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Smart Gloves for Messaging and Healthcare for Deaf and Dumb

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ABSTRACT

Now a days different methods are available for physically disabled like deaf and dumb people. This project focuses on the development of an assistive wearable system customized for individuals with limited mobility, such as those experiencing paralysis or other physical challenges. The system incorporates Arduino, flex sensors, a DF Mini MP3 player, and health monitoring sensors to facilitate communication through gesture recognition and real-time health parameter monitoring. By using flex sensors to identify finger gestures, the system enables users to trigger corresponding voice playback, displaying predefined strings on an LCD. Concurrently, health metrics, including heart rate, body temperature, and SpO2 levels, are monitored to provide essential information and generate alerts in case of abnormal values.

Keywords: Assistive wearable system, Flex sensors, DF Mini Mp3 Player,LCD,SpO2 And Alerts.e

1. INTRODUCTION

In a dynamic era marked by technological advancements, the intersection of innovation and compassion has paved the way for transformative solutions to enhance the lives of individuals facing physical challenges. Among these, differently-abled individuals, particularly those dealing with paralysis or limited mobility, often encounter barriers that impede effective communication and comprehensive health monitoring. This project introduces an ambitious endeavour: a multifunctional assistive wearable system meticulously crafted to bridge these gaps. By leveraging cutting-edge technologies including Arduino, flex sensors, a DF Mini MP3 player, and health monitoring sensors, this system aspires to redefine the landscape of assistive technologies. Beyond the confines of conventional solutions, the wearable system is engineered to empower users not only in their communicative endeavours but also in proactively managing their health in real-time.

The impetus behind this project is the recognition that traditional assistive systems often fall short in providing a unified and user-centric approach, typically offering either communication aids or health monitoring devices in isolation. The introduction of a wearable device that seamlessly integrates gesture-controlled communication and continuous health monitoring seeks to revolutionize the assistive technology paradigm. By allowing users to express themselves through intuitive gestures, the system transcends the limitations of conventional communication methods, affording a personalized and adaptable means of interaction.

Simultaneously, the real-time monitoring of vital health parameters, facilitated by integrated sensors, contributes to a holistic approach in fostering well-being and awareness.

In essence, this project endeavours to cultivate independence, inclusivity, and empowerment for differently-abled individuals by offering a multifaceted solution that aligns with the diverse needs of its users. Beyond the technical intricacies, the heart of this innovation lies in its potential to enhance the quality of life, breaking down barriers that hinder effective communication and health management. As we embark on this journey, the aim is not merely to engineer a device but to catalyze a positive impact, ensuring that technology becomes an enabler for a more accessible and enriched future for all.

2. LITERATURE SURVEY

1. Sign Language Interpreter Using A Smart Glove

Published in: 2014 International Conference on Advances in Electronics Computers and Communications.

This research presents an innovative method for translating sign language using a portable smart glove. Each finger is equipped with an LED-LDR pair that detects the signing motion and transmits the analog voltage to the microcontroller. The MSP430G2553 microcontroller translates analog voltage values into digital samples and wirelessly transmits the ASCII code of the indicated letter via ZigBee. When the computer receives a letter, it displays the letter that corresponds to the received ASCII code and plays the appropriate sounds.

2. Hand Gesture Recognition Using Image Processing For Visually Impaired And Dumb Person

Published in: International journal of advanced research in computer and communication engineering, IJARCCE, 2018.

In this proposed system, the term "dumb people motion" refers to a specific concept with a distinct message template that will be extracted and stored in a database. The movements are captured and then compared to gestures recorded in a database. The training signs serve as input, while the testing signs are located on the outside. The process begins by capturing photos, which are then compared with the registered motions in the database. Finally, the corresponding speech is created for the matching gesture..

3. Smart Glove For Sign Language Translation Using Arduino

Published in: KEC Conference Proceedings, September 27, 2018.

This study employs a sensor-based approach rather than relying on image processing techniques. First of all, sign language is transformed to analog voltage signal utilizing flex sensor and accelerometer. The microcontroller board utilizes an ADC to transform analog signals into digital signals. The microcontroller analyzes the digital stream, identifies the corresponding characters, and sends them to an Android phone via a Bluetooth module. An Android application is used to exhibit the characters obtained from a Bluetooth module in the form of textual content, which is then converted into audible speech utilizing Google's text-to-speech technology. Additionally, the voice is converted into written text and then transcribed into sign language with the use of a speech recognizer.

4. Smart Hand For Deaf And Dumb

Published in : Journal of Emerging Technologies and Innovative Research (JETIR) ,2019.

This study presents a system that will translate hand gestures into spoken words and written text, and will also transmit the messages via the android application. We have created an intelligent glove that uses flex sensors and a gyroscope to accurately track and record hand motions. The microcontroller receives the input and presents the output as text on an LCD screen and as voice via a speaker. The text may also be sent wirelessly to a smartphone. This initiative aims to enhance communication for those who are deaf and mute, hence reducing barriers in their interactions with others.

5. Literature Survey On Digital Glove For Gesture Recognition

Published in : International Organization of Scientific Research Journal of Engineering (IOSRJEN),2019.

The glove is equipped with flex sensors and an accelerometer, which are positioned along the length of each finger. They are used for detecting hand gestures. Flex sensors are used to quantify the extent of finger flexion. The accelerometer in the gesture recognition system functions as a tilt sensor component, determining the extent to which the finger is slanted. The flex sensor is connected to the digital pins of the Arduino Uno microcontroller. The flex sensor and accelerometer output data streams are sent to the Arduino microcontroller, where they undergo processing and conversion into their respective digital values. The microcontroller analyzes these data by comparing them to predetermined values, allowing it to understand motions and display corresponding text. The output received from the sensor-based system is thereafter sent to the voice module. The voice recording and playback module is used to provide auditory information to individuals. The purpose is to make sign alphabets accessible in an audio format via a speaker.

3. OVERVIEW OF EXISTING SYSTEM

The existing landscape of assistive technologies for differently-abled individuals offers various solutions; however, these often come with certain drawbacks and limitations. Primarily, there is a lack of comprehensive integration between communication aids and health monitoring devices, leaving users with fragmented solutions and unmet needs. Here are the key aspects of the existing system and its drawbacks:

(1).Fragmented Solutions:

Many current assistive technologies specialize in either communication aids or health monitoring devices, resulting in a disjointed user experience. Differently-abled individuals may need to rely on multiple devices simultaneously, causing complexity and potential difficulties in managing them effectively.

(2).Limited Gesture Recognition:

Existing gesture recognition systems are often limited in precision and scope. Simple gestures may be recognized, but nuanced expressions essential for effective communication may be overlooked, leading to a gap in expressive capabilities.

4. PROPOSED SYSTEM

The proposed system envisions a transformative assistive wearable that seamlessly integrates gesture-controlled communication and real-time health monitoring, addressing the limitations of existing solutions. It is designed to empower differently-abled individuals, particularly those facing paralysis or limited mobility, by providing a unified, user-centric solution that enhances communication, ensures continuous health awareness, and fosters independence.

(1). Gesture-Controlled Communication:

The heart of the system lies in its ability to recognize and interpret complex gestures through strategically placed flex sensors. These sensors capture subtle finger movements, allowing users to express themselves intuitively. An Arduino microcontroller processes the data, identifying predefined gestures and triggering corresponding communication messages.

(2). DF Mini MP3 Player for Voice Playback:

Communication is facilitated through a DF Mini MP3 player, which stores customized voice messages aligned with recognized gestures. As gestures are detected, the DF Mini MP3 player plays back the corresponding voice message, enabling effective and personalized communication.

(3). Real-Time Health Monitoring:

The system incorporates health monitoring sensors to provide continuous insights into the user's well-being. This includes a heart rate sensor for cardiovascular health, a temperature sensor for body temperature, and a pulse oximeter (SpO2 sensor) for blood oxygen saturation levels. The Arduino processes this health data in real-time.

(4). LCD Display for Visual Feedback:

A user-friendly LCD display serves as a visual interface, presenting predefined communication strings, real-time health data, and alerts. This dual-purpose display enhances user autonomy by providing instant access to critical information in an understandable format.

(5). Alert Mechanism for Abnormal Values:

The system includes an alert mechanism that promptly notifies both the user and caregivers in the event of abnormal health values.The abnormal values are shown along with the symbol Asterisk(*). Visual alerts on the LCD screen and auditory alerts through the DF Mini MP3 player serve as immediate indicators, enabling swift attention to potential health concerns.

5. IMPLEMENTATION

It consists of power supply, ADXL345 Accelerometer, Flex Sensors, ESP8266(Node MCU), MAX30102(HB, SPO2,Temp), DFMini MP3 player, LCD 20x4 display and speaker where connected to Arduino Mega microcontroller.

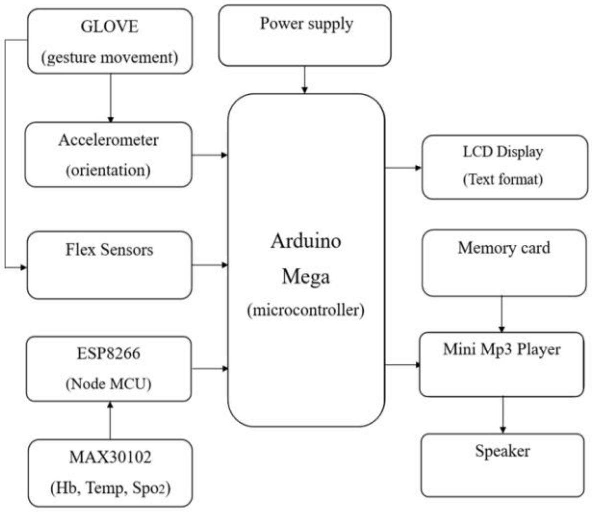

Fig1: Proposed Block Diagram

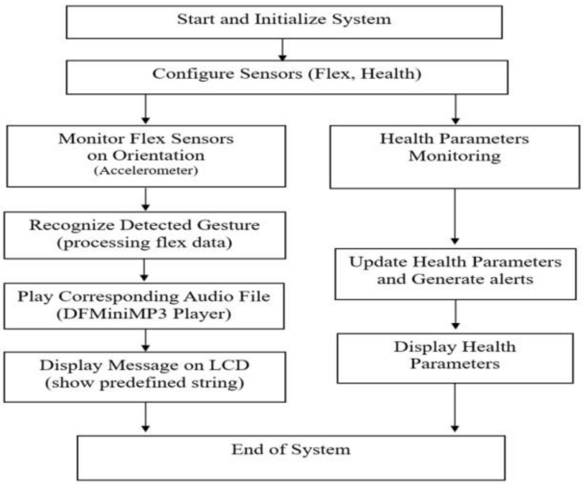

Fig 2 : Flow Chart

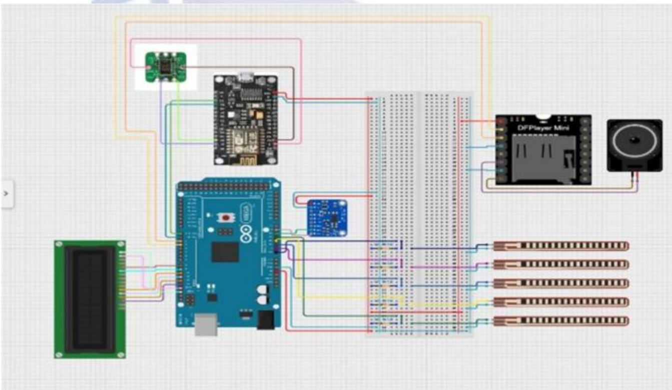

Fig 3 :Circuit Diagram

6. RESULTS

Smart gloves are used to dismantle the barrier that exists for those with disabilities in communicating. Smart gloves may facilitate job advancement for handicapped individuals, therefore contributing to the overall prosperity of the nation, given the significant population of disabled individuals. Compared to prior suggested systems, this system is more reliable, efficient, user-friendly, and lightweight. This facilitates communication between those with speech impairments and those without.

This device facilitates non-verbal communication by enabling those who lack verbal communication abilities to express themselves via gestures. The voice output may be customized to any language based on the user's preference.A gesture recognition module using flex sensors has been created to identify English alphabets and a limited number of words. Additionally, a Text-to-voice synthesizer has been implemented to transform specified text into voice on the device that will be used for the speech output.In this, you will also be monitoring the vital signs of handicapped individuals, including their temperature, heart rate, blood pressure, and other relevant metrics.

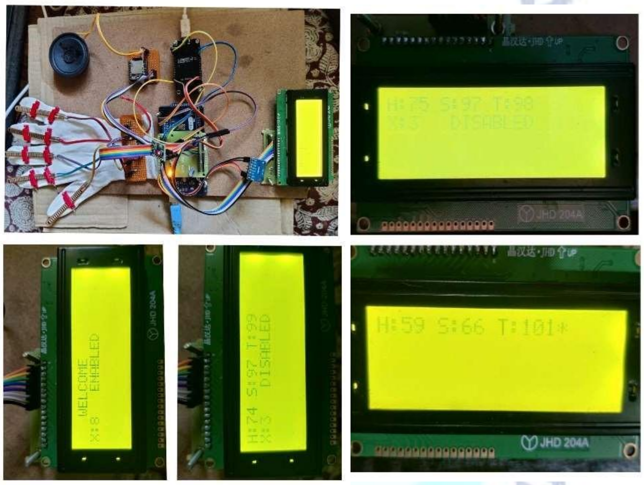

Fig4: Hardware kit and Health Monitoring(LCD)

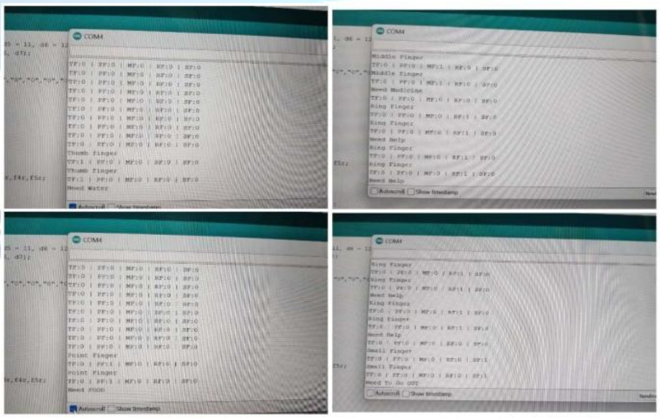

Fig5: Serial Monitor Outputs

Table : This table shows that the user needs through fingers

Finger Types	**User Preferences**
Thumb Finger	I Need Water
Point Finger	I Need Food
Middle Finger	I Need Medicine
Ring Finger	I Need Help
Small Finger	I Need Go Out

7. CONCLUSION

Sign language is a valuable means of facilitating communication between the deaf population and others who can speak and hear.This technique effectively resolved the aforementioned difficulty. This research utilizes a technology to facilitate communication between those who are deaf and mute by using smart gloves. The motions of the fingers are converted into text and sound, enabling the comprehension of gestures. Upon testing the device, it was found to be functioning well. The results section included photographs that demonstrated the device's performance. However, it was also seen that the system's design incurred a high cost due to the usage of flexible sensors. The number of gestures is reduced to four. By completing this planned project, it demonstrates that these wired gloves have the capability to partially recognize sign language. In the future, the suggested system may be improved by including more sensors, since it would be more advantageous to place a wireless sensor on each finger. The applicability of smart gloves may also be expanded to accommodate multiple languages. Furthermore, the design position may be altered to accommodate the smaller size of the sensors, hence enhancing their reliability.

FUTURE SCOPE

- The future scope for smart gloves for deaf and dumb is quite promisingwith advancements in technology, the system can further be added with the capability of transmitting the data wirelessly. this can be accomplished by using the xbee module.
- The system may can also add voice talkback using an Android App that can spell out or communicate the data or the signs being developed by the user directly and simultaneously.
- The advance glove translates the non deaf voice into text and represented in sign language by a characters.
- Designing and developing a prototype of a system "Intelligent Gloves" facilitates two-way communication between deaf-mutes and non-deaf-mutes by translating the sign language to text and voice simultaneously that can be understood by non-deaf-mute people and translating non-deaf-mute voice to text and sign language presented by a video of an avatar on the screen to the deaf-mute people.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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