






# Gesture Controlled Device with Vocalizer for Physically Challenged People

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**Abstract:** Hand Gesture Vocalizer is a social project that aims to raise the morale of the speech and hearing impaired by enabling them to communicate better with the society. This project aims to meet the need to create an electronic device that can translate sign language to speech in order to eliminate the communication of speech impaired and the general public. A Motion Controlled vehicles are robots that can be controlled by simple human movements. The Robot and Motion device connect wirelessly via wireless radio. We can use the accelerometer along with the glove box to control the car movement by direction. These sensors are designed to replace the traditional remote control used to operate it. It will allow the user to control forward, reverse, left and right movement while using the same accelerometer sensor to control the vehicle's accelerator pedal. The main advantage of this mechanism is the car, which can smoothly make sharp turns. The robotic arm is a glove that imitates the movements of the human hand.


## 1 INTRODUCTION


Humans have the ability to speak languages to communicate and interact. Unfortunately, not everyone can speak and hear. Sign languages used by people who cannot speak or hear in the community is not understandable to general public. A gesture vocalizer is a gesture-based glove that includes a combination of hand shapes, hand gestures, and facial expressions for clarity in what the speaker is thinking. Normal people do not use the sign language to communicate with other dumb people as they do not know the meaning of the sign even with other people who always know the meaning of language. However, people cannot interpret normal speaking mute and deaf sign language, and not everyone can learn the language. So, another option for is that we can use a computer or a smartphone as a modem. A computer or smartphone can take input from a mute person and convert it to text and audio. We use sensor-based technology. We have created a


module that converts finger movements into sound. A more humane, succinct, and natural approach to human-computer interaction is required in intelligence. Related equipment can perform remote operation duties on unmanned platforms in uncharted regions through human-computer interaction. Wearing appropriate gear, the driver can wirelessly and remotely control the smartcar. A new entry point for the evolution of human-computer interaction is gesture recognition. The physical gadget is controlled by the conversion of gestures as a signal change, assisting users in finishing the designated tasks. The entertainment and gaming industries have used somatosensory-based human-computer interface technologies.


Robots that can be controlled by hand gestures rather than traditional buttons are known as gesture-controlled robots. We only have to wear a small transmitting gadget with an acceleration meter or glove in your hand. This will send the robot the proper command, enabling it to carry out our instructions.

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ADCs for analogue to digital conversion and an ADC were integrated in the transmitting device. By using an RF Transmitter module, it will send an encoder. The encoded data is received and decoded at the receiving end by an RF Receiver module. A microcontroller processes this data next, and our motor driver uses the results to regulate the motors. To make the task simple and straightforward to do, it is now necessary to divide it into separate modules receiver and transmitter.

## 2 LITERATURE REVIEW

(Kadam K. et.al,2012) “American Sign Language Interpreter” discussed an effective use of glove for implementing an interactive sign language teaching programme. They believe that, with the use of glove, signs can be made with more accuracy and better consistency. Having a glove also would enable to practice sign language without having to be next to a computer.

(M. S Kasar.et.al ,2019) have developed a smart talking glove for speech patients and people with disabilities. Often times, people with aphasia communicate in sign language that people cannot understand. They created programs to solve this problem, allowing non-speaking patients to communicate with people. They use a flexible sensor that sits on the glove to detect finger movements. Depending on the finger movement, the ATmega328 microcontroller will display the information on the LCD.

(Prerana K. C , 2019) proposed a method of Hand Gesture Recognition system. A system that can read the values for a particular gesture done by the user and predict the output for the gesture. This system is not that reliable because the dataset for all the alphabets and frequently used words was not created.

(Kunjumon, J., & Megalingam, R. K, 2010) in their work Communication is just a means of conveying information from one place, person or group to another or with each other. Voice communication is how people interact with other people. Because perhaps not all of us have a physical disability that prevents us from verbally sharing our thoughts. It is difficult for deaf people to communicate their thoughts and ideas to people. Most people do not know the language, which makes it difficult for people who remain silent to communicate with others. There are tools that can convert sign language to text that can be used in other languages.

## 3 METHODOLOGIES

The Gesture vocalizer is nothing but a normal glove with 4 fingers that can be adjusted by connecting the fingers together or using glue. Help the sensor bend correctly and provide the correct voltage drop, the controller can sense the voltage drop in the appropriate direction. The glove used in this system has 4 flexible sensors. The flexible sensors used in this module are mounted on each finger of the gesture control glove. The efficiencies of flexible sensors depend on the bending moment and the measurement by sign.

The result is then sent to the microcontroller where the same work is done and converted to digital format. The result of this output changes as the variable is bent. The microcontroller uses the output from the converter and the Arduino converts the received signal to text and sends it to the Bluetooth module, which will be connected to the phone to convert the text to speech.

For moving vehicle there is serial communication between the two Arduino nano boards. One Arduino is used for sending the signals and the other Arduino is used for receiving those signals and move the moving vehicle accordingly. There is an accelerometer sensor that can sense the gesture of our hand. The transmitter sends the signals via an Zigbee rf module that we use for wireless communication.

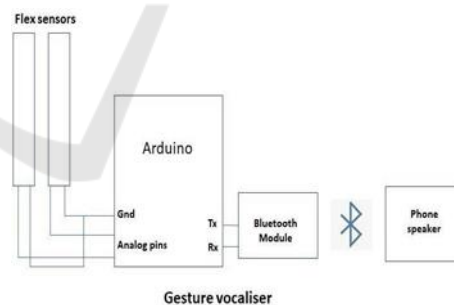


Fig 1. Block diagram for Gesture based vocaliser.

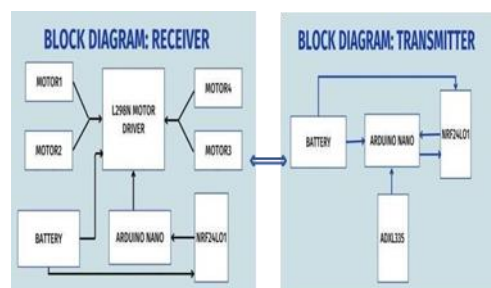


Fig 2. Block diagram Gesture based moving vehicle.

We have to tie the transmitter circuit on our hands and the moving vehicle will move as we move our hands. For controlling the dc motors, we have in L298D motor driver module.

## 4 TOOLS USED FOR THE PROJECT WORK

### BLUETOOTH MODULE (HC-05)

HC-05 is a Bluetooth module designed for transparent wireless communication. It is preconfigured as a Bluetooth slave device. When combined with a Bluetooth host device such as PCs, smartphones and tablets, its operation becomes transparent to users. Bluetooth-enabled devices automatically detect each other when they are close to each other. Bluetooth uses 79 different radios in about 2 small bands with 4GHz. This frequency band is also used by Wi-Fi, but Bluetooth uses little energy and is less effective for Wi-Fi communication.

### 4.1 Arduino Uno Microcontroller Board

The hub of the Arduino ecosystem is the commonly used microcontroller board known as the Arduino UNO. It's intended to give both novice and seasoned developers an approachable and user-friendly platform to build interactive projects and prototypes.

The ATmega328P microcontroller, on which the Arduino UNO board is based, has a variety of digital and analogue input/output pins that are simple to programme and control. It has a 16 MHz quartz crystal, 6 analogue input pins, 14 digital input/output pins (of which 6 can be used as PWM outputs), a USB connection for programming and power, an ICSP header, and a reset button.

The Arduino UNO allows users to quickly prototype because of its simple programming environment and a large library of pre-built functionality.

### 4.2 Flex Sensor

A flex sensor, or bending sensor, is a sensor that measures the amount of deflection or bending. Usually, the sensor is connected somewhere and the resistance of the main sensor is changed by bending the ground. Since the resistance is directly proportional to the amount of bending, it is often called a flexible potentiometer. Flexible sensors, computer interfaces, rehabilitation, security systems and even music interfaces are widely used in research.

Complete block diagram of multipurpose gesture based glove

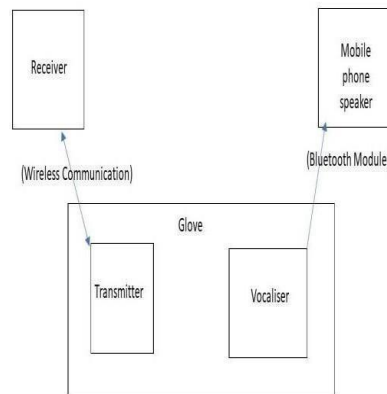


Fig 3. Complete block diagram.

### 4.3 Zigbee

Zigbee is an ideal communications technology for establishing personal connections through small, low-power radios such as home appliances, medical data collection, and other low-demand, low-bandwidth applications designed for small devices that require wireless connectivity. The technology outlined in the Zigbee specification is designed to be simpler and cheaper than other Wireless Local Area Networks (WPAN) such as Bluetooth or more wireless networks such as Wi-Fi. "ZIGBEE" represents the international standard for regional integration, battery life, economy and efficiency.

### 4.4 Arduino Nano

Arduino Nano is a small, complete, enhanced development based on the ATmega328. It has more or less the same functionality as the Arduino, but in a different package. It has only DC power and can use a Mini-B USB cable instead of a standard cable. Arduino Nano is a micro controller-based device with 16 digital pins that can be used for many purposes. It can be used for almost any project from small to large. It can also be used to build and build new apps.

### 4.5 Accelerometer

An accelerometer is a device that detects various types of acceleration or vibration. Acceleration is the change in velocity caused by the motion of an object. The accelerometer absorbs the vibrations created by the body and uses it to understand the direction of the body. Accelerometers are just one of many sensors that video telematics systems use to capture important

vehicle information. These systems may include multi-axis accelerometers for speed, acceleration and deceleration, gyroscopes to detect rotation and direction, and GPS to detect position. The basic working principle of an accelerometer is to convert energy into electricity. When a large object touches the sensor, it bounces off and starts moving. As soon as he moved, he began to accelerate.

#### 4.6 Motor Driver

A generator is an electrical device that converts electricity into electricity. Thus, the drive allows you to use electricity for automatic operation. There are many types of electric motors. These types include DC motors, stepper motors and servo motors. The working model of the engine and its different characteristics. The driver itself is the interface between the motor and the microcontroller. This is because the microcontroller and the motor operate at different speeds. The motor will use a higher current level than the microcontroller. First, the microcontroller sends the signal to the motor. The received signals are then interpreted and processed in the engine. The motor has two power input pins. Pin 1 powers the driver and pin 2 powers the motor using the motor IC.

### 5 TESTING

For gesture vocalizer we tested many combinations of finger gestures, with each finger gesture there was bending of flex sensor and as we know the working of flex sensor, and the resistance of the main sensor is changed by bending the ground. Since the resistance is directly proportional to the amount of bending, it is often called a flexible potentiometer. So, we tested for different combinations and noted down the voltage drop occurring in the flex sensors. So, as we had a plan to make gesture vocalizer glove so when the person is unable to speak when he wears the glove as shown in below figure. For different hand gesture we tested different voltage value as we will show that what is the voltage drop for different hand gesture.

### 6 SOFTWARE IMPLEMENTATION

We utilize Arduino IDE, for coding we had written the code firstly for gesture vocalizer and uploaded the code to microcontroller (Arduino UNO). We had written code to take output from flex sensors and take

the value from the sensor and store it in a variable. And had written if conditions in the code that if the value of the variable is more than the calibrated value then the predefined words will be sent to the Bluetooth module.

Bluetooth communication was declared the code. And for the Gesture based moving vehicle the code was written to take the x axis and y axis value based on hand gestures and if conditions were written based on these conditions the instruction was sent to the receiver part through Zigbee module and this code and uploaded into Arduino NANO (Transmitter). And the other code was uploaded to another Arduino NANO (Receiver) which had the code to initialize and run the motor driver based on the instructions given from transmitter.

## 7 RESULTS AND ANALYSIS

Fasten the moving vehicle with a smart glove and control the straight forward and rotation of the car from with hand gestures. The operation of the car is always stable after many adjustments. Checking the three-axis acceleration data and three-axis gyro data by reading the MPU6050 in real time, and calculate the Roll angle and Pitch angle through the built-in filter algorithm. The system is then sent to Operation and the 3D status of the MPU6050 is displayed in real time in the serial monitor. By monitoring the angle of the MPU6050, the angle of the MPU6050 can be kept in real time and the 3D events of the MPU6050 can be made. Seen by making an intuitive demo Interface. We could see that the behavior at a given moment when the MPU6050 rotates and the value of the response angle is. It proves that there is no problem with the MPU6050 module and that the character angle can be calculated normally uses gesture recognition technology, software and programming to realize moving vehicle control.

In this control system, the gesture based moving vehicle has good manoeuvrable ability handling and stability, and can perform forward, backward, left turn, right turn, etc. The tests were conducted as shown in testing section and reanalysed that the as specified the as expected, for the respective hand gestures we got the respective words which we had predefined and the Bluetooth module was sending the text to the android mobile accurately and the conversion of text to speech was done with accuracy.



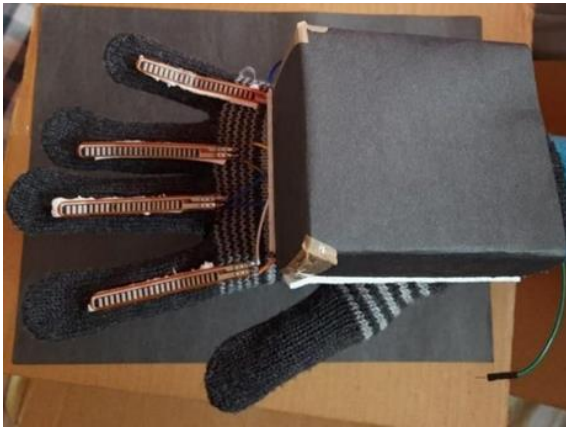

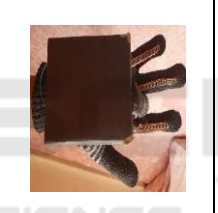





Fig 4.



Fig 5.

	<b>WATER</b>
	<b>TABLET</b>
	<b>HELP</b>
	<b>EMERGENCY</b>
	<b>FRONT</b>

## 8 CONCLUSIONS

The inspiration behind this project are ideas that will help solve the language problems of deaf and hearing communities. Trying to translate these finger gestures into words is just minutes away from this ultimate goal. The vocalizer created by executes the steps required by. This project uses as a prototype to check the feasibility of, which uses the glove sensor to recognize the gestures and convert the text received through Bluetooth module and the predefined word will be printed in the app and can be heard from the mobile speaker. This gesture controlled moving vehicle are designed to replace traditional remote controls used to drive vehicles. It will allow us to control forward and backward, left and right movement while using the same sensor to control the throttle of the vehicle as hand gestures. Since the hand appears to be angled to the right, the robot moves in the right direction. The vehicle is in stop mode as the hand is still fixed to the environment. From testing, about 80% of it worked as expected; the rest were less due to background noise, being negative usage letters. A motion- controlled robot offers a better way to control the device. The commands given for the robot to move in a certain direction in the environment are based on gestures from the. Unlike existing systems, the user can control the robot with hand gestures without using external devices to support feedback

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