GESTURE CONTROLLED ROBOTIC WHEELCHAIR

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ABSTRACT

The principle goal of this paper is to exhibit a quick and exact calculation for controlling a robot by just indicating hand motions from a wearable gadget mounted on a glove. Using this method, one can represent a constrained arrangement of hand signals, the automated vehicle will move in the respective direction. A specific arrangement of physically created directions and a well-structured domain to show a basic, yet possible method for hand-signal recognition. The methodology includes the detecting of movement of the hand, ordering the signal by using a coded microcontroller and further transmission to the receiver on the automated vehicle utilizing a radio transmitter. The motion is detected by an accelerometer on the glove, which is at that point encoded and transmitted to the radio receiver on the vehicle. The gesture is then received, decoded and moved to a motor driver to control the wheels. Comparing to the coordinated motion, the activity is performed by the robot. The calculation being used in the process is independent of translation, the size of the client's hand and revolution. This is planned to be utilized in pulling objects of multiple times its own weight in industries as well as hotels for serving purposes. The unwavering quality and power of the proposed model are tried and broke down. The outcomes, which decide the effectiveness and accuracy, have been tabulated.

Keywords : - *Gesture-controlled ,Paralysis, Biomedical, Handicapped, Automation, Wheelchair*

1. INTRODUCTION

Lately, for the most part handicapped individuals use wheel chair. Their day to day usage is increasing. Older individuals and physically challenged find it very hard to work the wheelchair without outer assistance. An individual can feel that its preferred position of a seat based on wheels which can be pushed by individual by physical power is called as wheelchair. Wheelchairs have a few basic conventions, adaptability, and hardness and they also have a few limitations. In this paper, the gesture-controlled wheelchair is run and given direction by the accelerometer to control the mechanical arm in 3-hub accelerometers and its expense is comparatively low when contrasted with other quickening sensors. In this paper, we have clarified about the signals constrained by the Bluetooth module and in this, signals have taken transmitting the information through Bluetooth and the receiver of the microcontroller will get the information and send it to the motor driver and depending on the gestures provided by us the wheels are turned. Our execution was that to change Bluetooth to remote mode like utilizing RF-transmitter and RF-receiver.

Gestures control systems are widely used for human nonverbal communication which mainly comprises of our hand gestures. This project gives importance to this concept with the development of the wireless communication for the control of locomotion. This robot is divided into 2: Transmitter and Receiver.

Researchers have fabricated a couple of machines and devices that are constrained by human motions. Close to hand movement recognition, face and sound recognition has also come up as well. There are two sorts of movements utilized in signal recognition: online movements and offline movements. In online movements, direct controls like upset and scaling are done. In offline movements, the things are done basically after the client arranges with the article. Technological advancements in motion recognition are related in two or three fields like in Augmented Reality and socially assistive robots.

1.1 AIM AND OBJECTIVE

The main aim of this paper is to give freedom or mobility to the physically challenged/paralyzed people particularly those who doesn't have the physical strength to move the wheelchair by themselves. Objective to give mobility to physically challenged people; the chair will particularly move to particular direction corresponding to the hand gesture shown by them. To give them the freedom of movement without depending on any other person or their own physical strength.

1.2 BACKGROUND AND MOTIVATION

The main objective behind the use of a wheelchair is to get a physically incapable person from one point to another. But a lot of physically challenged people find it very hard to move their wheelchairs on their own and often find themselves relying on others to move from one place to the next. This paper discusses about a hand gesture-controlled wheelchair prototype which enables the patients to move the wheelchair on their own.

2. METHODOLOGY

Hand signals are utilized to move a wheelchair, to perceive the Hand signals we have to detect them, Accelerometer is a sensor used , to detect the hand-signals and the output of accelerometer is given to microcontroller as data and we need to code it based on the sensitivity values and we need to fix the axis of rotation for concerned gestures, the microcontroller output is encoded and goes through RF-Transmitter and the data from transmitter is given to RF-receiver. This data is decoded by the Decoder and it goes to Motor-driver which is associated with wheels of the Wheelchair, the wheels will rotate as indicated by the motions given. Arduino Uno is used as the microcontroller where we have coded the sensitivity values according to the sensitivity of the accelerometer. According to the tilt of the accelerometer, the Arduino gives the appropriate command to the motor driver and the robot moves towards the direction given by the gesture controller.

2.1 System Description

In the proposed hand gesture model, the working of the wheelchair will be by using the hand gestures. The detecting of Hand-gesture will be done by the accelerometer. ADXL335 is the accelerometer utilized in this model. We will get the output from accelerometer in digital format.

The digital data should be transmitted to microcontroller and there we fix a direction of rotation for the wheel based on the sensitivity values we computed. The output data from the microcontroller is in parallel. Here we use ARDUINO UNO, as the output data is parallel, we have to use an encoder. Therefore, we used HT12E encoder, and after encoding, that data will be transmitted using wireless mode by using Radio frequency (RF)Transmitter and receiver. The received data must be decoded and then it is provided to the motor diver for rotating wheels. We have used the HT12D and L293D as decoder and motor-driver respectively.

The transmitting device includes an accelerometer, Microcontroller and Encoder which is used to encode the data and then it will be transmitted by an RF Transmitter module.

At the receiving end an RF Receiver module will receive the encoded data and then it is decoded by using a decoder. This data is then taken to the microcontroller to be processed and then passed to the motor driver to rotate the motors in the respective directions.

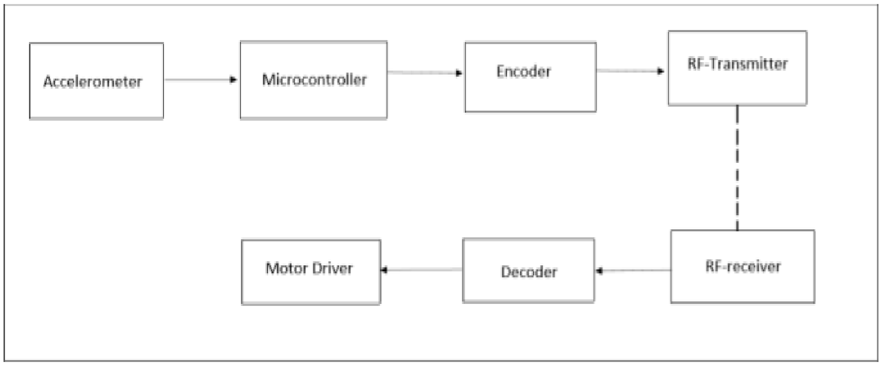

Fig -1: Gesture-Controlled Wheelchair Block Diagram

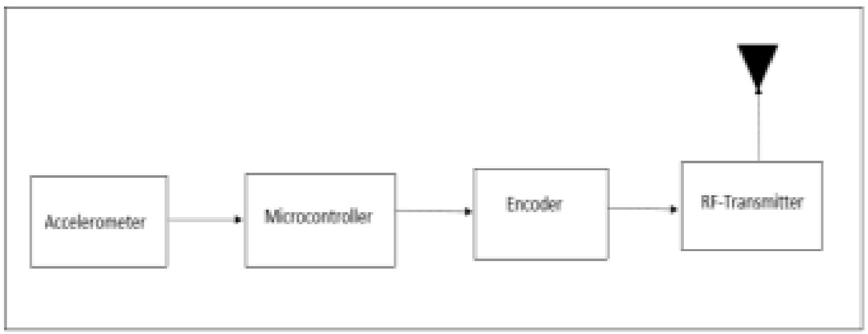

Fig -2: Transmitter Block Diagram

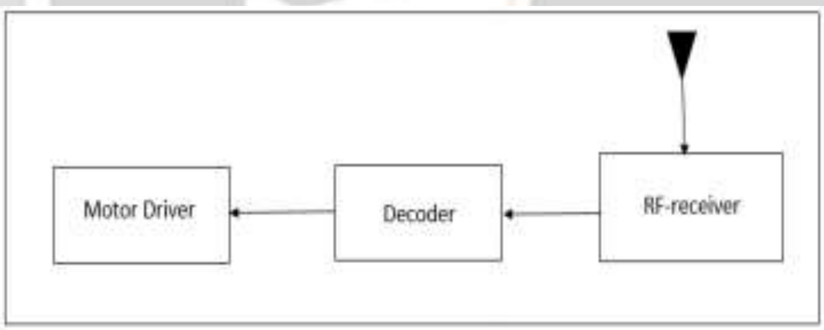

Fig -3: Receiver Block Diagram

2.2 Proposed Hand Gestures

The proposed hand gestures are as follows

- Stop (Keep hand in a Horizontal position)
- Forward (Tilt hand in a downwards direction)
- Backward (Tilt wrist in an upward direction)
- Leftward (Tilt hand towards the left)
- Rightward (Tilt hand towards the right)

Fig -4: “Stop” hand gesture

Fig -5: “Forward” hand gesture

Fig -6: “Backward” hand gesture

Fig -6: “Leftward” hand gesture

Fig -8: "Rightward" hand gesture

3. RESULTS

The uses of the hand gesture controlled automated wheelchair have huge applications in different fields. One specific application is in the field of surveillance purpose. In this specific use of the wheelchair, the client's hand motion developments control the robot for forward/in reverse/left/right headings according to the need of the client. This is done with the assistance of an accelerometer which is set at the hand to record the direction in which the client wishes to move. Rather than utilizing radio frequency transmitters, the utilization of Wi-Fi modules is also possible for the application at a wider range. The installation of a camera can be utilized for surveillance purposes where information will be stored in a specific cloud server and can be accessed by the client at the required time, given he/she has a strong internet connection. Usage of edge sensors must be considered so as to keep the gadget from tumbling off any edge. As intranet is being bolstered by Arduino chips these days, the application of this device can be broadened.

An Arduino microcontroller is the design core for the hand gesture controlled robotic wheelchair. The complete implementation of the project is based on this. Through multiple updates and firmware corrections, this product can be improved in multiple folds. As this device is very economical as well as extremely portable, this can be put across for various applications, be it big or small. With the purpose of making a completely digital world in our minds, this could very well be a part of the future that could make the analogous work vanish soon enough.

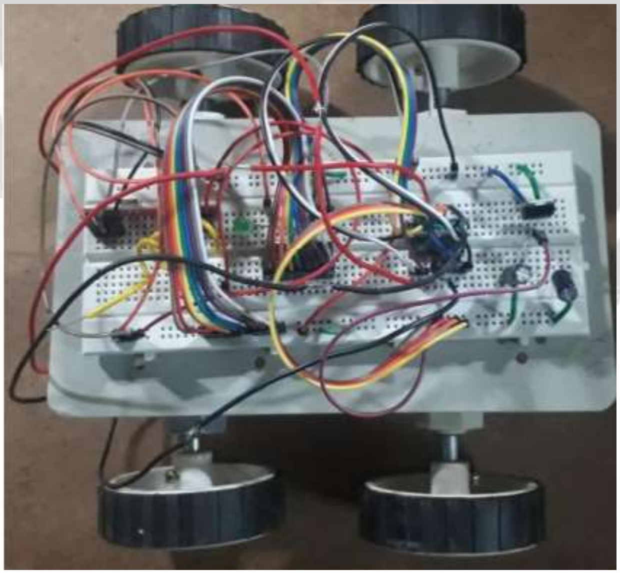

Fig -9: Receiver Module of the Robotic Wheelchair

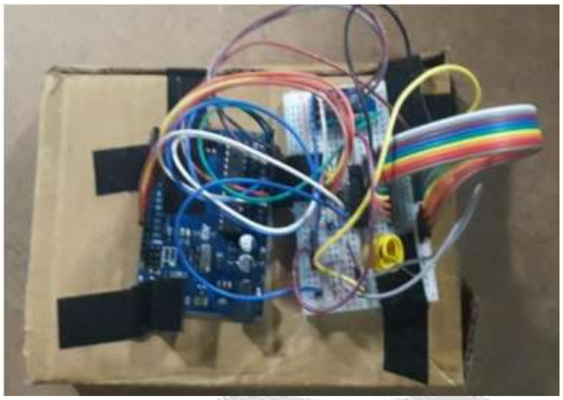

Fig -9: Receiver Module of the Robotic Wheelchair

3.1 Tests Performed

Directional response of the motor system and performance of the transmitter and receiver was tested for 50 times and the results were recorded and tabulated as follows.

Device	Total number of Tests	Total Number of Pass cases	Percentage Efficiency
Transmitter	50	48	96
Receiver	50	45	90

Table -1: Performance of the transmitter and receiver used

Direction	Total number of Tests	Total Number of Pass cases	Percentage Efficiency
Forward	50	48	96
Backward	50	46	92
Left	50	48	96
Right	50	43	86
Stop	50	48	96

. **Table -2:** Directional Response of the motor system

3.2 Code Simulation

The Arduino was connected to the PC and the code simulated showed the following outputs

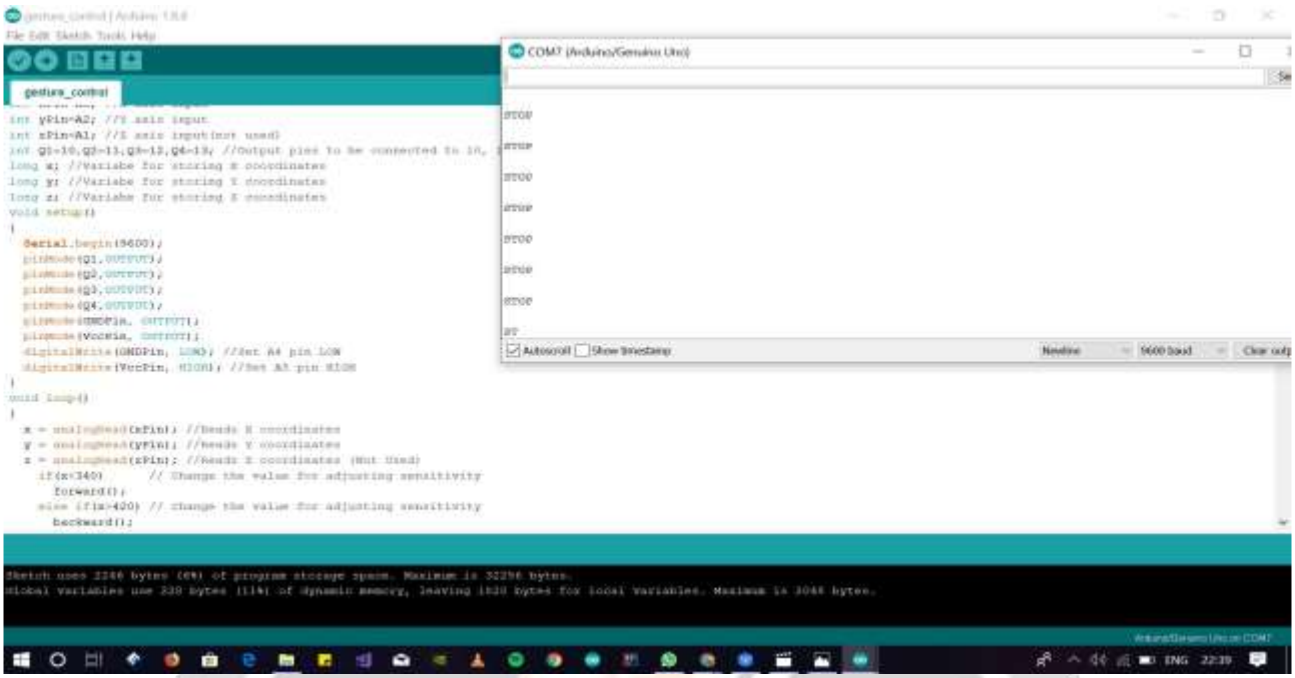

Fig 11: Serial monitor Simulation result when Accelerometer was kept in "Stop" position

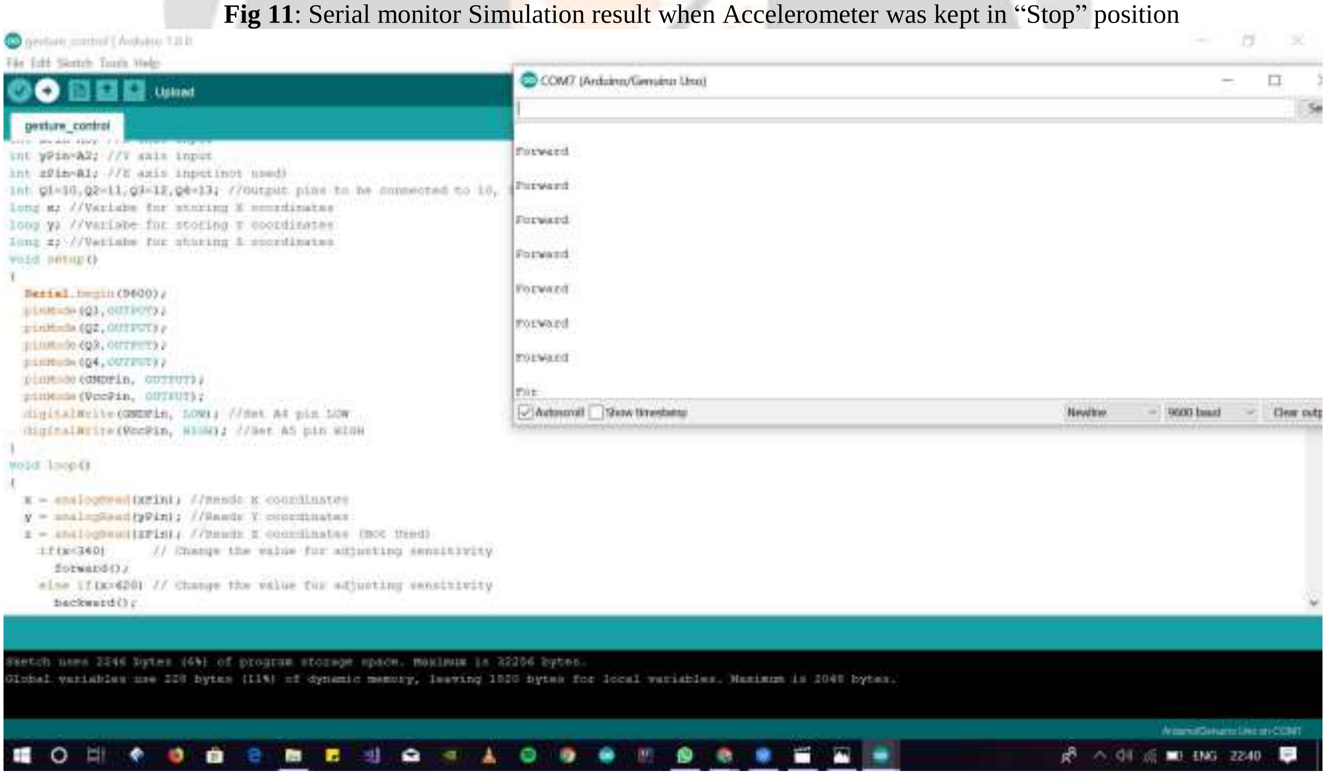

Fig -12: Serial monitor Simulation result when Accelerometer was kept in "Forward" position

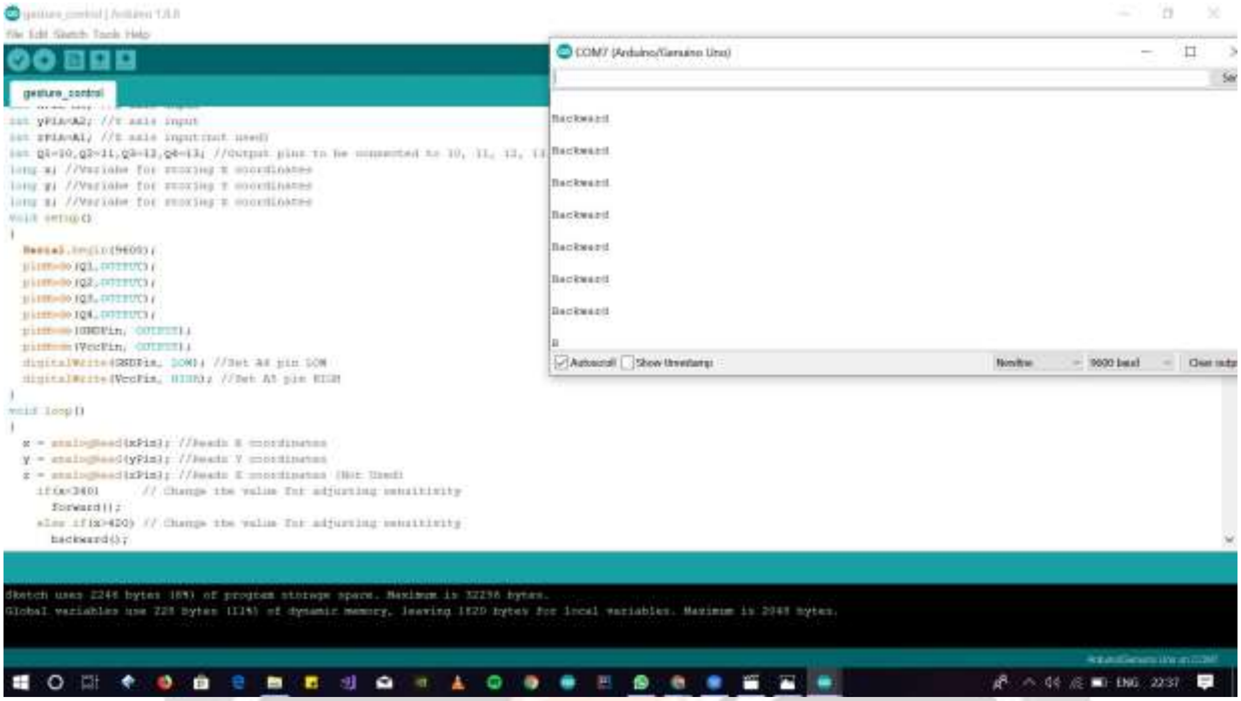

Fig -13: Serial monitor Simulation result when Accelerometer was kept in “Backward” position

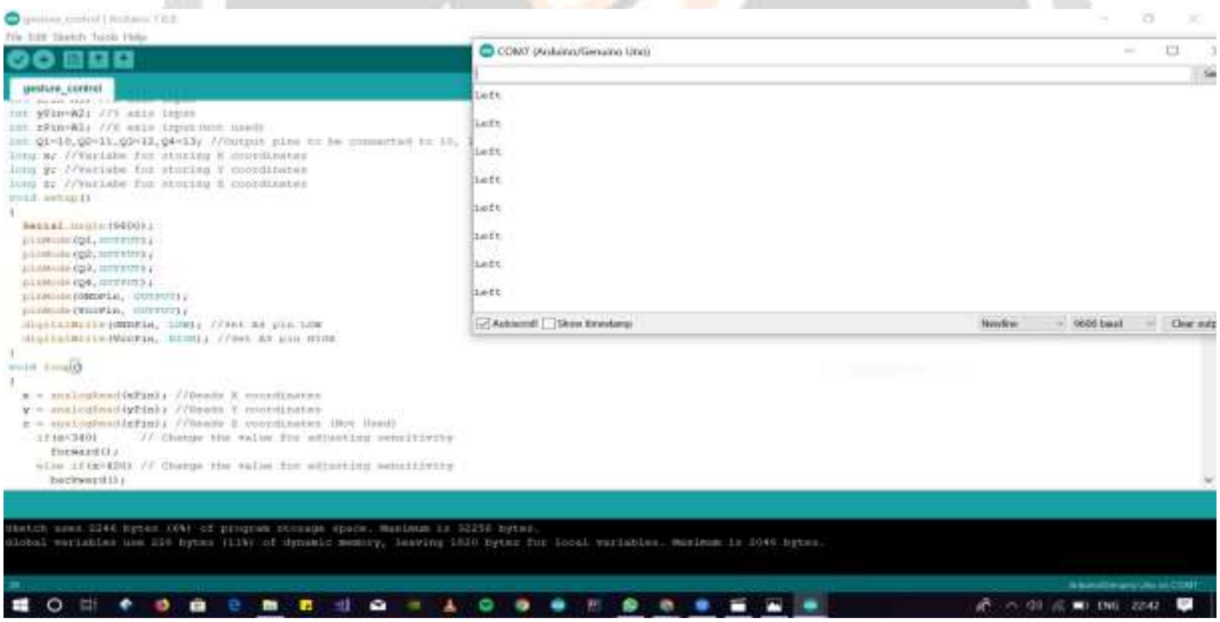

Fig -14: Serial monitor Simulation result when Accelerometer was kept in “Left” position

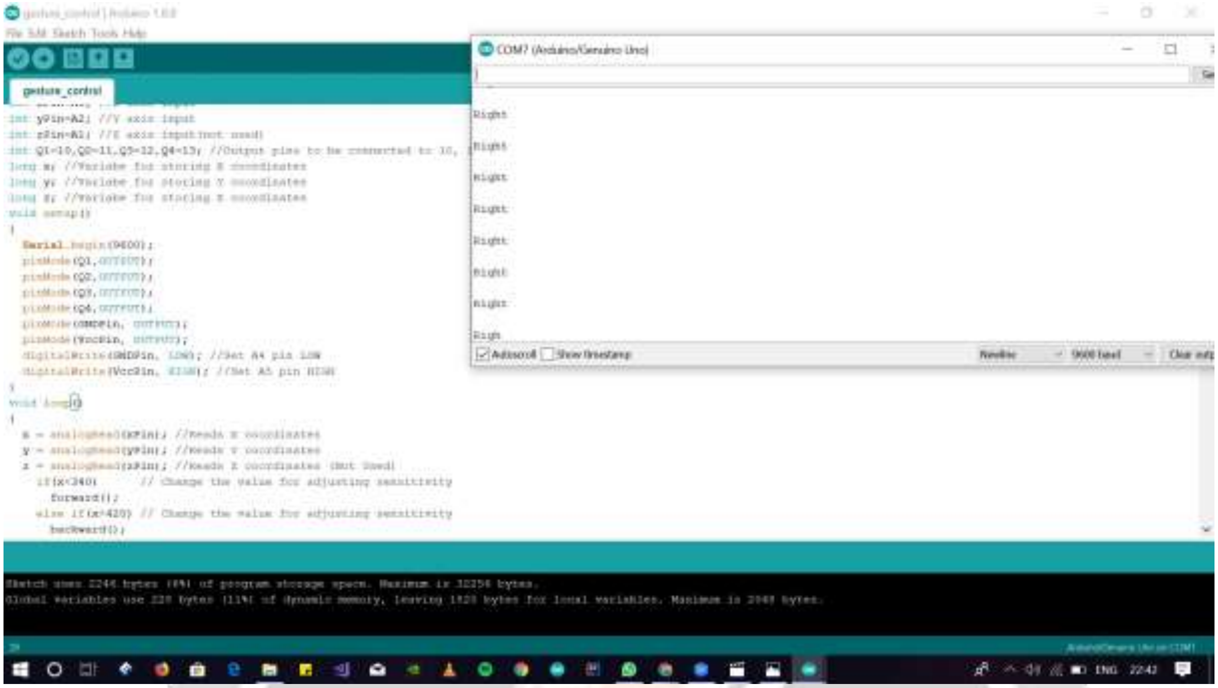

Fig -15: Serial monitor Simulation result when Accelerometer was kept in “Right” position

4. CONCLUSIONS

This paper discusses about the hand gesture-controlled wheelchair, this model works for five signals right, left, forward, back ward and stop, each direction was observed about 50 times and their efficiency was tabulated. This model needs more power supply when the user weight increases and transmitter and receiver was observed and their efficiency was tabulated. This model cannot give information when an obstacle hits in a user path.

5. ACKNOWLEDGEMENT

We would like to express our gratitude to Prof. Dr. Vivekanandan S, our faculty for the course for giving us an opportunity to work in this project and for guiding us through it. We would also like to thank VIT library for providing us with enriching information. We would also like to thank VIT University Management for providing us an opportunity to carry out this study at the university.

6. REFERENCES

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