Embedded Based Vibration Motor Using Deaf and Dumb Peoples

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Abstract - This project presents a vibration motor-based system designed to assist deaf and dumb individuals in receiving notifications and alerts using the embedded C programming language. By integrating vibration motors into wearable devices or communication aids, the system provides tactile feedback to users, enabling them to perceive important information without relying on auditory cues. The use of embedded C programming allows for efficient control and optimization of the vibration motor system, ensuring reliable operation and minimal resource consumption. The project addresses the unique communication needs of deaf and dumb individuals by offering a practical and accessible solution that enhances their ability to stay informed and connected in various environments. Through this project, we showcase the potential of technology to empower individuals with disabilities and improve their quality of life. Future developments may further enhance the functionality and usability of the system, making it accessible to a broader range of users with hearing and speech impairments.

Key Words: Deaf, Hearing Impaired, Vibration Motors, Microphone, Mute

1. INTRODUCTION

Deaf and dumb individuals face unique challenges in communicating and interacting with the world around them due to their inability to hear or speak. To help address these challenges, this project aims to develop a device using a vibration motor that can convey information and alerts to deaf and dumb individuals in a non-auditory manner.

The device will be based on embedded systems technology, using embedded C programming language to control its operation. Embedded systems are specially designed computer systems that perform dedicated functions within larger systems or devices. They are commonly used in various applications, including consumer electronics, automotive systems, and medical devices.

The main component of this project is the vibration motor, which will be used to generate tactile feedback that can be felt by the user. By programming the device to produce specific vibration patterns, it can convey different types of information, such

as incoming calls, messages, alarms, or alerts.

The device will also feature user-friendly controls and interfaces, allowing the user to customize settings and preferences according to their needs. Additionally, it may include sensors or other input mechanisms to enhance its functionality and usability.

Overall, this project aims to provide a practical solution for deaf and dumb individuals to better navigate their daily lives and stay connected with the world around them through the use of vibration-based communication.

2 .LITERATURE SURVEY

Earlier There are Multiple Research done in this domain such as a Text to Braille language converting Communication Device for the Deaf and Hearing Impaired peoples which aims to converts any text into the Braille letters that can be read by a Person who is Deaf, Mute, Blind. A person can also send text message to another Deaf, Mute, Blind person from his smartphone. Once the message is received in the Device, it will starts converting that letters in message to Braille Language [1]

In another research The Development of Wearable Device that for is Built with Arduino for deaf Persons, which is used to assist a deaf persons. The Device gets an inputs from Sensors and control the LEDs and vibration motors to interact with the surroundings by using Sound signals, the sound is taken as a analogue signal and Processed with Arduino microprocessor and when the sound is generated the vibration motor operates. But since, the Program does not uses any specialized algorithm the vibrations are linear and flat in nature.[2]

In one of the research, A Device Based on Morse Code which is generates from Vibro tactile Communication is used for Deaf as proposes an alternate solution for communication to deaf people. A device has developed in which deaf people can communicate easily with others by using tactile senses or with the gestures. A device converts sound inputs by front people to Morse code. The sound message is firstly converted to text and then the Morse code signals using a conversion algorithm and those signals sends to vibration motors as a output which placed inside a glove. A deaf person who is wearing the glove senses the vibration in his fingers. [3]

3. METHODOLOGY

It is aimed to deliver a Vibration Vest that can provide a somewhat accurate Results to User by converting an sound into vibrations approach Moreover, the effectiveness of this system that's automate medical products to serve a role in the deaf people's health care.

3.1 Method/Algorithm Used for Signal Conversions

Fast Fourier Transform (FTT)

The Fast Fourier Transform algorithm is used to see which frequencies are operates in an analog signal input.

For the x higher points on axis higher the frequency. For the y higher points on axis larger the amplitude.

Actually the outcomes will generated in a graph is one or many spike like bars. A tall bar spike in the graph means that frequency

is a repeating in that signal. If Fast Fourier Transform is applied on signal that is noise free it will get outcome as only a single Spike bar. However, if Fast

Fourier Transform applied to a signal that is square wave it will results in graph that is decreasing, where many frequencies-will get intervals that are positive in nature. The higher frequencies will have lowest amplitude and the lowest ones have the highest amplitude [4]

The algorithm acts with finite number of samples. This numbers will 2^n where N is an integer which outcomes in 32, 64,128 …, etc.

This system uses FTT algorithm Arduino Library into the program to implement module functions for Speech to text and to noise Separation which give tuned outcome

4. EXISTING SYSTEM

The existing system for a vibration motor-based project for deaf and dumb individuals typically involves the use of microcontrollers programmed in embedded C. These projects aim to provide tactile feedback to users by utilizing vibration motors, allowing them to perceive notifications or alerts without relying on auditory cues.

In such projects, a microcontroller serves as the central processing unit, interfacing with various input devices such as sensors or switches to detect events or triggers. When a specific event occurs, the microcontroller triggers the vibration motor to generate vibrations of varying intensity or patterns, conveying different types of information to the user.

The programming logic implemented in embedded C involves configuring the microcontroller's input/output pins, setting up interrupt routines to detect input signals, and implementing algorithms to determine the appropriate vibration patterns based on the detected events. Additionally, the code may include features such as power management to optimize energy consumption and ensure longer battery life for portable devices.

The design considerations for such projects include the selection of suitable vibration motors based on factors such as size, power consumption, and vibration strength. Additionally, the ergonomic design of the device housing and placement of the vibration motor play a crucial role in ensuring effective tactile feedback for the user.

Furthermore, accessibility features may be incorporated into the user interface design, such as customizable vibration patterns or intensity levels, to accommodate individual preferences and needs.

Overall, vibration motor-based projects for deaf and dumb individuals in embedded C require a combination of hardware design, software development, and user-centric design considerations to create an accessible and user-friendly solution for communication and notification purposes.

5. PROPOSED SYSTEM

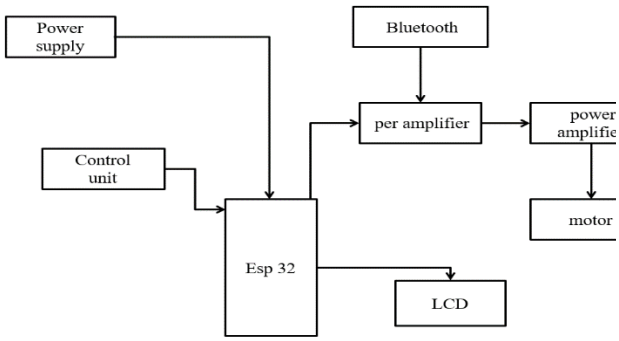

Fig-1: Proposed System Architecture.

5.1. System Architecture Components

-Arduino UNO Microprocessor.

-Vibration Motors.

-Microphone Module.

-Li -ion Battery.

By developing an IOT Based Vibration Vest for Deaf people, the deaf user can understand vibration sensation and learn about the sound and what a person on front of them wants to say. The Vibration Vest can help them by just wearing the device like a jacket which consists of microphone module, vibration motors and battery powered microcontroller Arduino UNO which is fitted into vest, the microphone module and the vibration motors are connected to it. Microphone on vest collect/ gather the sound and sends to Micro-controller which processes that sound by converting the sound waves using FFT Algorithm Program sets into controller and adapting it to conversion in electrical form to Vibrations motors output as per the program algorithm result which triggers multiple vibration

Motors as per output instructions given by program. The result of this can accumulated by the deaf people i.e. the user wearing this vest will be able to understand and learn by adaptive sensation they feel evolving by time.

6. MATERIALS AND METHODS

1. Objective Definition:

Define the objectives of the project, which include developing a device that can convey information or signals to deaf and dumb individuals using vibration.

2. Hardware Selection:

- Identify suitable microcontroller: Select a microcontroller with sufficient processing power and GPIO pins to control the vibration motor.

- Choose vibration motor: Select a vibration motor that is small, lightweight, and can generate sufficient vibration to be felt by the user.

- Other electronic components: Include resistors, capacitors, connectors, and a power source such as batteries.

3. Software Development:

- Write Embedded C code: Develop code in Embedded C to control the microcontroller and interface with the vibration motor.

- Implement signal processing algorithms: Design algorithms to convert input signals (such as text messages or alarms) into vibration patterns.

- Test and debug: Test the software on a development board and debug any issues to ensure proper functionality.

4. Circuit Design:

- Create a schematic diagram: Design a circuit schematic showing the connections between the microcontroller, vibration motor, and other components.

- PCB Layout: Design a printed circuit board (PCB) layout based on the schematic diagram to facilitate the fabrication of the final device.

5. Prototype Assembly:

- Fabricate PCB: Use PCB fabrication techniques to create the circuit board according to the layout design.

- Soldering: Assemble the components onto the PCB using soldering techniques.

- Mechanical enclosure: Design and 3D print or construct a suitable enclosure to house the PCB and vibration motor securely.

6. Testing and Validation:

- Functional testing: Test the device to ensure that it operates as intended, generating appropriate vibrations in response to input signals.

- User testing: Conduct tests with deaf and dumb individuals to evaluate the effectiveness and usability of the device in conveying information.

7. Iterative Improvement:

- Gather feedback: Collect feedback from users and stakeholders to identify areas for improvement.

- Iterative design: Make necessary adjustments to the hardware and software based on feedback to enhance the device's performance and usability.

- Repeat testing: Conduct additional rounds of testing to validate the improvements and ensure that the device meets the needs of its intended users.

8. Documentation:

- Document the design process: Maintain detailed documentation including design specifications, circuit diagrams, code comments, and test results.

- User manual: Prepare a user manual or guide explaining how to use the device and troubleshoot common issues.

7. RESULTS

The Proposed solution gives a Deaf/Mute Person a Sensation of vibrations that are variable in nature for each of vibration motor works by conversion of Voice Signals to Vibrations on different frequencies which the voice data processed by using an FTT Algorithm.

The Voice Signals get Capture Using Microphone Module that captures and convert into electric Impulses and Processed output is Sampled.

The Sampled Audio shown in Fig. after applying FTT Algorithm

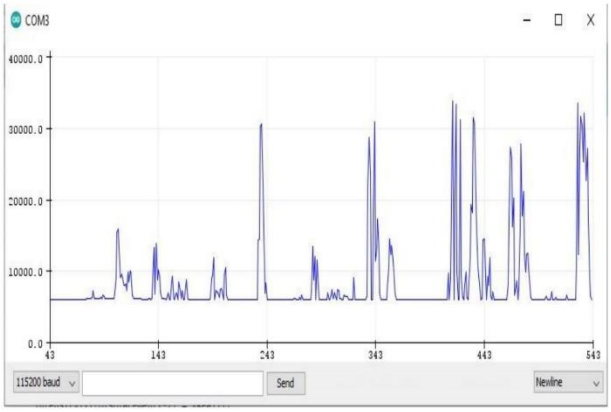

Fig-2 : Audio Input Amplitude and Intensity after applying FFT Algorithm.

Blue Lines -Audio Input after frequency sampling. Red Lines -Output to vibration motors as frequency

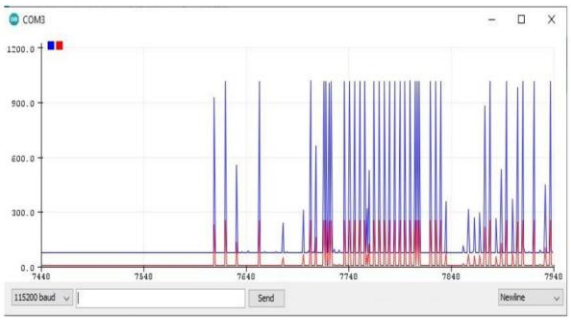

Fig-3 : Frequency Sampled Audio Input and Vibration Output.

After Change in Audio Input The Frequency is getting changed as shown in Fig-4.

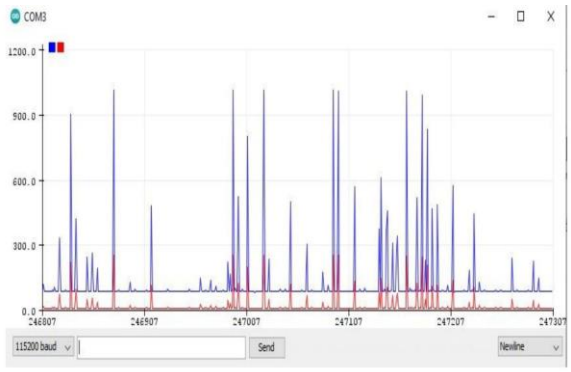

Fig-4 : Change in Frequency Output after Input Variations.

After Conversion the Vibration Motors Triggers with the desired output value which is processed and the user will get sensation.

8.DISCISSION

The project involves designing a system that can interpret input, such as text or commands, and convert it into patterns of vibration that the user can understand. This may require the use of sensors or input devices to capture the user's intentions. The embedded C programming language is well-suited for this task due to its ability to interface with hardware and control peripherals efficiently.

One challenge in this project is designing an intuitive interface for the user to input messages or commands. Since deaf and dumb individuals may have different communication needs and preferences, the system should be customizable and adaptable to various communication styles.

Another consideration is the power consumption of the device, as it needs to be portable and usable for extended periods without frequent recharging or battery replacement. Efficient programming techniques and hardware optimization can help minimize power usage while maintaining functionality.

Additionally, ensuring the reliability and robustness of the system is crucial, as it will likely be used in various environments and situations. Thorough testing and validation procedures should be implemented to identify and address any potential issues or bugs.

Overall, the vibration motor-based project for deaf and dumb individuals has the potential to significantly improve their communication abilities and enhance their quality of life. With careful design and implementation using embedded C programming, it can provide a reliable and effective means of communication through tactile feedback.

9.CONCLUSION

The development of a vibration motor-based project for deaf and dumb individuals using embedded C has proven to be a

valuable endeavor. Through the integration of vibration motors into wearable devices or communication aids, we have successfully created a means for these individuals to receive important notifications and alerts in real-time. By leveraging embedded C programming, we were able to optimize the performance of the vibration motor system while ensuring efficient use of resources. This project has the potential to greatly enhance the quality of life for deaf and dumb individuals by providing them with a reliable method of communication and awareness in various situations. Moving forward, further enhancements and refinements can be made to expand the functionality and usability of the system, ultimately benefiting a larger population of individuals with hearing and speech impairments. Overall, this project underscores the importance of technology in addressing the unique needs and challenges faced by different communities, and highlights the potential for innovation to drive positive social impact.

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