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Implementation of Artificial Intelligence Wheel Chair for Differently-abled Person

A.Sahaya Anselin Nisha, T.Bernatin

Abstract: ***The vehicle is designed by taking into consideration of the physically challenged people especially the paraplegic patients. These people are living in our vicinity with paralyzed legs, their mode of transport from one place to another is through the wheel chairs. The normal wheel chair has to be operated manually with more man power, this eventually makes tiresome for people to cover long distances, in order to overcome such hardships faced by those people artificial intelligent wheel chair is proposed work. The vehicle is being controlled by the analog sensors fitted in the patient's hand. The device used here is an accelerometer MPU 6050 sensor. The arduino nano board and arduino uno board is acting as an interface between the accelerometer and RF transmitter, DC gear motor and the RF receiver respectively. Coding is developed be the principles of accelerometer in x, y and z directions. The vehicle moves in all four direction according to the gesture of the patient. On the whole the vehicle is patient friendly and cost efficient.***

Keywords **: *Arduino uno board, arduino nano board, DC gear motor, gesture, handicapped people.***

I. INTRODUCTION

A disability is an impairment which affects a person's life activities and might be present from birth or occur during a person's lifetime. According to recent survey 27.3 % of peoples are affected to paralyzed legs. These people are living in our vicinity with paralyzed legs, their mode of transport from one place to another is through the wheel chairs. The normal wheel chair has to be operated manually with more man power, this eventually makes tiresome for people to cover long distances. They are depended on other people for their migration.

Voice controlled wheelchair system recognizing the persons voice [1],[5] by the android device and the commands are send through Bluetooth module to the wheelchair for the four direction movements. The design of wheel chair input controlled by the android device is proposed by M.D.Balsarf et.al [2],[7],[11] . The android app was developed by direction buttons to control the wheelchair in four directions. The commands of the person is recognized by the android device and the commands are send to the wheelchair interfaced with Arduino Uno and Bluetooth module.

Wheel chair controlled using the hand gesture controlled captured by mobile camera [6].It is designed to control the wheelchair by the hand gesture action which is recognized by the android device camera. The commands are recognized by the camera and sends the command to the arduino interfaced wheelchair.

Smart wheel chair controlled using mobile accelerometer [3],[8] is designed to control the wheelchair by the accelerometer axis of the mobile. The android app was developed to recognize the axis of accelerometer and the commands is send to the wheelchair interfaced with arduino and Bluetooth module.

Automatic camera based eye controlled wheelchair [4] system is designed to control the wheelchair by the eyeball movement of the person. The eyeball movements are captured by the camera and the commands are recognized by the raspberry pi board. Then the wheelchair is moved in the direction by commands of the user's eye movement.

The existing systems for the wheelchair system are joystick, eyeball movements, gesture-based, voice-based, patterns made by hand. In joystick based wheelchair person with different disabilities may find it difficult to move joystick as it requires the considerable amount of force Moreover it may affect the reaction time of the wheelchair which may be dangerous. In this case, the user has restricted sight as the motion of the eyeball/head/neck is taken as an input by the system that can give wrong output for that instance. Voice controlled system can provide an inaccurate response in the noisy environment and it can become difficult for the user to loco mote in such environment. In an Accelerometer-based controlled system, the tilting direction of the mobile phone should be precise to receive an accurate result. Also in brain signal controlled system, it acquires and converts the brain signal to give direction signals. These signals are generated due to electrical activity that is stimulated by the brain but brain signal cannot be relied on for motion of wheelchair as in some external electric field the device may not able to capture the accurate signal. The proposed work mainly focused on wireless hand gesture controlled system which covers the drawbacks from the existing systems.

II. PROPOSED SYSTEM

This paper describes about the wireless hand gesture control vehicle which can be controlled by your normal hand gesture positions.

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The transmitter will transmit the signal according to the position of MPU 6050 sensor and the receiver will receive the data values transmitted and make the vehicle move in respective direction. Here, the program is designed by using Arduino IDE.

The vehicle is being controlled by the analog sensors fitted in the patient's hand. The accelerometer sends command to the arduino board for its action to get completed. This data is processed by the microcontroller and the motor driver is used to control the DC gear motor. The arduino board is used as an interface between the accelerometer and the vehicle. The arduino board which has been used here is an arduino uno board in receiver side and arduino nano board in transmitter side. the accelerometer which is used here takes only x and y and z values. based on these values the coding is developed for each directions. the vehicle moves in all four direction according to the gesture of the patient. On the whole the vehicle is patient friendly and cost efficient.

III. WORKING PRINCIPLE

The vehicle is made to run in four directions by the analog sensor accelerometer. The accelerometer x and y values are noted on the serial port. According to the x and y values the coding is done for forward, backward, left, right, stop directions and also the vehicle can be made still from those values. The accelerometer is connected to the arduino nano board. The scl-pin of the analog device is connected to the analog pin number four and sda-pin of the analog device is connected to the analog pin number five of the arduino nano board. The RF transmitter is connected to the arduino nano board. The data-pin of the transmitter is connected to the digital pin 7 of the arduino nano board. Program is stored in arduino uno board has an Atmega microcontroller 328 for storage purposes. gram is stored in this microcontroller.

The RF device is connected to the TX and RX pins of the arduino board. The RF transfers as well as receives data from the device. The DC motors are used to run the vehicle, 12V power supply is given for the vehicle to operate at a normal speed. In case of test drive, the vehicle is given 3-5V supply from the laptop. The motor is driven by the buffer Relay, this ULN2003 IC is used to control the clock-wise as well as the anti-clock wise direction of the motor. The motor sometimes gets struck due to high supply power or may not operate under low power in order to avoid such conflicts the buffer is used to give appropriate power supply to the vehicle. The Relay and RF receiver are in fixed in the breadboard to avoid complexity in connection. The program is coded such a way that when the vehicle is moved in four directions, it transfers data from the transmitter to receiver side.

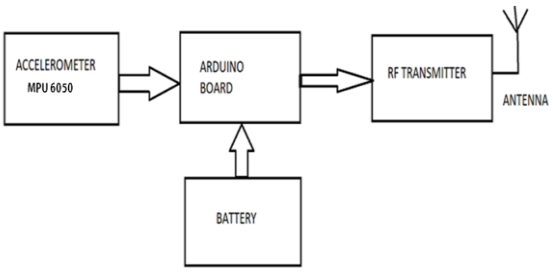

Fig. 1. Block diagram of transmitter side

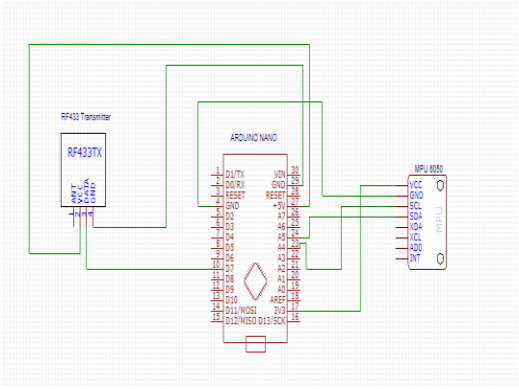

Fig. 2. Circuit diagram of transmitter side

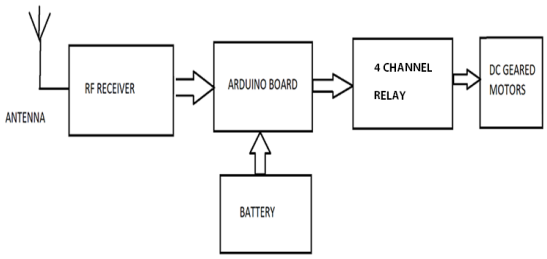

Fig. 3. Block diagram of receiver side

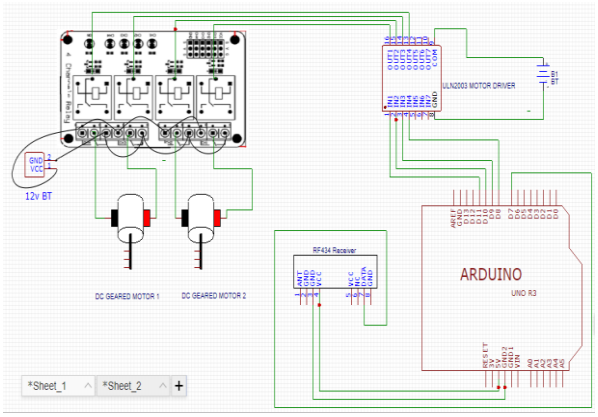

Fig. 4. Circuit diagram of receiver side

IV. IMPLEMENTATION OF PROPOSED WORK

According to the hand position of user x,y,z direction value of accelerometer is detected. The serial port is displayed which is based on their hand gestures, this is used to observe the x-values and y-values and z- values of the accelerometer. By condition

a. Z >14000 && Z < 16200 = Forward
b. X >15000 && X < 17200 = Backward
c. Z > 6000 && Z < 9500 = Left turn
d. Y > 14000 && Y < 16500 = Right turn
e. Y > 5000 && Y < 7200 = Stop

The coding is developed for the movement of the vehicle based on the hand gesture recognized values and the real time implementation is shown in following figure.

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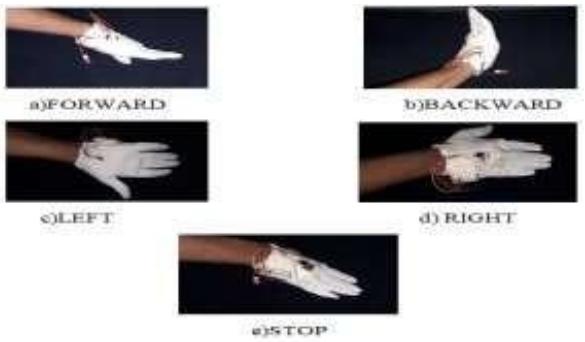

Fig. 5. Real time implemetation

IV. CONCLUSION

In this paper wheel chair is designed which is based on accelerometer MPU 6050 sensor, the arduino nano board and estimated the analog values. From the obtained results the analog variables are calculated and made to transmitted over RF433MHz transmitter, then the transmitter values are read by the RF 433MHz receiver. Arduino uno board connected to move in four directions. Initially by observing the analog values on the serial port an algorithm has been developed in order to move the robot in desired direction. Next the accelerometer is combined with the dc motors for its working. This is very much helpful for the paraplegic patient. Future work can be developed in hand gesture recognition without any delay, automatic driving of vehicle can be developed with GPS map and tracking, obstacle detection can be done for prevention of accidents.

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