



Gesture Control Robot using Accelerometer and Voice Control for the Blind

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Abstract:

In this paper, we are introducing a robot with a gesture controlled 3-axis accelerometer (ADXL335) and a Bluetooth module Setup for the voice recognition with an ATmega microcontroller we will configure the whole setup using the Arduino board along with some mathematical algorithms. The gestures can be recognized from any kind of physical movement detected by the Accelerometer from a person and the voice recognition will be working with the help of the Bluetooth module using Android Application we will just some command on our android device and with the help of the Bluetooth module present in the whole unit voice will be recognized and therefore the necessary action will be accordingly. Gesture recognition and Voice recognition can be explained like the method or process that how the computer will understand the body language of human beings and it also creates a bridge of communication between the computer and the human world.

Keywords: Gesture; Accelerometer; Arduino; Bluetooth Module; Microcontroller; Wireless; Voice Recognition; GIU;

I. INTRODUCTION

Gesture recognition can be defined as the manner by which gestures acted by the user are detected and recognized by the receiver module same goes with the Voice recognition system where the Bluetooth module comes into play combined with the gesture controlled module.

Gestures are just the significant movements of the body that are associated with the physical movements of the fingers, hands, face or any other part of the body whereas voice is something which comes out of our mouth automatically when we are giving commands to someone.

In this system, the movements of the human hands are perceived by the robot through an accelerometer and the voice is perceived with the help of the Bluetooth module which includes an android smartphone which will obviously have Bluetooth in it that will be the transmitter and the device which will receive signals on the robot will be the receiver. As a person moves the hand, the accelerometer also starts moving and perceives the parameters according to the position of the hand and if switched into the voice mode which is basically for the blind the voice signal receiver starts receiving the voice on the receiver signal.

Gestures and voices captured by the accelerometer as well as the Bluetooth receiver are sent to the comparator IC, which assigns the proper and different voltage levels according to the recorded movements.

The information is then transmitted to the HT12E encoder to encode the data or serialize it, and then transmit it using the RF433 MHz transmitter.

In the receiver section, the RF433 MHz receiver holds all the received parameters, and then the received data is decoded by the HT12D. According to the data received, we can control the robot using two DC motors in all four directions.

BLOCK DIAGRAM

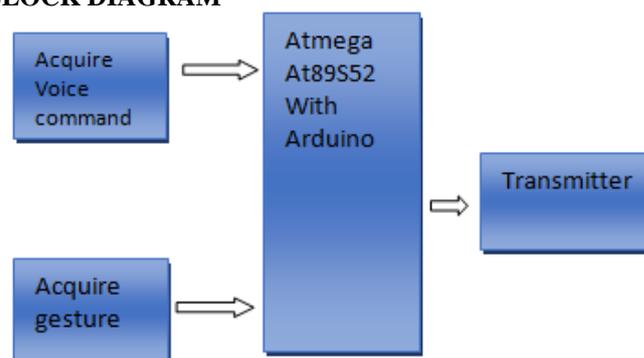


Figure.1. Block diagram of the System

ADXL335, which is a 3-axis accelerometer. ADXL335 is a polysilicon surface microprocessor structure in which polysilicon springs suspends the structure over the surface of the plate. It also consists of a differential capacitor, which is used to measure the deviation in the structure. For the Voice recognition the Bluetooth module is connected to the Arduino board and is configured and programmed accordingly with the help of necessary sensors. The comparator is used to change the analog voltage to a digital voltage by comparing the analog voltage with the reference voltage and setting a specific high or low voltage. The radio frequency (RF) tx(transmitter) module operates at a frequency of 433 MHz and has a range of 100 m under standard conditions.

II. PROPOSED SYSTEM.

The System proposed in this paper is that there is still no robots or robot vehicles which have both hand gesture recognition for the people who are not able to speak for the physically challenged combined with voice recognition using simple Bluetooth module that is present in the every smartphone now days this will be helpful for the people who are blind and cant do their work on their own so this system comprises of both the hand gesture recognition feature as well

as voice recognition feature that will help the physically challenged. This is a very useful and powerful system for the people who are physically challenged.

III. SYSTEM IMPLIMENTATION

A. Methodology of hand motion Recognition

Working principle

Accelerometer is a 3 axis acceleration measurement device with +3g range. This device is made by using polysilicon surface sensor and signal conditioning circuit to measure acceleration. The output of this device is Analog in nature and proportional to the acceleration. This device measures the static acceleration of gravity when we tilt it. And gives an result in form of motion or vibration. According to the datasheet of adxl335 polysilicon surface-micro machined structure placed on top of silicon wafer. Polysilicon springs suspend the structure over the surface of the wafer and provide a resistance against acceleration forces. Deflection of the structure is measured using a differential capacitor which incorporate independent fixed plates and plates attached to the moving mass. The fixed plates are driven by 180° out-of-phase square waves. Acceleration deflects the moving mass and unbalances the differential capacitor resulting in a sensor output whose amplitude is proportional to acceleration. Phase-sensitive demodulation techniques are then used to determine the magnitude and direction of the acceleration. A manual accelerometer is a three-dimensional solid that can be rotated around three orthogonal axes. This rotation occurs as the X axis is called a step, and the next rotation axis Y is called roll, and the last rotation around the Z axis is called yaw. Any orientation can be achieved by drawing up these three spontaneous revolutions. In our work, all the planned manual movements for robot control are simple gestures, each of which contains only one of the three rotations of the element. Gestures consisting of more than one elementary rotation are too complex for such applications. Gesture controlled robot moves according to hand movement as we place transmitter in our hand. When we tilt hand in front side, robot start to moving forward and continues moving forward until next command is given. When we tilt hand in backward side, robot change its state and start moving in backwards direction until other command is given. When we tilt it in left side Robot get turn left till next command. When we tilt hand in right side robot turned to right. And for stopping robot we keeps hand in stable.

B. Methodology of Voice recognition

Working principle

Speech recognition (SR) is the conversion of spoken words into text. These systems identify the particular voice and use it to sharp-tune the recognition of that person's speech, resulting in more error free transcription. Systems without type of behaviour are called "speaker-independent" systems. Systems with type of behaviour are called "speaker-dependent" systems. The term voice recognition refers to identify "who" is speaking, rather than "what" they are saying. The term voice recognition refers to identify "who" is speaking, rather than "what" they are saying. Voice recognition is the conversion of spoken words into text. These systems identify the particular voice and use it to sharp-tune the recognition of that person's speech, resulting in more error free transcription. The L293 and L293D devices are quadruple high current half H-Drivers. The L293 is designed to provide bidirectional drive currents of upto 1A at voltage from 4.5V to 36V. The L293D is designed

to provide bidirectional drive currents of upto 600mA at voltages from 4.5V to 36V. both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high current/ high voltage loads in positive supply applications. Universal Asynchronous Receiver Transmitter is usually an individual integrated circuit used for serial communications over a computer or peripheral device serial port. UART are now commonly included in microcontrollers. A dual UART combines two UARTS into single chip. Many modern ICs come with a UART that can also communicate synchronously. These devices are called UART. Voice controlled robot through an android application. Now here it is simple to control your robot using Bluetooth module HC-05 and AT89S52 microcontroller with your android smartphone device. The controlling devices of the whole system is a microcontroller. The data receive by the Bluetooth module from android smartphone is fed as input to the controller. The controller acts accordingly on the DC motor of the robot. The robot in the project can be moved in all the four directions using the android phone. The direction of the robot is displayed on the LCD display of the robot system. In achieving the task the controller is loaded with program written using embedded 'C'

C. Methodology of identifying Obstacles

Ultrasonic measurement module HC-SR04 is used to detect obstacles and determine the range of obstacles from the robot. The ultrasonic sensor consists of two parts: one is a transducer creating an ultrasonic sound wave with a frequency of 40 kHz, and the other is for listening to an echo. This robot has 3 mutually perpendicular ultrasonic sensors covering three directions. HC -SR04 has four contacts - ground, Vcc, trigger and echo. The ground pins and Vcc sensors are connected to ground and 5 V contacts on the Ardiuno board respectively, while the trigger and echoes are connected to any digital I/O terminal on the Ardiuno board. To create an ultrasound, one needs to set Trig to high state for 10 3s. This will send the Eight-stroke sound pulse that will move with the sound of the speed, and thus it will be received in the echo buffer.

System Architecture

For Accelerometer Alone

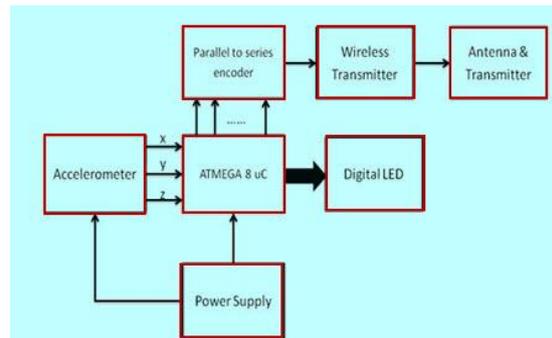


Figure.3. Transmitter

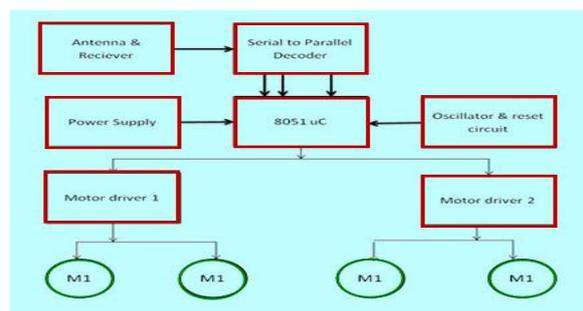
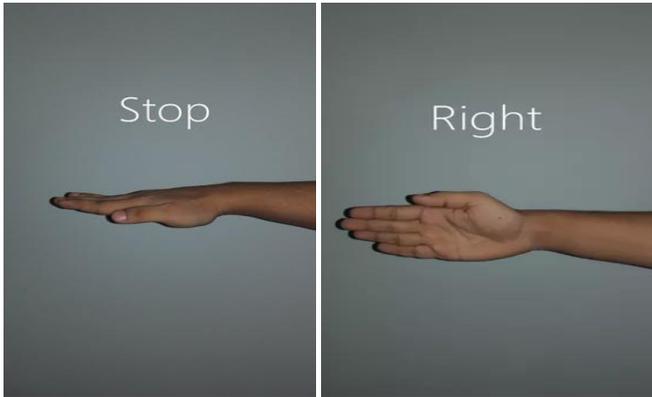


Figure.4.Receiver

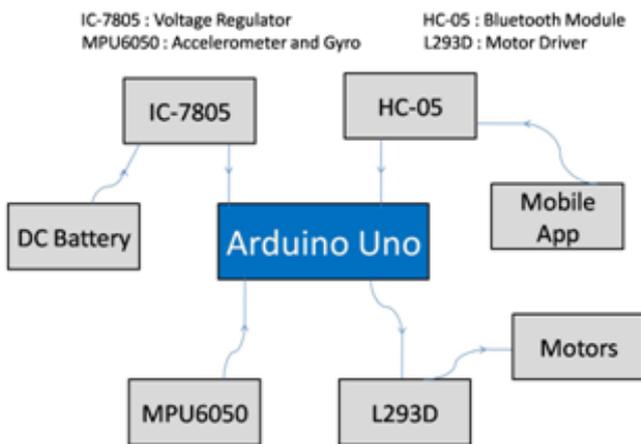
In the system architecture shown in the above figures its Very clear how's the whole system works alone. As it is very Clear Arduino Board is playing a vital role in connecting the whole of the system as it is the central Microcontroller as well as the brain of the whole system.

IV. RESULTS AND DISCUSSIONS

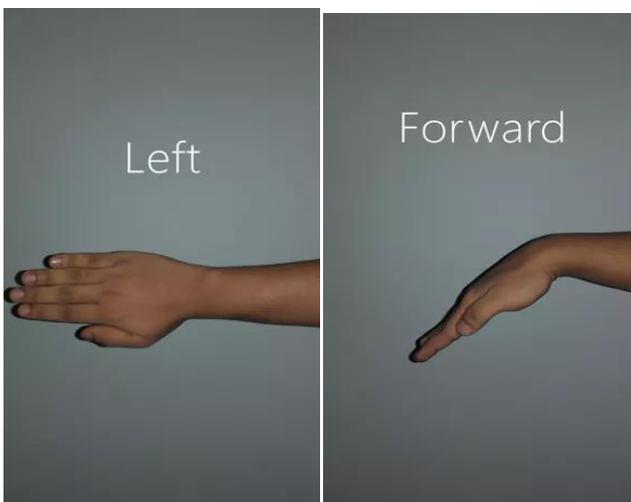
For the Accelerometer the hand gestures are recognized by Tilting the hand in various positions so the accelerometer gets The tilt and will move accordingly the values of the gestures are By programming the Arduino.



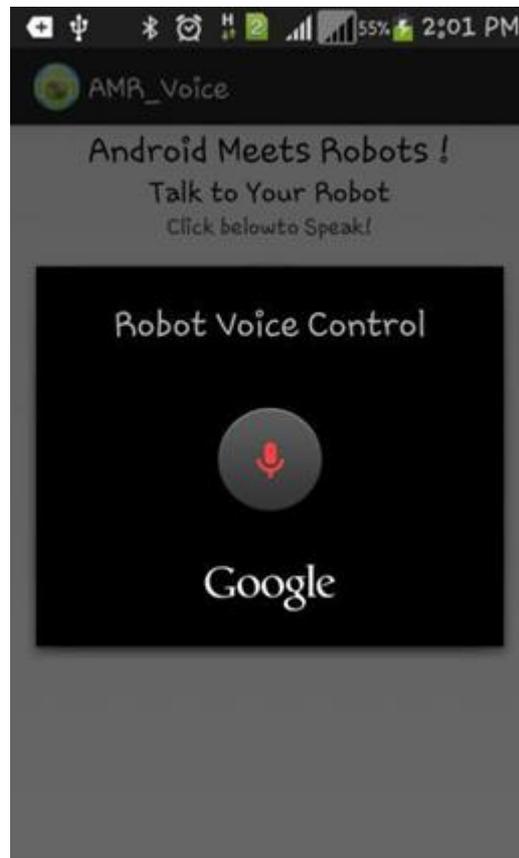
For Bluetooth Module Alone



Hand Gestures for the System



For the Bluetooth module in the System we will download “BTVOICE CONTROLFOR ARDUINO” from Google play store and install it.



V. CONCLUSION

In the paper, we have suggested a prototype of a robot based on “Human Gesture Recognition” with Voice Recognition, i.e. to control of a robot using gestures and voice, without any complication. The robot moves in accordance with 3-axis accelerometer and a HC-05 bluetooth module, which is the input device of the system and captures the human hand gesture and voice recognition. The ADXL335 accelerometer is a robust and easy to use input device. It reduces the physical hardship of user and provide user with an ability and freedom to maneuverer the robot in desired direction this goes same with the Bluetooth module also. Along with successfully using accelerometer and the Bluetooth module in the robot, we have also employed ultrasonic sensors which would help a user to detect any obstacle in his/her way and also provide the distance of obstacle from the robot. In this age of technology where humans and machines are working together to take technology to the next level, such type of prototype could play a vital role in various fields and pave the way for future generation.

VI. FUTURE SCOPE

The future of gesture and voice controlled technology is very promising. The robots can be used in various applications such as by surgeons in medical surgery. One of the biggest challenges world is facing today is proving a better world to handicapped people. This technology is expected to make their life easier. The gesture and voice controlled robot module can be used in wheel chairs of physically challenged people, promising a better life to physically disabled .It also has Entertainment applications. Video gaming will become more interesting and creative with the help of hand gesture control technology. Gesture and voice controlled robots has a potential in growing market all around the world.

VII. REFERENCES

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