analog Write/Read circuit. These circuits are clocked by either the Internal Oscillator or an external clock source. When playbackis desired the previously stored recording is retrieved from memory, low pass filtered, and amplified as shown on the right hand side of the diagram. The signal can be heard by connecting a speaker to the SP+ and SP- pins. Message management is controlled through the message control block represented in the lower center of the block diagram.

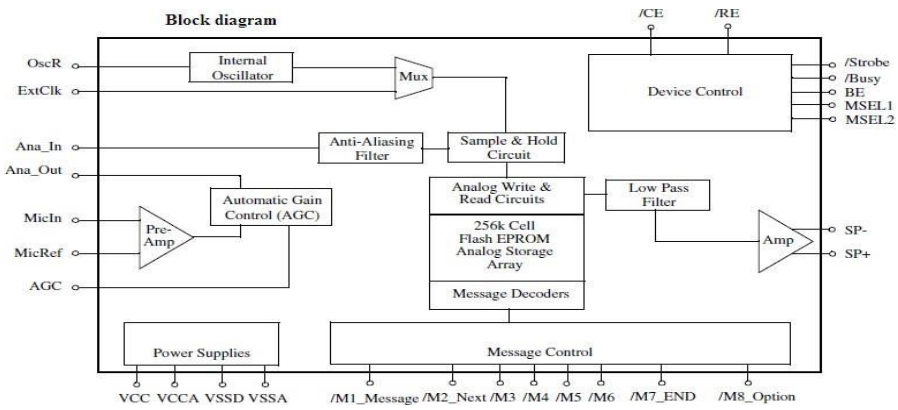

Fig 3 Block diagram of voice module

4.1 LCD(Liquid crystal Display)

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).

Fig 4 (16*2nLiquid crystal Display)

5 RESULTS AND DISCUSSION

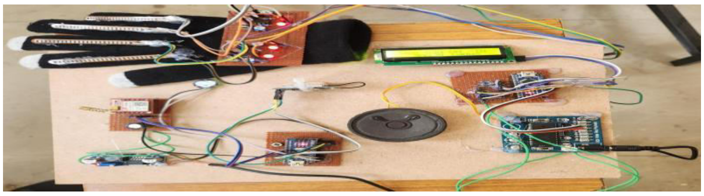

Fig 4:- Hard ware setup for arduino based smart glove for human intercation

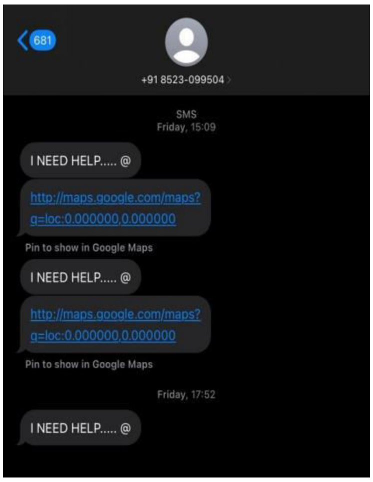

Fig 5 :-Gsm sends location and emergency message to the corresponding attendent when user want help from others

Fig 6 :-Lcd display shows the user inner needs when they move their fingers and also voice play back in speaker

6 Conclusions

In conclusion, the Smart Glove for Human Interaction Project represents a ground breaking initiative in empowering individuals with physical disabilities through innovative technology. By translating sign language into spoken or written words using flex sensors and Arduino technology, the project aims to break down communication barriers and foster greater inclusivity. Additionally, the integration of vital monitoring features such as heart rate sensors and an SOS button further enhances the safety and autonomy of users. This holistic approach not only addresses communication challenges but also prioritizes the well-being of individuals within the community. Overall, the project holds tremendous potential to revolutionize human interaction for the physically and mentally impaired, offering a glimpse into a more accessible and connected future

6.1 FUTURE SCOPE

Implementing machine learning algorithms to enhance the accuracy and efficiency of sign language translation, leading to more precise and natural communication., Expanding the project to support multiple spoken and written languages, catering to a broader audience and facilitating communication across diverse communities. Developing a more compact and wearable version of the smart glove, allowing for greater mobility and convenience for users in their daily lives.we use battery for traveling purpose.

7. REFERENCES

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