



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 13, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

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6381 907 438

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Design and Implementation of Integrated Intelligent System for Disabled People

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ABSTRACT: Those who are dumb, deaf, or blind find it challenging to communicate in daily life. They can only speak through sign language, which makes it incredibly challenging for them to interact with one another and with those outside their group. A glove with a MEMS Sensor connected to it is brought along in order to avoid the blockage.

Only sign language is used for communication by the Deaf, Stupid, and Blind. When it comes to communicating with regular people, this gets challenging. Hence, to stop this, a glove containing a MEMS sensor and two switches were constructed as part of an electrical framework. The pre-loaded instruction is played on the speaker through the speech IC when the glove is tilted or moved, as detected by the sensor and sent into Arduino Uno controller. In this research, an ultrasonic sensor is attached to a shoe that can be worn on the feet of the blind, and the sensor sends data to a microcontroller based on the distance between the obstacle and the pit. Microcontroller alerts blind people through APR 33A3 IC depending on the distance.

KEYWORDS: APR 33A3 Voice IC, MEMS Sensor, ATMEGA328P Controller, LCD, Speaker, Ultrasonic sensor and Glove.

I. INTRODUCTION

The modern world has encountered several techniques. Those who are blind, deaf or unable to hear confront challenges in autonomous movement and navigation. Mobility is the capacity to move around freely, both at home and in strange environments, without the assistance of any other people. Individuals with vision impairment have severe movement restrictions. The term "navigation aid for visually impaired" refers to a system that uses sound commands to guide or help those who have vision loss ranging from partial sight to absolute blindness (NAVI). To develop a navigation system for blind persons, several studies are being carried out. The majority of these solutions have drawbacks since it is difficult to meet the criteria of accuracy, usability, interoperability, and coverage with existing technology for both indoor and outdoor navigation.

Every person's first goal in a conversation is communication. So, the main goal of using this microcontroller-based electronic framework is to avoid the corresponding problem as these people communicate mostly by gestures, which is quite challenging. The Device makes it possible for persons with hearing, speech, and visual impairments to communicate with one other and with healthy people. The ATMEGA328P, which is the main control component of the gadget, makes up the majority of it. A switch and a glove with a MEMS Sensor are features of the device. The gadget processes the output using an APR33A3 Voice IC, which is a voice integrated circuit. This device makes it simpler for these physically disabled people to communicate with each other and with healthy people. In this paper, we have designed it as a single system to help the deaf, dumb, blind and differently able persons.

II. LITERATURE SURVEY

[1] A wireless sensor glove with a revolutionary design that was created for American Sign Language was demonstrated by NetchanokTanyawiwat and SurapaThiemjarus. Recognition of finger spelling gestures. Five touch sensors were included into the glove. Five sensors on the fingers and a 3D accelerometer on the back of the hand. Each pair of flex and contact sensors was employed to reduce the number of channels and installation space into the same input channel on the BSN node. Software analyses the signal and separates it into flex and contact aspects. The electrical connections and wirings on the glove are composed of conductive fabric and threads, making the design smaller and more flexible. Using signals gathered from six patients with speech impairment, ASL finger writing gesture recognition tests have been conducted.



[2] Nikolas Bourbakis explained the challenges problem in human interaction is the communication process between blind and deaf individuals. The challenge here involves several cases like: Deaf person usually does not speak, When a blind person speaks a deaf person cannot hear, When a deaf person makes sign language, a blind person cannot see them. This paper presents a study on multi-modal interfaces, issues and problems for establishing communication and interaction between blind and deaf persons. Tyflos- Koufous is proposed in an effort for offering solutions to these challenges.

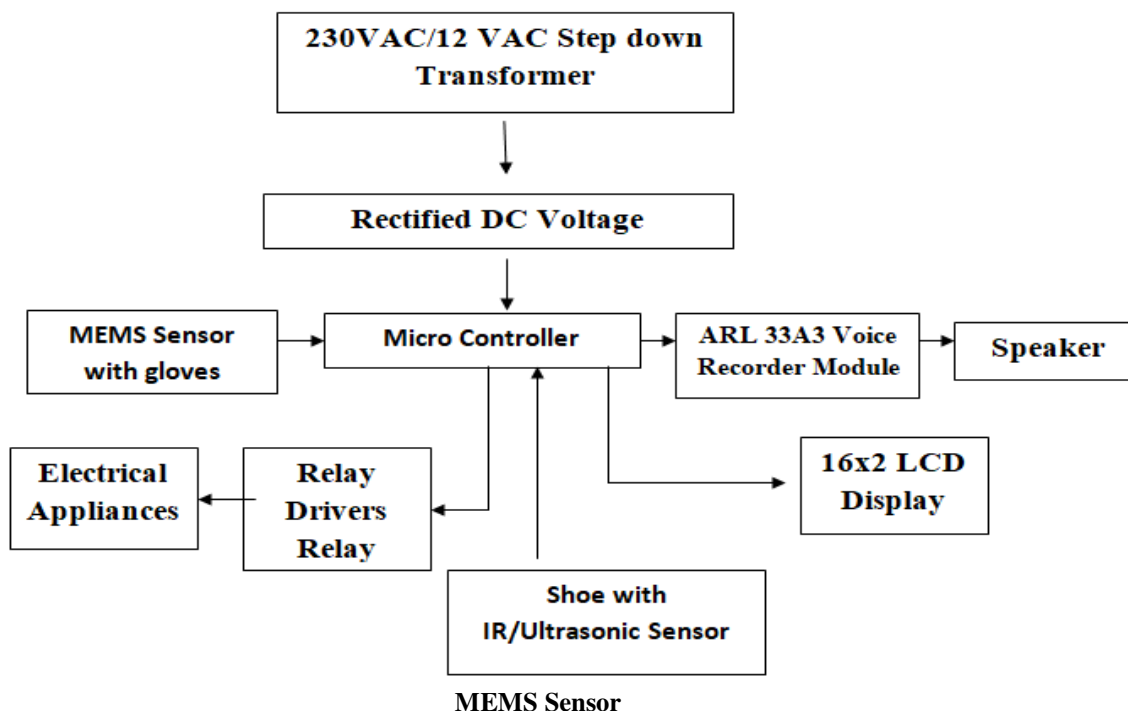
Instinctive palm signal detection has been applied in a variety of app contexts, including person-system interaction [3], video game [4], sign translation [5], and surgery ability evaluation [6]. Based mostly on the original modularity, the signal identification ideology will be divided into three kinds. Although images and videos are rich sources of data, the data processing procedure occasionally calls for complex calculations. Variable lighting conditions, complex backgrounds, field of sight limitations, and occlusion are all examples of image and motion process issues. The sensor-based methods, especially wireless sensors, will give users better service. The equipment is sometimes expensive and awkward in some situations. There are several tools available for translating verbal communication.

[7] M. Mohandas, S. A-Buraiky, T. Halawani, and S. Al-Baiyat discussed the direct-device and vision-based interfaces used in sign language systems. Such measuring tools as flexion sensors, styli, position-tracking tools, and instrumented gloves are in direct touch with the hand. The singer's hand is holding a camera that records images depending on eyesight. The signer may be required to wear a glove with painted sections showing the locations of the knuckles or fingers to help with movement. The primary benefit of vision-based systems is that the user is not burdened by any intricate equipment. Nevertheless, before conducting any picture analysis, they need to undertake a significant amount of computation only to extract the hand position. In this essay, the directed-devise

[8] According to S. F. Ahmed, S. Muhammad B. Ali, S. Saqib, and M. Qureshi, the glove's wearer may communicate with physicians or other people by making gestures with their fingers, which are then translated into synthetic speech. Several flex sensors composed of "bend-sensitive resistance components" are integrated throughout the glove. Internal flex sensors recognize each distinct motion. Adjust the resistance of various components proportionally. As this data is processed, a specific set of signals are delivered to the pre-programmed A VR (Advance Virtual RISC) microcontroller, which speaks the desired words.

III. PROPOSED METHODOLOGY

Figure 1

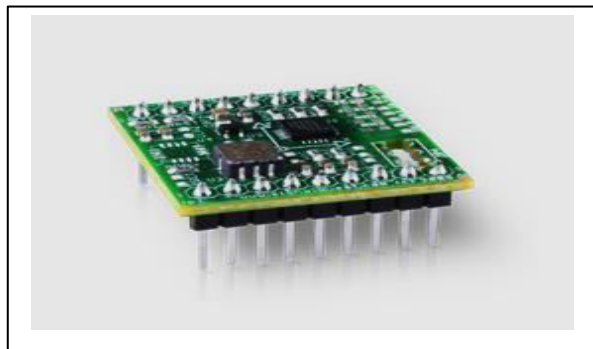




Microelectromechanical systems or MEMS are integrated micro devices or systems combining electrical and mechanical components .they are fabricated using integrated circuit(IC) batch processing techniques and can range in size from micrometers to millimeters. These systems can sense control and actuate on the micro scale and function individually or in arrays to generate effects on the mic

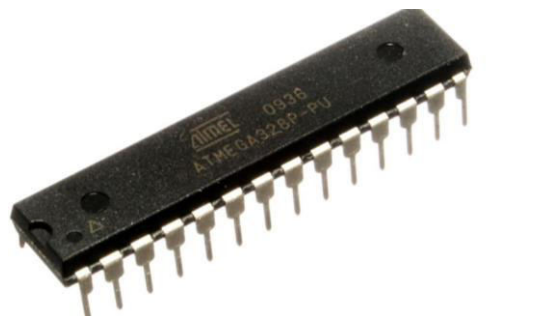
Figure 2
MEMS SENSOR

Micro Controller



AT mega 328p is an Advanced Virtual Risc (AVR) microcontroller. It supports 8-bit data processing. ATmega-328 has 32KB internal flash memory.
AT mega has 1 KB Electrically Erasable Programmable Read-Only Memory (EEPROM).

Figure 3
ATMEGA 328p



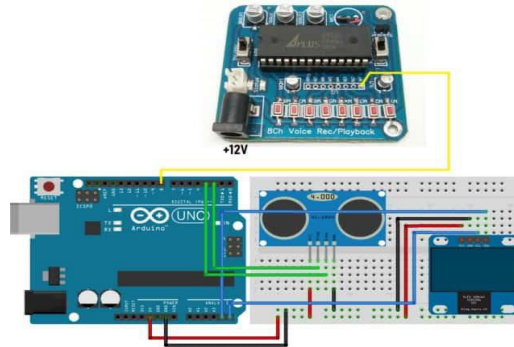
APR33A3

APR33A3 is an 8 Channel Voice Record & Audio Playback Board that includes high-performance audio analog-to-digital converters (ADCs) and digital-to-analog converters as well as an APR33A series IC that is a powerful audio processor (DACs).

The board can be utilised in a variety of applications, such as an accident detection system's audio notifier or a PIR sensor application's Namaste Welcoming Robot. Moreover, it can be applied to voice-controlled robots, automatic telephone answerers, train announcement systems, and doorbells. Here, we'll utilise this module in conjunction with the HC-SR04 ultrasonic sensor to inform a blind person of the measured distance and a MEMS sensor to inform a deaf person and a dumb person of the detected X, Y, and Z axis values

Connecting an Arduino to an APR33A3 voice recorder and playback module:

Let's connect the Arduino to the APR33A3 Voice Recording & Playback Module now. This module, together with the Ultrasonic Sensor HC-SR04 and 16X2 LCD Display, will be used in this section. Below is the connecting diagram.



An ultrasonic distance sensor called the HC-SR04 Module is employed. I utilized a 0.96" I2C OLED Display/16x2 LCD display to show the measured distance. There are 8 output pins on the APR33A3 Voice Recording & Playback Module, numbered M0 to M8. Arduino can be attached to one of the pins. The module pin will be activated by the digital low input, which may be utilised to play back the voice message that has been recorded. I chose M1 and wired it to the Arduino D8 pin.

This project's equipment will play audio out at distances of 30, 60, 90, and 150 cm. Record the audio from channels M1 to M4 as the following message to start.

- M1: The separation is 30 cm
- 2. M2: 60 cm separates them.
- 3. M3: 90 cm is the distance
- 4. M4: 150 cm is the distance

Relay

Relays come in a variety of form factors, styles, and technologies. Depending on your application, only one relay type may be suitable. In other cases multiple relay types may be appropriate. By understanding the strengths and weaknesses of the different relays you should be able to pick the one that is best suited for the job at hand.

Ultrasonic Distance Sensor

Its compact size, higher range and easy usability make it a handy sensor for distance measurement and mapping. The robot requires means of detecting an obstacle (or another robot) thout making physical contact. This allows the robot to decide whether to avoid or to confront and investigate the obstacle depending on its programming. Ultrasonic transducers were chosen for this because they are more reliable and have a greater range than IR sensors (effectiveness of IR sensors varies with ambient light level).

IV. OUTPUT

Fig 4 :Disabled Persons Assistance

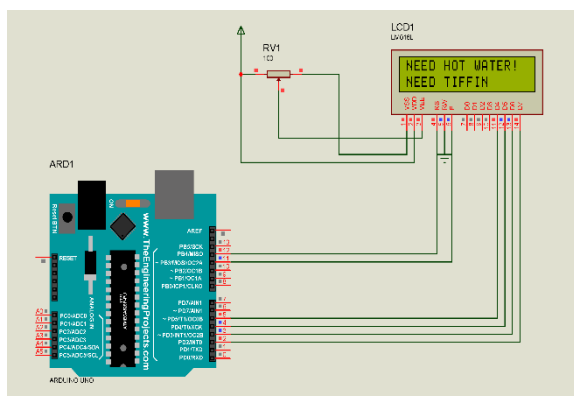


Fig 5: Disabled Persons Assistance

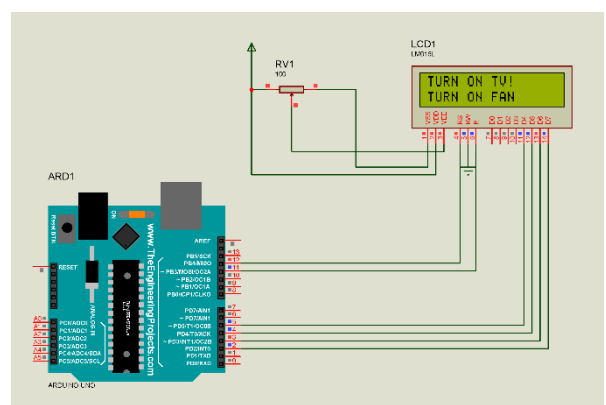


Fig 6: Blind Persons Assistance. Shoe

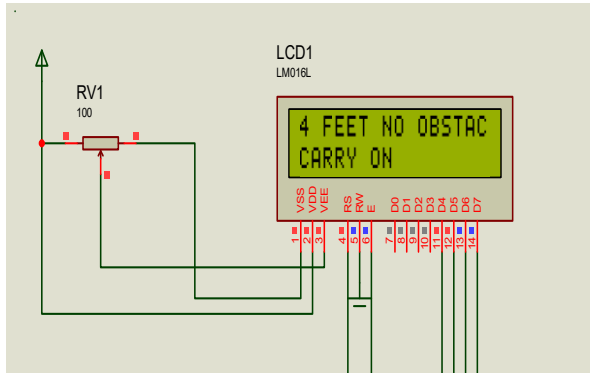


Fig 7: Blind Persons Assistance. System installed in shoe.

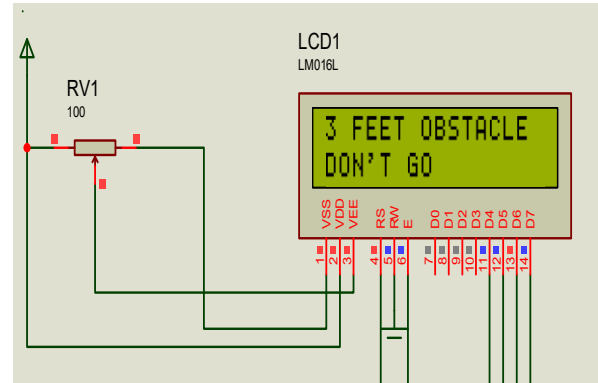
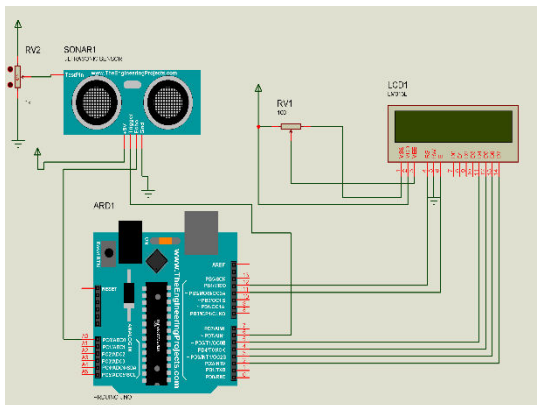


Fig 8 : Blind Persons Assistance. Overall Circuit Diagram



V. SIMULATION RESULT

In fig 4: The MEMS sensor turn x – axis and guide the disabled person when they need hot water and tiffin

In fig 5: The MEMS sensor guide for turn on TV and fan

In fig 6: The MEMS sensor guide for detecting the obstacle at 4 feet

In fig 7: The MEMS sensor guide for detecting obstacle at 3 feet

In fig 8: The overall circuit diagram is shown

VI. CONCLUSION

The main goal of this activity is to make it easier for people who are blind, hard of hearing, or deaf to communicate with each other and with other people. In the real world, this electronic framework connects unusual people with ordinary people. ATMEGA328P microcontroller is the project's main control device. For people who are deaf, have trouble hearing, or are visually handicapped, an information glove has been developed. They don't currently have any problems to communicate. ATMEGA328P microcontroller is designed so that design parameters may be quickly changed without altering the entire code. The equipment is put into use after the desired results are obtained. Result breakdowns are done following equipment use. This device can be expanded upon in the future. The correspondence process for the deaf, hard of hearing, and mentally retarded people using this electronic framework will advance gradually.



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