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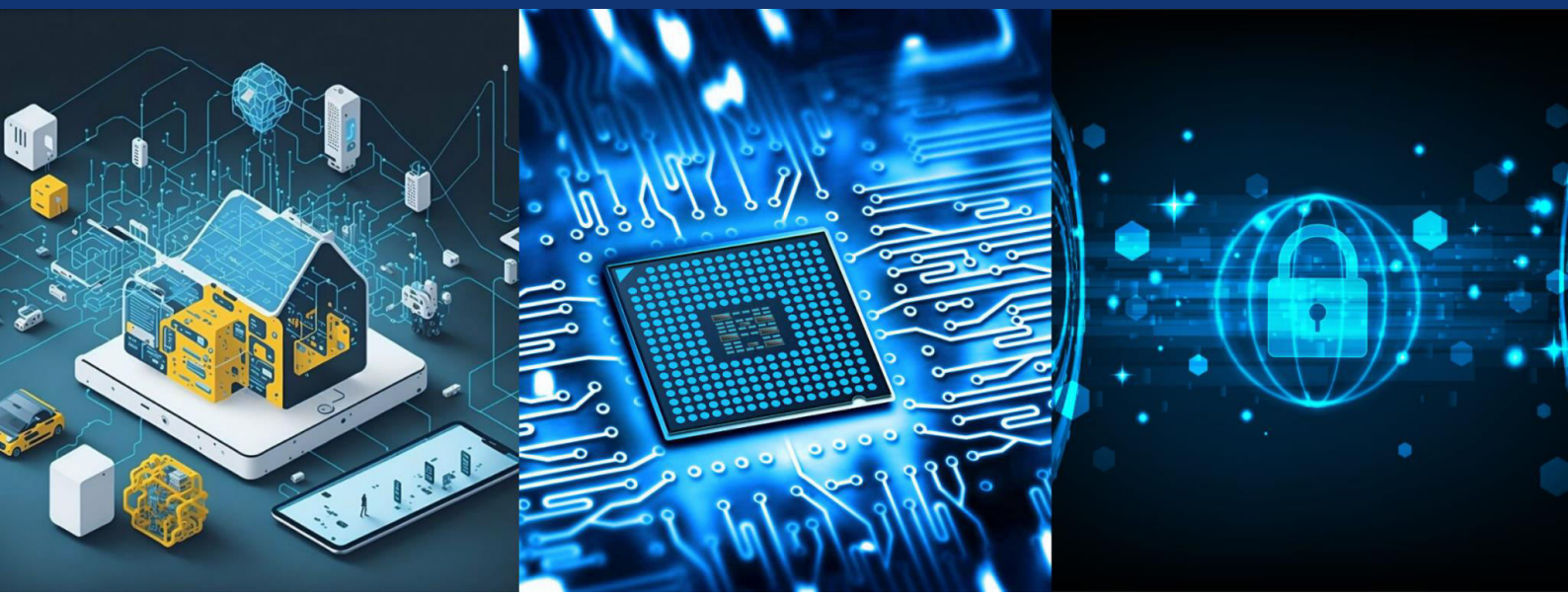
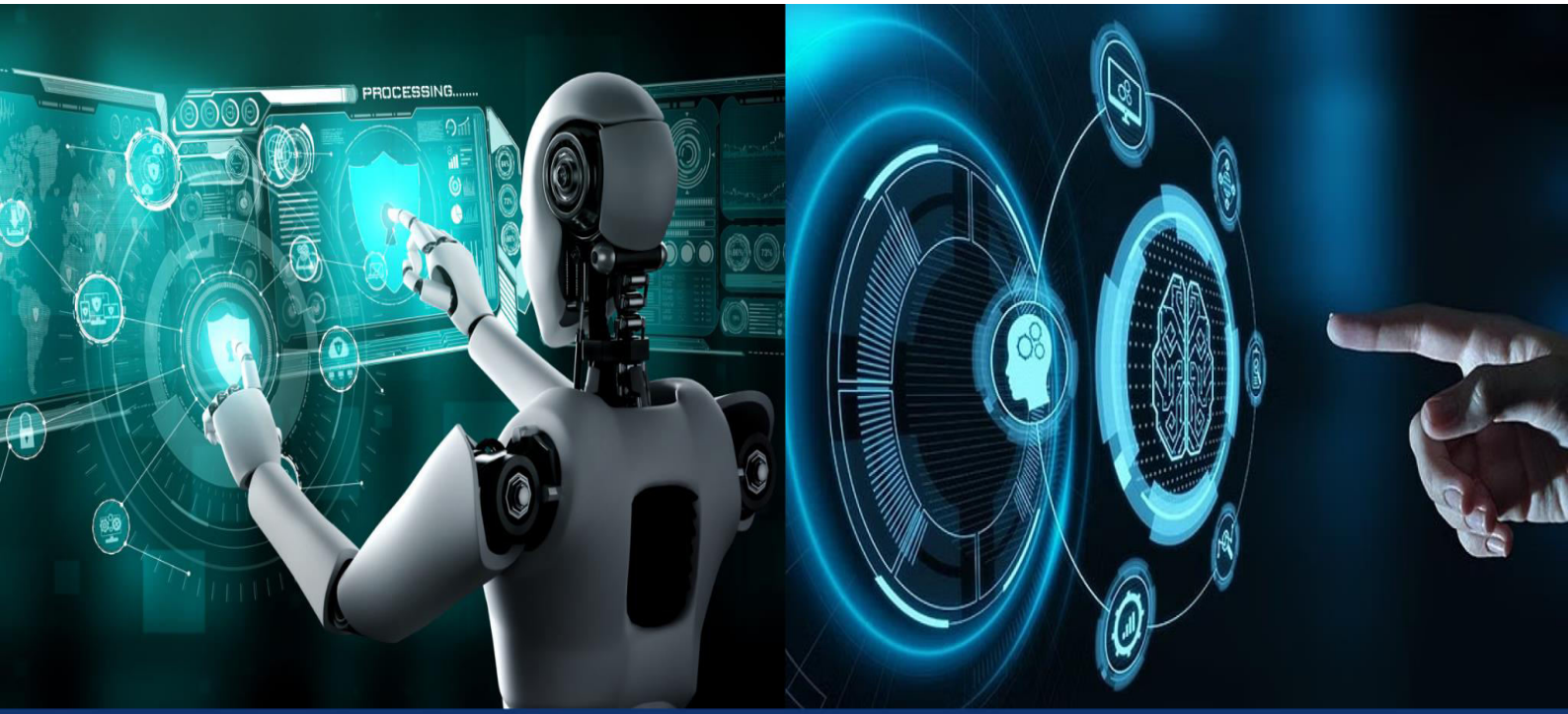


International Journal of Innovative Research in Computer and Communication Engineering

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



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IOT based Sign Language Device for Mute People

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ABSTRACT: IoT based Sign to Speech Converter System allows to convert gestures or hand movements into speech. It uses flex sensors to understand the gestures from the user. There is an Android Application which will be connected to system present on glove wirelessly through Bluetooth module.

Leveraging IoT technology, this glove translates sign language gestures into spoken language in real-time. Furthermore, the integration of an Android application enhances user interaction and customization options. These data are then processed by a central unit, which utilizes machine learning algorithms to interpret the gestures and generate corresponding spoken language output. The Android application complements this system by providing users with a customizable interface for adjusting settings, language preferences, and accessing additional features such as text-based communication.

KEYWORDS: gestures, text-based, central unit, algorithms, corresponding.

I.INTRODUCTION

The project aims to develop an innovative solution to facilitate communication between the deaf and non-signing individuals through the creation of a wearable device called the Sign-to-Speech Converter System (SSCS). Leveraging IoT technology, this glove translates sign language gestures into spoken language in real-time. Furthermore, the integration of an Android application enhances user interaction and customization options. The core functionality of the SSCS lies in its ability to capture hand movements and gestures commonly used in sign language through embedded sensors. These data are then processed by a central unit, which utilizes machine learning algorithms to interpret the gestures and generate corresponding spoken language output.

The Android application complements this system by providing users with a customizable interface for adjusting settings, language preferences, and accessing additional features such as text-based communication. Key features of the SSCS include high accuracy in gesture recognition and adaptability to various sign languages and regional variations. Its ergonomic design ensures comfort and usability, making it suitable for extended periods of wear. Overall, the IoT-based Sign-to-Speech Converter System is a glove combined with the Android application, offers a promising solution to bridge the communication gap between the deaf and hearing communities, promoting inclusivity and empowerment. Future developments may focus on refining gesture recognition algorithms, expanding language support.

II. METHODOLOGY

IoT based Sign to Speech Converter System allows to convert gestures or hand movements into speech. It uses flex sensors to understand the gestures from the user.There is an Android Application which will be connected to system present on glove wirelessly through Bluetooth module. Lastly the gesture will be recognized by the Arduino and later output will be generated on the Android Application.

NodeMCU -The main processing unit

In hardware work we have decided to use NodeMCU as the main processing unit for our project, flex sensors, Bluetooth module and many more related components and created a understandable flow diagram and block diagram as well. But as we started to study deeply we noticed that NodeMCU was not compatible for project as it has only 2

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Analog pins and we were needed 5 Analog pins so we decided to go for ESP32 and for displaying data we were decided to use Third Party Application on temporary purpose.

Android Application to fetch data

A simple Android Application to fetch data directly to mobile application through Bluetooth from ESP32. But we noticed that ESP32 was not capable to provide 3.3v to all 5 flex sensors. After that,Arduino Mega to overcome this problem. As per the Arduino Mega we recreated the circuit diagram and reconnected whole circuitry after trying much we become successful to create whole hardware. Under guidance we had created code for Arduino in embedded C language and successfully dumped code in Ardiuno Mega successfully.

III.MODELING AND ANALYSIS

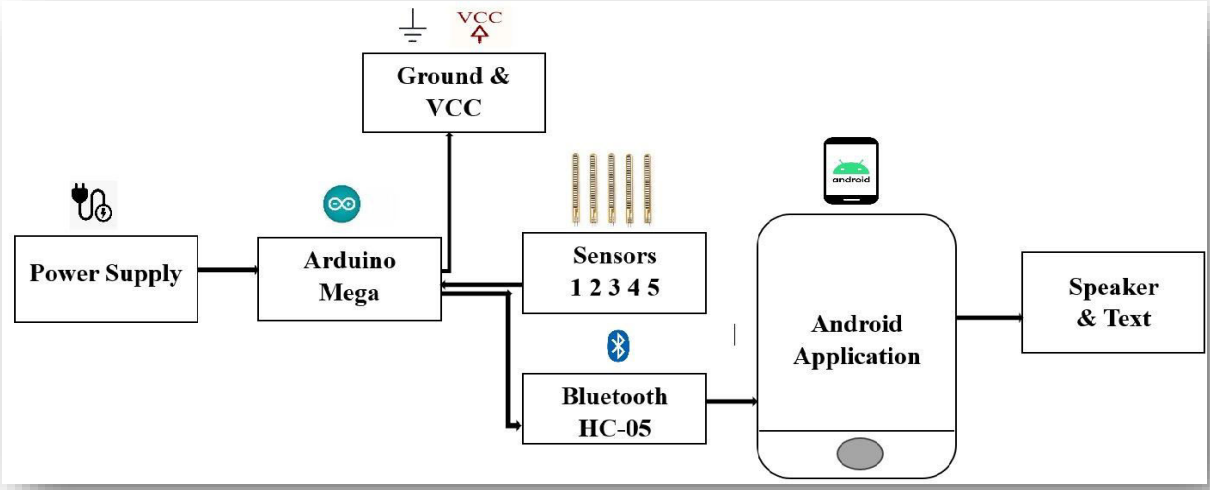

Figure1: Architectural Design.

IV.RESULTS AND DISCUSSION

- **Input Layer (Sensors):**Use of sensors like flex sensors, accelerometers, gyroscopes, or EMG sensors to detect hand gestures and finger movements.Collect raw data representing gestures commonly used in sign language.
- **Processing Unit:**A microcontroller (e.g., Arduino, Raspberry Pi) receives sensor data and transmits it to the central processing unit.Cloud-based or edge-based machine learning models analyze the data in real-time.
- **Output Layer:**Audio output via speakers to generate spoken language.Optional visual/text-based output displayed on a screen or through an Android app.
- **Android Application:**Provides a platform for customization (e.g., language settings, gesture profiles).Acts as an interface for text communication, real-time feedback, or updates.
- **Gesture Recognition Model:**Machine learning algorithms (e.g., Random Forest, SVM, or deep learning models like LSTM or CNNs) are trained to interpret sensor inputs.Time-series data analysis may be required to understand dynamic gestures.
- **Feature Extraction:**Identify relevant features (e.g., angle of fingers, velocity of movements).Principal Component Analysis (PCA) may reduce dimensionality for faster processing.
- **Real-Time Communication Protocol:**Bluetooth, Wi-Fi, or LoRaWAN may connect the glove to the Android app or cloud services.

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Table 1. ANALYSIS TABLE

1	00000	Bye	16	00011	Promise
2	10000	Bless You/ Dog	17	11100	Call
3	01000	Take Care	18	10011	Parents
4	00100	Unmarried	19	11001	Siblings
5	00010	I am Sure	20	10101	
6	00001	Hello	21	10110	Laughing
7	11000	I am feeling cold	22	01110	Right
8	10100	I am Hungry	23	01011	Slow as snell
9	10010	I need Water	24	00111	Victory
10	10001	Nice/ Beautiful	25	11110	Best/ Good
11	01100	Love	26	01111	One/First/No
12	01010	I don't know	27	10111	Four
13	01001	Locked	28	11011	Married
14	00110	Shoot/Kill	29	11101	I am in emergency
15	00101	Family	30	11111	Punch/ Yes

V.CONCLUSION

The IoT-based Sign-to-Speech Converter System offers an innovative solution for improving communication between the deaf and the non-signing community. By utilizing a glove embedded with sensors to capture sign language gestures and converting them into spoken language through a seamless integration with an Android application, the system effectively bridges the communication gap. The real-time translation, wireless data transmission, and customizable features make this system practical and accessible, providing an empowering tool for the deaf community and promoting more inclusive communication.

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