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A novel communication system based on sign language recognition and voice convertion for differently abled person

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ABSTRACT:

Sign language is a language that helps the deaf and mute to communicate with the hearing impaired. About 2.78% of people in our country cannot speak, e.g. Their communication with others is done only through their hand movements and gestures. People know each other and connect through thoughts and ideas. Some people have no voice; the only way to communicate with others is through sign language. Today, technology has bridged the gap with systems that can convert the sign language used by these people into speech. Sign language recognition (SLR) and gesture-based control are two important applications of hand gesture recognition techniques. On the other hand, the controller converts sign language into text and speech, which is converted through text-to-speech and analog-to-digital conversion.

Keywords: Sign language recognition, Gesture based control

Introduction:

Our project proposed a new technology called an artificial mouth for stupid people. A communication gap between two people occurs because a stupid person uses sign language that a normal person cannot understand. This design mainly focuses on removing the barricades of communication between people. the mute community and people who do not know the universality of sign language. Many languages are spoken and translated all over the world. "Disabled", i.e. people who have difficulty speaking and hearing, respectively "stupid" and "deaf", find it difficult to understand exactly what another person is expressing, and also deaf people. Sometimes people misinterpret these messages either through sign language or lip reading or lip syncing. To solve these problems, we provide a system that works effectively to solve these problems.

Literature Survey:

Emily Johnson [1] "Integration of Sign Language Recognition and Speech Synthesis: A Comparative Study"
This comparative study investigates different approaches for integrating sign language recognition with speech synthesis technologies. It compares the performance of rule-based and data-driven methods, discusses the trade-offs between accuracy and computational efficiency, and provides insights into designing hybrid communication systems for diverse user needs
David Wilson [2] "User-Centered Design of Communication Systems for Differently Abled Individuals"

This research paper focuses on the user-centered design of communication systems tailored for differently abled individuals. It presents case studies of participatory design processes involving end-users with diverse abilities, discusses challenges in ensuring usability and accessibility, and offers practical recommendations for designing inclusive communication technologies.
Sarah Thompson [3] "Ethical Considerations in Assistive Communication Technologies"

This article examines the ethical implications of assistive communication technologies, including systems based on sign language recognition and voice conversion. It discusses issues such as privacy, data security, and the impact of technology on social interactions among differently abled individuals. It also proposes guidelines for ethical development and deployment of such technologies.

Existing system:

Sign language is a language used by the mute and is a communication skill that conveys meaning through gestures instead of sound, at the same time combining hand shape, direction, and hand, arm or body movement as well as facial expressions to fluently express the thoughts of the speaker. . Wireless data gloves are standard fabric conductive gloves with flexible sensors along the length of each finger and thumb. Mute can make hand gestures with gloves and it will be converted into text In the existing system, the main role is played by the Flex Sensor, Flex sensors are sensors whose resistance changes depending on the amount of flex in the sensor. Smart glove system and Raspberry Pi system. The smart glove system converts the analog signals from the flexible sensors into digital signals that the Raspberry Pi system can understand. The Raspberry Pi system then translates the digital signals into words that listeners can understand.

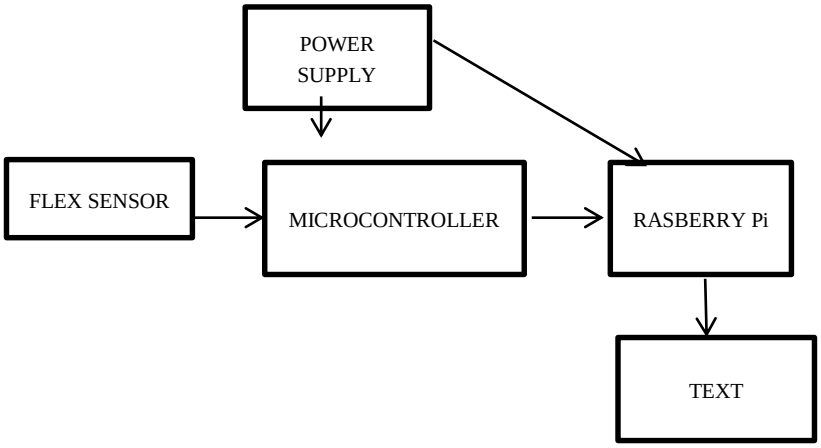

FIG 3.1: BLOCK DIAGRAM OF EXISTING SYSTEM

Disadvantage:

- It is not suitable for the people who's are not able to reading the output text.
- Analog output from flex sensor is in low range.
- Analog output from flex sensor is less accurate
- Highly unstable analog output from flex sensor.
- More circuits.
- Expensive

Proposed system:

The current system is not suitable for all people and has many challenges and shortcomings. To solve this problem, we implemented a new type of communication system based on sign language recognition and voice conversion for people with different abilities. In this system, the image of a person communicating in sign language can be recorded by a camera. The image of the hand is taken through the material and it is taken to the image pre-processing stage. . Image pre-processing includes cropping, filtering, brightness and contrast adjustment, among others. Therefore, the first step is to convert RGB images to binary images. Algorithms used were grayscale image conversion, median filter, smooth binary mask, RGB separation, histogram and sable operator. For a grayscale image, a sharpening filter is used to sharpen the details. We use GLCM (Gray Level Co-occurrence Matrix) and LBP (Local Binary Pattern) for classification. After classification, the output is given to the microcontroller where it receives the signal and the Audio.

Block diagram

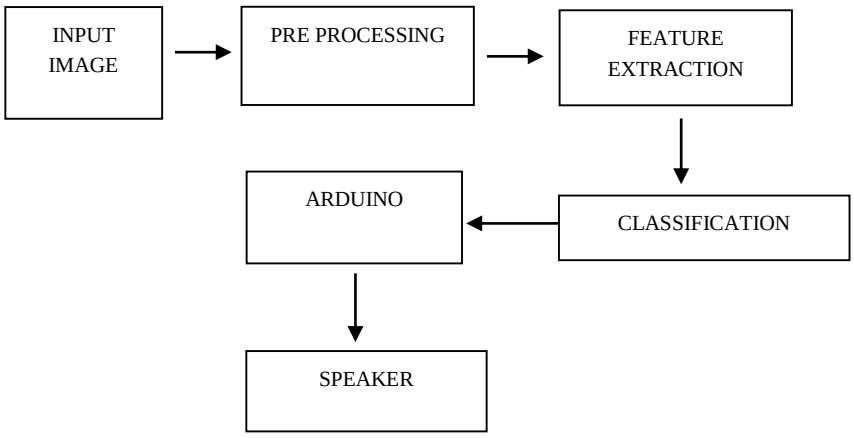

FIG 4.1: BLOCK DIAGRAM OF PROPOSED SYSTEM

System Architecture:

The system architecture consists of both hardware and software.

Arduino:

Arduino Uno is a microcontroller board based on ATmega328. It has 14 digital I/O pins (6 of which can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB port, a power connector, an ICSP header, and a reset button. It includes everything needed to support the microcontroller; Connect it to a computer or power source, AC adapter or battery with a USB cable. The Uno differs from all previous boards in that it does not use the FTDI USB serial chip. Instead, it has an Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named in honor of the upcoming Arduino 1.0 release. Uno and version 1.0 are now Arduino reference versions. The Uno is the latest in the Arduino USB board series and a reference model for the Arduino platform.

Power:

The Arduino Uno is powered by a USB connection or an external power supply. External (non-USB) power can come from either an AC-DC adapter (wall socket) or a battery. The adapter can be connected by connecting the middle 2.1mm positive connector to the power connector of the card. The battery wires can be connected to the Gnd and Vin pins of the POWER connector. The card can work with an external voltage of 6-20 volts. However, if the supply voltage is below 7V, the 5V pin may supply less than five volts and the board may be unstable. If you use a voltage regulator above 12V, it may overheat and damage the board. The recommended voltage range is 7-12 volts.

APR:

The APR9600 is an inexpensive and efficient audio recording/reproduction circuit that uses analog flash recording technology. The recorded sound is preserved even when the power source is disconnected from the module. The sound produced is high quality and quiet. The sampling rate during the 60 second recording period is 4.2 kHz, so the audio recording/playback bandwidth is 20 Hz to 2.1 kHz. However, by changing the oscillating resistor, a sampling rate of up to 8.0 kHz can be achieved. This reduces the total length of the audio recording to 32 seconds. The total audio recording time can be changed from 32 seconds to 60 seconds by changing the value of one resistor. An IC can operate in two modes: series mode and parallel mode. In burst mode, audio can be recorded in 256 parts. In the parallel operating mode, the sound can be recorded in 2, 4 or 8 cycles. The IC can be controlled simply by buttons. ICs can also be controlled by external digital circuits such as microcontrollers and computers. The APR9600 has a 28-pin DIP package. Input voltage is 4.5 to 6.5 V. Current consumption during recording and playback is 25 mA. In sleep mode, the current drops to 1 mA. The APR9600 test circuit is an assembled circuit consisting of an APR9600 IC, an electret microphone, supporting

components and the necessary switches that allow users to explore the full functionality of the APR9600 chip. The vibration resistance is chosen so that the total recording period is 60 seconds with a sampling rate of 4.2 kHz. The dimensions of the plate are 80 mm x 55 mm 6.6.

Software details:

Embedded C

Eembedded C Embedded C is an extension of the C Standards Committee's C programming language designed to address common problems with C extensions in various embedded systems. Historically, embedded C programming required non-standard extensions to the C language to support exotic features such as fixed-point arithmetic, multiple discrete memory banks, and basic I/O operations.

Arduino software (IDE)

Arduino software (IDE) Arduino integrated development environment, or Arduino software (IDE).It combines Arduino and Genuino hardware for program loading and interaction. MATLABs a high-level language and interactive environment for numerical computing, visualization and programming. With MATLAB, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions allow you to explore different approaches and arrive at a solution faster than using spreadsheets or traditional programming languages like C/C++ or Java. It use for communications, image and video processing, control systems, testing and measurement, computational economics and computational biology.

Result**:**

Deaf communication is a big problem compared to blind and sighted people. This article focuses on bridging the communication gap between the deaf or mute community and ordinary people. The system proposed in this article will increase the lifespan of the mole/deaf. It is also useful for dark and silent communication. The whole system is efficient and functional. The system can be extended to support more characters and different languages. The system can be extended to support more prompts and\different language modes. It is useful for all kinds of people and helps them to communicate easily and effortlessly with common people. It provides accurate sign language-based audio for the deaf and mute. It is used to improve the communication of all quiet people. In the current system it provides text but is not used for uneducated people. But in this system, it offers audio reproduction. It helped people to know the exact meaning of sign language.

Conclusion and Future work:

Communication between the deaf and the hearing presents a major problem compared to the communication between the blind and the sighted. This article highlights bridging the communication gap between the deaf or mute community and ordinary people. The future work of our project is to convert text to sign language for people with different abilities. Going forward, SignTalk has tremendous room for improvement and expansion. In the future, we could focus on improving gesture recognition algorithms to support a wider range of sign language gestures and expressions, thereby improving accuracy and usability. In addition, the incorporation of machine learning and artificial intelligence techniques can allow SignTalk to adapt and adapt its detection capabilities to a user's individual preferences and learning habits.In addition, integration with new technologies such as Augmented Reality (AR) and Natural Language Processing (NLP) can improve the immersive and interactive aspects of an application, enrich the user experience and open new possibilities for communication and expression. Overall, SignTalk is at the forefront of assistive technology innovation and offers promising opportunities for continued development and innovation in accessible communication..

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