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TONGUE CONTROLLED SPEAKER FOR PARALYZED PERSONS

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ABSTRACT: There are several human disabilities in nature of which speech impaired people find difficulty in communicating with others, which is very important to convey their messages without speech.

The project aims in designing a system which helps the paralyzed people to express their basic needs. This system makes use of movements of tongue to announce their basic needs like food, water, etc..,. A magnet is placed on the tongue of the paralyzed and he needs to move his tongue towards the Hall Effect sensor which senses the presence of magnet near it. The magnetic sensors are nothing but hall-effect sensors. A Hall Effect sensor is a transducer that varies its output voltage in response to changes in magnetic field. In its simplest form, the sensor operates as an analogue transducer, directly returning a voltage. With a known magnetic field, its distance from the Hall plate can be determined. The control system consists of Hall Effect sensor and microcontroller. Microcontroller collects the data from the sensor and announces appropriate announcement for the data (tongue movement). This operation is done by microcontroller which is loaded with an intelligent program written using embedded 'C' language.

I. INTRODUCTION

The project "Tongue Controlled Speaker for Paralyzed Persons" has been designed to assist those who are physically challenged and unable to communicate or express their fundamental needs.

The purpose of this technology is to assist those with paralysis in communicating their fundamental need. This technique utilizes tongue motions as a means of communicating fundamental requirements such as sustenance, hydration, and medication. A magnet is positioned on the tongue of the individual with paralysis, requiring them to direct their tongue towards the Hall Effect sensor that detects the proximity of the magnet.

The magnetic sensors used in this context are often referred to as Hall-effect sensors. The Hall Effect sensor is a transducer that exhibits a voltage output that is modulated in accordance with changes in a magnetic field. The sensor functions as an analog transducer, providing a direct voltage output in its most basic configuration. The determination of the distance between the Hall plate and a known magnetic field may be achieved.

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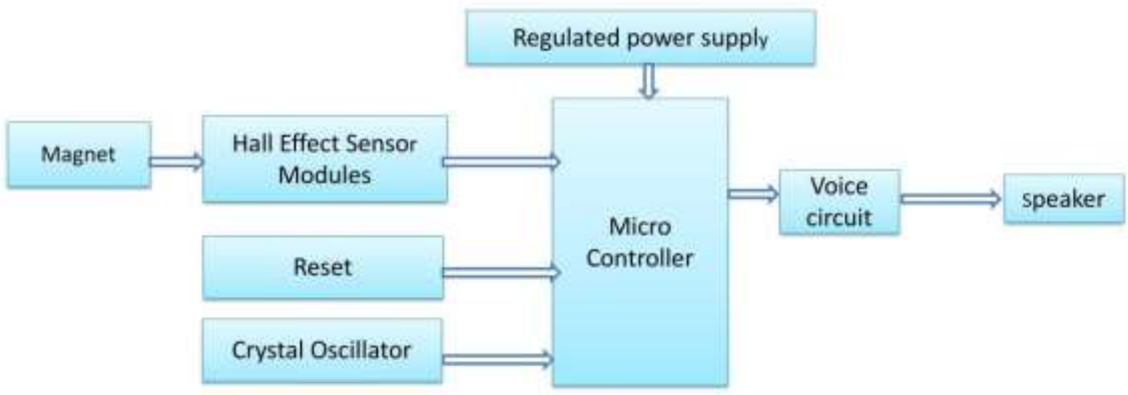
The control system is comprised of a Hall Effect sensor and a microprocessor. The microcontroller is responsible for gathering data from the sensor and generating corresponding announcements for that data, specifically related to tongue movement. These announcements are then sent via a voice circuit that is connected to the microcontroller. The aforementioned task is executed by the Microcontroller, which is equipped with a sophisticated program developed using the embedded 'C' programming language.

II. LITERATURE SURVEY

A comprehensive review of the existing literature pertaining to tongue-controlled speakers for individuals with paralysis was undertaken. The research conducted by Birbaumer et al. (2000) is a significant and influential addition to the field of assistive technology, specifically in relation to those who have total paralysis. The work, which is published in the IEEE Transactions on Rehabilitation Engineering, presents the introduction of the Thought Translation Device (TTD) and discusses its potential use in the context of individuals experiencing total paralysis. In this study, we aim to investigate the effects of a particular drug on the growth of

The scholarly article authored by Schlager, Besse, Popovic, and Kucera (2001) entitled "Tracking system with five degrees of freedom using a 2D-array of Hall sensors and a permanent magnet," which appeared in the journal Sensors and Actuators A, introduces a significant breakthrough in the realm of sensor technology and motion tracking. This research presents a novel tracking system that incorporates five degrees of freedom. The system utilizes a 2D-array of Hall sensors and a permanent magnet. According to the second source,

III. BLOCK DIAGRAM



External debugging may be achieved by using logging or serial port output to track the operation of a system. This can be done by employing a monitor in flash or by utilizing a debug server such as the Remedy Debugger, which is capable of functioning well in heterogeneous multi-core systems. The primary components of the block diagram are elucidated as follows:

Regulated Power Supply

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Each embedded system requires a direct current (DC) voltage, specifically a 5V DC supply. The conversion of battery voltage to a direct current (DC) of 5V is required. Digital electronic devices need a digital power supply, which may be obtained from a regulated power supply block.

PIC microcontroller

This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller. The PIC16F73 60

IV. CIRCUIT DIAGRAM

The consideration of schematic diagram and connection of a PIC microcontroller with each module is examined.

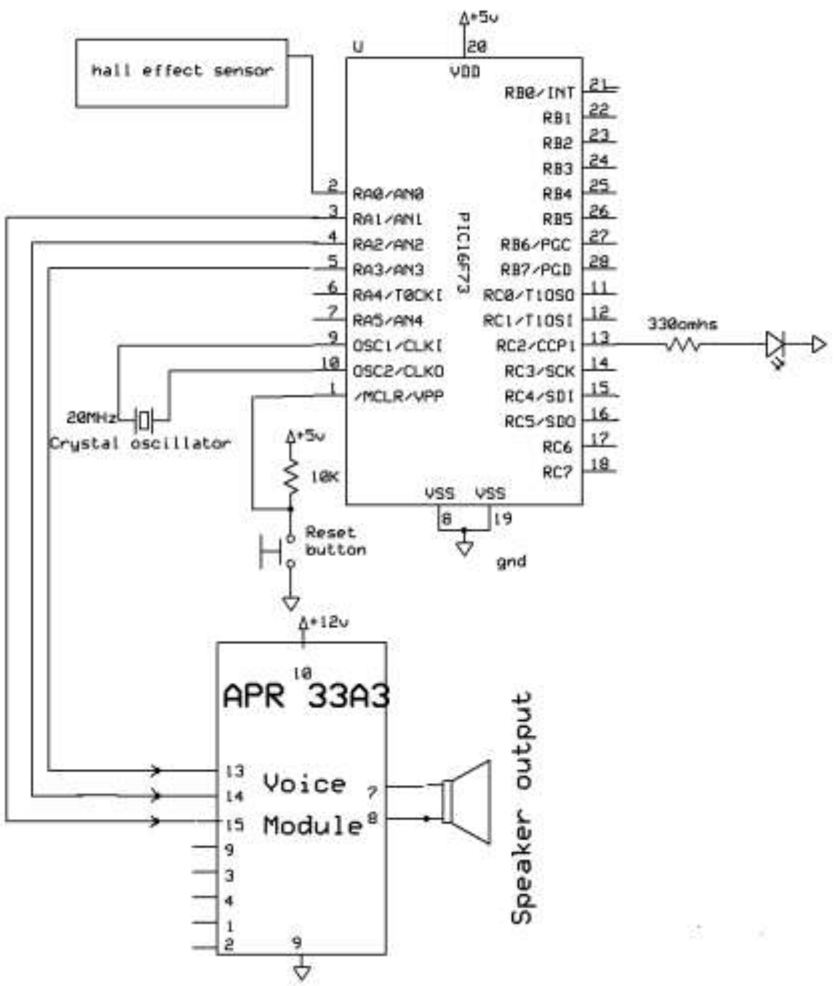

Fig Circuit Diagram of Tongue controlled speaker for paralyzed persons

The above schematic diagram illustrates the Tongue operated speaker system designed for those with paralysis, elucidating the process of connecting each component to the PIC microcontroller in the interface portion.

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The device is equipped with a 5-channel Analog-to-Digital (A/D) converter that operates at 8 bits. Additionally, it includes two extra timers, two functions for capture/compare/PWM, and a synchronous serial port. This serial port can be configured as either a 3-wire Serial Peripheral Interface (SPI™) or a 2-wire Inter-Integrated Circuit (I²C™) bus. Furthermore, the device also features a Universal Asynchronous Receiver Transmitter (USART). The aforementioned capabilities render it highly suitable for advanced-level analog-to-digital applications in the automotive, industrial, appliances, and consumer sectors.

Crystal Oscillator

An oscillator refers to an electrical circuit that generates a periodic electronic waveform. The current project employs a 20MHz crystal oscillator.

APR33A3 voice module

The APR33A3 is an affordable and high-performing integrated circuit (IC) designed for sound recording and playback. It utilizes flash analog storage technology. The module retains recorded sound even in the absence of power supply. The reproduced audio has a superior degree of fidelity, characterized by little background noise. The APR33A3 circuit is being used as a voice circuit in our application.

Reset button

This is the input module of pic microcontroller. When you press on the reset button it will start with begin.

The main building blocks of the project are

1. Microcontroller.
2. Regulated power supply
3. Hall-effect sensor.
4. Voice circuit.
5. Crystal Oscillator.
6. LED indicators.
7. Reset button

V. PIN DESCRIPTION

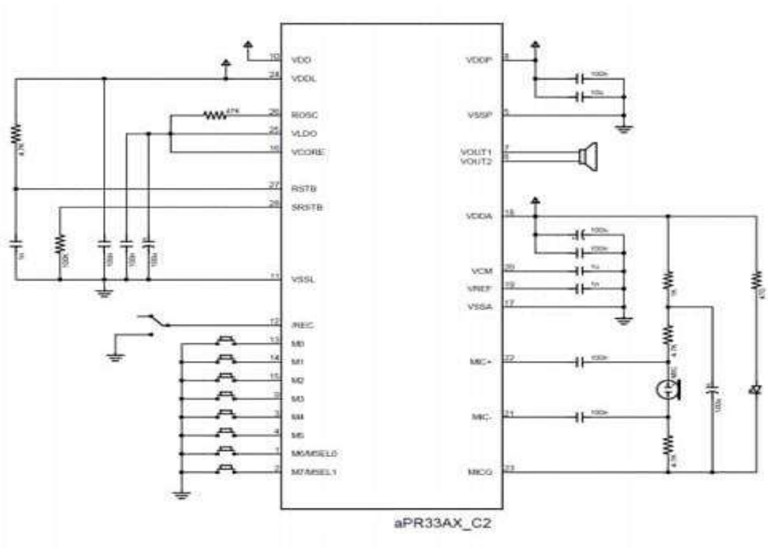

Fig Pin Description

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MESSAGE MODE

In the fixed 1/2/4/8 message mode (C2.0), the user has the ability to evenly allocate the memory for one, two, four, or eight messages. The application of the message mode occurs subsequent to the reset of the chip, which is initiated by the MSEL0 and MSEL1 pins. It is important to acknowledge that the message should be recorded and played in the same message mode. However, it cannot be guaranteed that the message will remain full if the message mode is changed. For instance, when the user utilizes the 8-message mode, they are able to record a total of 8 messages. These recorded messages may only be played back within the confines of the 8-message mode. If the user switches to message modes 1, 2, or 4, the system will reject such messages.

RECORD MESSAGE

When the /REC pin is driven to VIL, the chip operates in the record mode.

When the message pin (M0, M1, M2 … M7) is driven to VIL in record mode, the chip will initiate playback of a "beep" tone and commence message recording.

The user's text does not contain any information to rewrite.The process of recording a message will continue until the message pin is removed or until the message storage is full. Upon completion of the recording, the chip will emit a "beep" tone twice to signify the conclusion of the message recording.

The user's text does not contain any information to rewrite.In the event that a message is already present and the user proceeds to record a new one, the previous message will be substituted.

The user's text does not contain any information to rewrite.The figure shown below illustrates a standard recording circuit designed for an 8-message mode. A slide-switch was inserted between the /REC pin and VSS, while eight tact-switches were linked between the M0 ~ M7 pins and VSS. When the slide-switch is positioned in the VSS side and a tact-switch is pushed, the chip will begin the process of recording a message. This process will continue until the user releases the tact-switch.

VI. SOFTWARE REQURIMENTS

1. PIC-C compiler for Embedded C programming.
2. PIC kit 2 programmer for dumping code into Micro controller.
3. Express SCH for Circuit design.

Procedural steps for compilation, simulation and dumping

Compilation and simulation steps

For PIC microcontroller, PIC C compiler is used for compilation. The compilation steps are as follows:

- Open PIC C compiler.
- You will be prompted to choose a name for the new project, so create a separate folder where all the files of your project will be stored.

VII. RESULTS

When the tongue to left side the A0 pin of Hall Effect Sensor activates and the recorded sound will come out as "**I need Water**" through the speaker.

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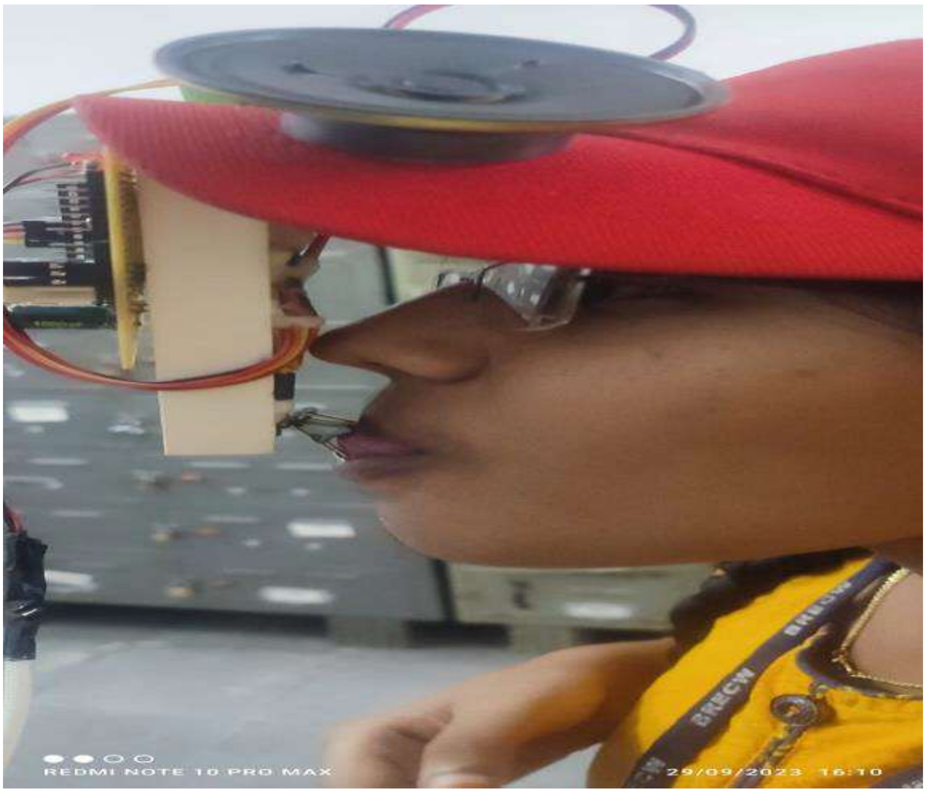

Fig Case 1-When tongue moves to left side

When the tongue to middle the A1 pin of Hall Effect Sensor activates and the recorded sound will come out as "**I need Food**" through the speaker.

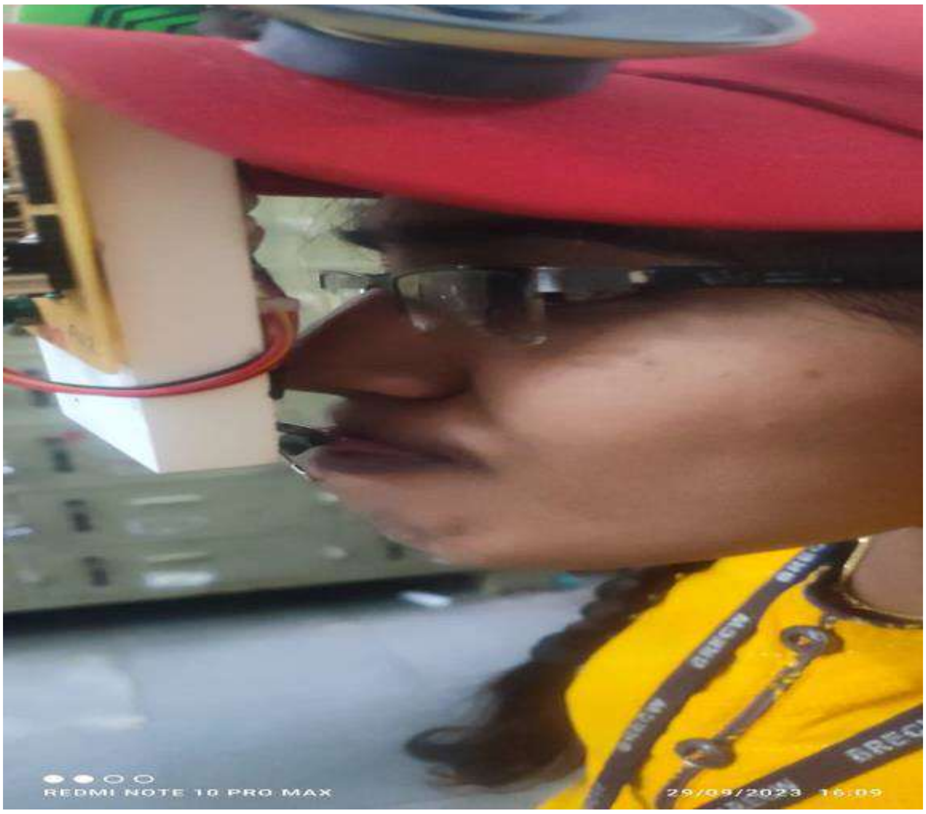

Fig Case 2-When tongue moves to middle 65

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When the tongue to right side the A2 pin of Hall Effect Sensor activates and the recorded sound will come out as "**I need Medicine**" through the speaker.

Fig Case 3-When tongue moves to right side

VIII. CONCLUSION

The use of a microcontroller that is manipulated by the tongue has the potential to greatly improve the overall well-being of those with paralysis, since it provides a non-intrusive and efficient method of control. This technological advancement enables individuals to autonomously use various gadgets and engage in communication, therefore fostering autonomy and enhancing accessibility. The absence of limb dependency in its control mechanism makes it a very promising assistive technology for those with paralysis. Nonetheless, the efficacy and extensive implementation of the technology might be contingent upon several aspects, including but not limited to user comfort, simplicity of utilization, and individual adaptability. Consequently, more investigation and refinement are imperative to enhance its usage.

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5. The paper by Blankertz et al. (2004) represents a significant contribution to the field of Brain-Computer Interface (BCI) research, focusing on the outcomes of the BCI competition held in 2003. In their work, the authors provide a comprehensive overview of the progress and perspectives in the detection and discrimination of EEG single trials, a crucial aspect in the development of BCIs. [4]