International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.03, April 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Remote Gesture Controlled (RGC) Multipurpose Vehicle

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ABSTRACT

This paper reports a prototype of remote gesture controlled multipurpose vehicle which can be operated and controlled by normal hand gestures. The circuitry comprised of this designed vehicle transmitter, receiver, an accelerometer and an Arduino Micro-controller. As per the hand gesture and the position an analogue signal generated by the accelerometer is converted to digital form; by Arduino Micro-controller and then fed to the receiver wirelessly. The Receiver circuit on receiving the signal will initiate the Motor Driver IC to make the vehicle to move in the respective direction. Arduino IDE is programmed suitably to recognize the motion in different direction. The designed vehicle is capable to move smoothly in forward, backward, left and right hand side direction in the periphery of around 100 meters.

***Key Words**: Accelerometer, Arduino, Control, Hand gesture, Vehicle*

1. INTRODUCTION

Robotics has emerged as one of the most cutting edge field of technology. The applications of robotics are extensively used in numerous fields such as automobiles, medical, construction and defence. However, controlling robots with remote or switches is a tedious task. It also demands a skilled operator for smooth functioning. More attention needs to be given for robot's operational management rather than quick reaction and response to the critical and demanding situation [1]. Consistent efforts are being taken by scientific community to resolve this issue through the continuous development of Gesture controlled robots. In fact, in recent years, gesture recognition and control technologies has significantly influenced and evolved the field of robotics. In general, gesture originates from face, hand as well as bodily motion which communicate non – verbally with machines not only to understand them but also to respond and execute a task accordingly. This has enabled to achieve a higher level of human- machine interactions, thereby minimizing the programming hard work for the robots. [2] [3].

The numerous ways for gesture capturing are such as the use of camera or by infrared waves, acoustics, optical and motion recognitions. Such gesture-based interfaces have enabled to aptly control and extend the functionality of robots. Gesture technologies are applied in areas like recognition of sign languages, emotion detection from facial expressions, Augmented Reality etc.

Literature reports different types of gesture controlled robots [4], [5], [6].

This present paper deals with the design and implementation of a wireless gesture-controlled vehicle using Arduino micro controller along with an accelerometer for tracking the Gesture. An effort is made to merge the idea of gesture control and vehicle control. The development of gesture recognition, along with its integration with motor drives forms important objectives of the present work.

2. METHODOLOGY

The Fig. 1 depicts the block diagram and the operational flow of our as prepared Remote Gesture Controlled (RGC) vehicle. The operational steps are as follows -

- Analogue signals are generated by the motion sensor
- These analogue signals are suitably converted into their digitals counterparts using the ADC pins of the Arduino Nano as per the programmed logic
- Further, these digital signals are encoded, transmitted, received and decoded by respective circuitries
- Finally, the decoded signals are then fed to the motor driver IC for the perfect execution of the given commands (hand gestures) to drive the RGC vehicle

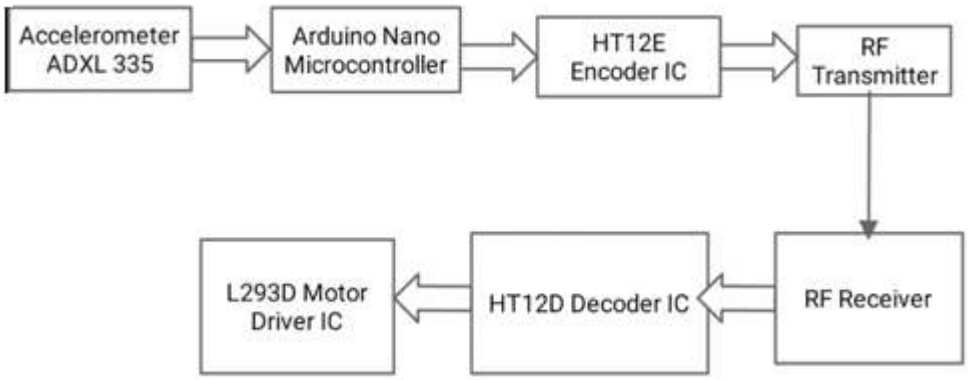

Fig. 1 Block Diagram

3. DESIGN AND TESTING

The main components of as designed RGC vehicle along with their circuit diagrams are given below

- A chassis for vehicle along with suitable motors
- An ADXL335 3-axis accelerometer
- Arduino Nano Microcontroller
- HT12E and HT12D encoder-decoder pair
- 433.94MHz RF transmitter-receiver module
- L239D Motor Driver IC

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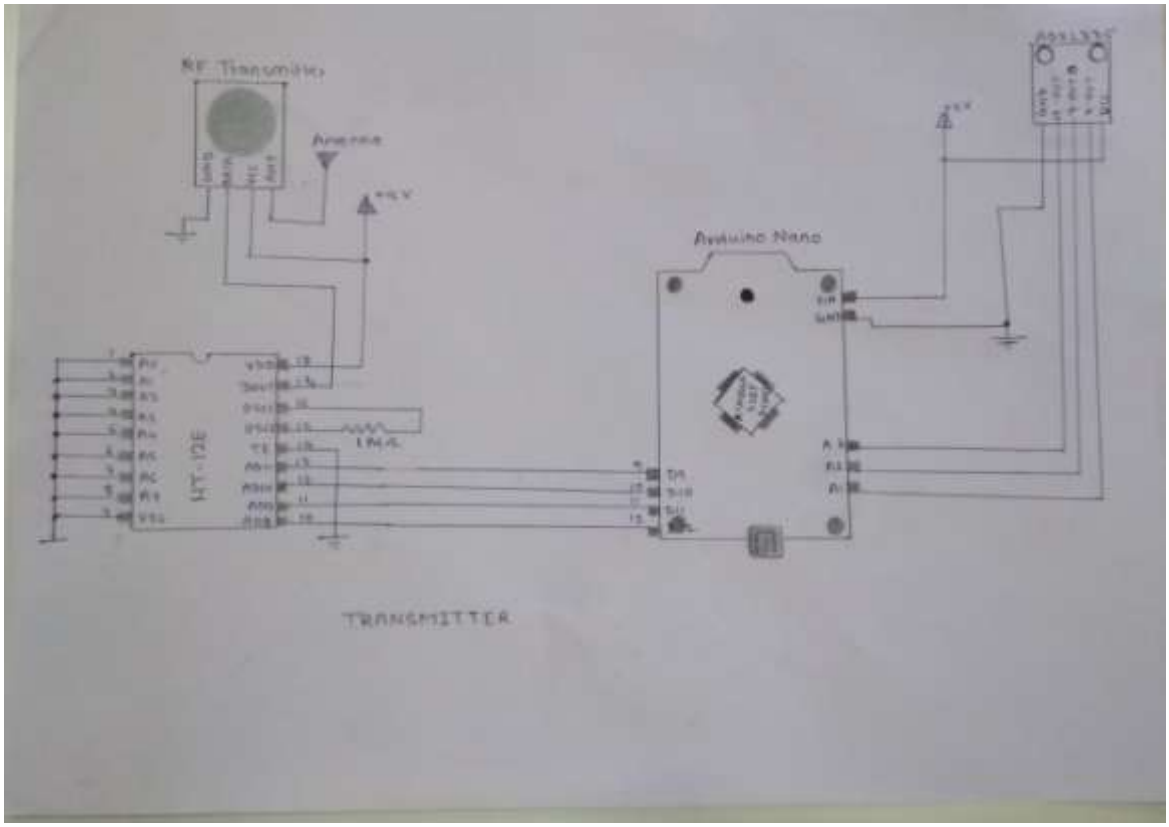
RF Transmitter
Antenna
Arduino Nano
HT-12E
1MΩ
TRANSMITTER

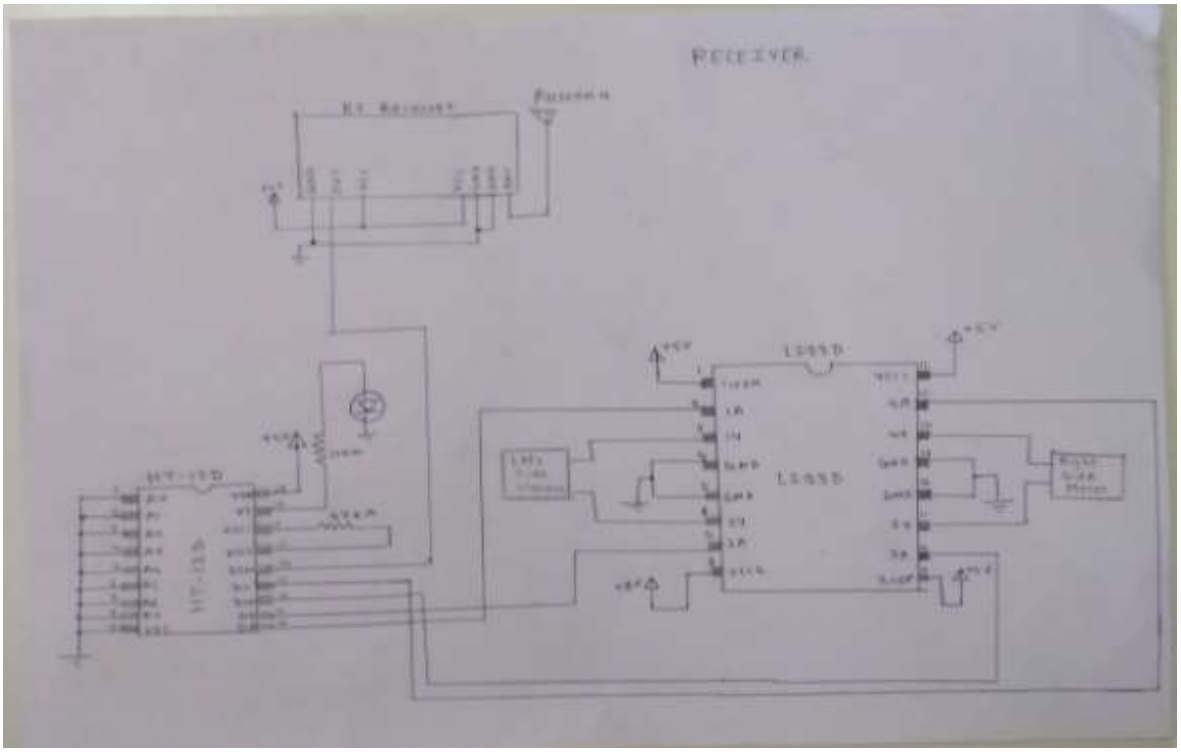
RECEIVER
RF Receiver
Antenna
L293D
HT-12D

Fig. 2 (a) Transmitter Section (b) Receiver Section

The feasibility of gesture controlled manoeuvres is tested during the trials and the respective angular inclinations with respect to horizontal as preset in the programming are listed in Table I

Sr. No.	Directions	Angle
1.	Forward	22^o
2.	Backward	15^o
3.	Left	23^o
4.	Right	23^o

Table I Recorded and adjusted values of tilt of sensor (measured w.r.t. horizontal)

This table discusses about the different angles at which the different commands are directed to the vehicle via motion sensor.

4. PROGAMMING FOR ARDUINO

The program describes the Algorithm for logical execution of process flow. The software used by us for the same is

Arduino Integrated Development Environment (IDE).The accelerometer gives us analogue outputs, which are then fed to the ADC pins of the Arduino Nano. We get a range of 10 bit data from the Arduino, which is calibrated as per our required needs and thus got the measured values as mentioned in the Table I. Then the appropriate function is executed as per the gesture recognised, and a unique output signal is sent to drive the RGC vehicle accordingly.

5. FIGURES

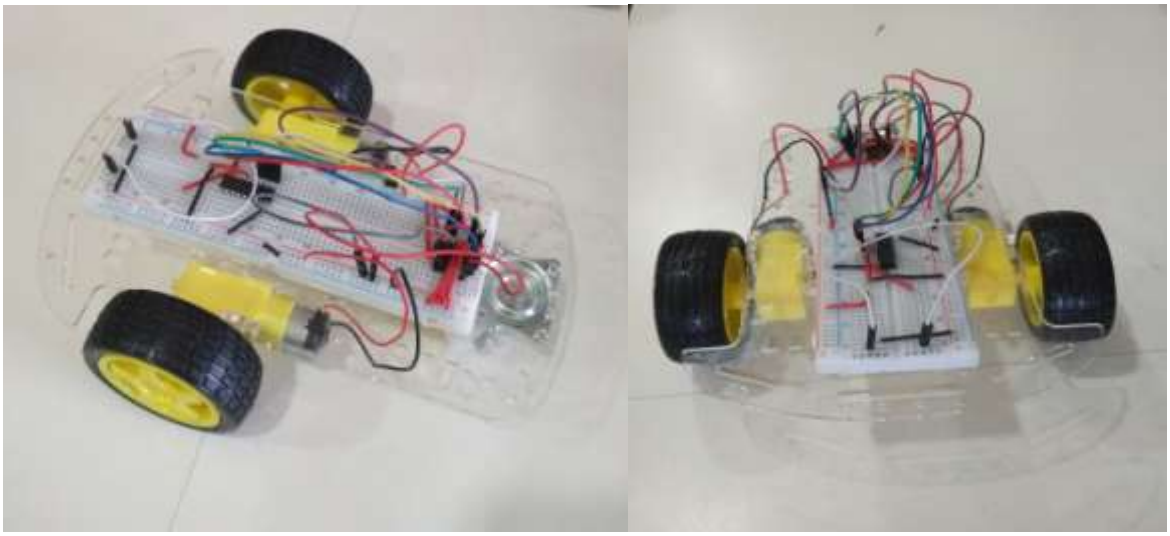

Fig. 3 a) and b) Images of (RGC Multipurpose Vehicle)

6. RESULTS AND DISCUSSIONS

The discussion about various maneuvers performed as per the corresponding gestures during testing given below in reference with Fig.4.

Fig. 4 (a) depicts the forward motion gesture of the motion sensor. As mentioned earlier, the data is directed towards the motor driver to work accordingly. The output confirms the logical way of process. It follows our theoretical objective of wirelessly controlling the vehicle with the help of gestures.

Fig. 4 (b) indicates the backwards motion which works similar to forward action but just in an opposite way. This motion commands the vehicle backwards thus moving the motors in reverse directions to go backwards.

Fig. 4 (c) shows the right hand gesture which directs the motors, and turns the vehicle to move towards right direction by changing the movement of motors. Thus this is the flow for turning the vehicle towards right.

Fig. 4 (d) signifies the gesture for turning the vehicle towards left direction. The process is similar to that of turning the vehicle to right direction but just in opposite sense. Motors just rotate in opposite direction (to right direction).

Fig. 4 (e) indicates the stop gesture. No command is given to any of the motors while in stop position. Thus the vehicle is in idle state.

Fig. 4(a)

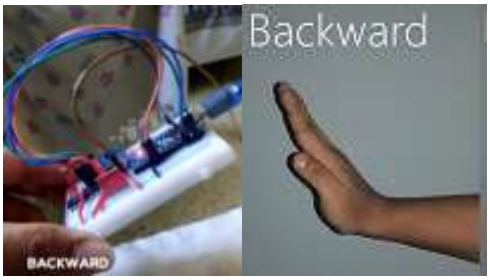

Fig. 4(b)

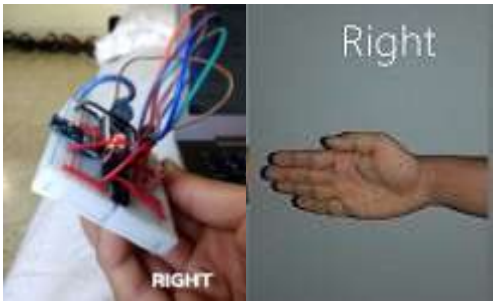

Fig. 4(c)

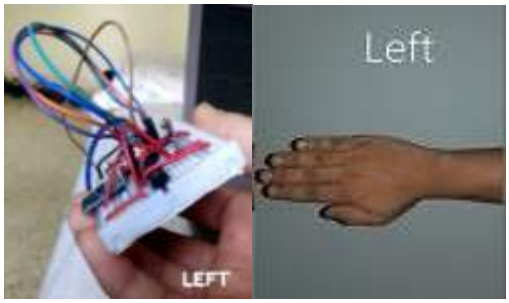

Fig. 4(d)

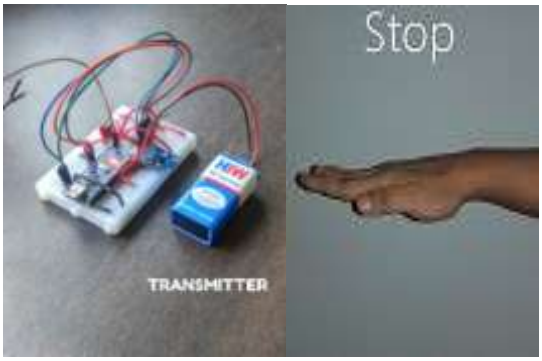

Fig. 4(e)

Fig. 4 Gestures and corresponding Maneuvers

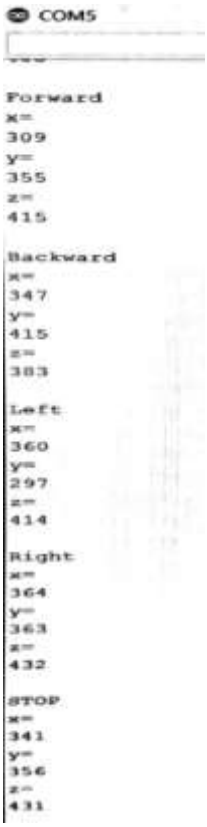

Fig. 5 Calibrated output readings of accelerometer on serial monitor of Arduino IDE

7. CONCLUSION AND FUTURE SCOPE

We have successfully designed and built vehicle that is controlled by using hand gestures. The purpose of this project is to control a vehicle using accelerometer sensor which is intended to replace the remote control by hand gesture. The addition of some other sensors and camera will make it more productive and flexible. Also GPS system can be added to the vehicle by the help of which its location can be tracked. As an end thought, the system will allow the user to control it in a way that reduces the gap between physical world and digital world.
The RGC vehicle prepared through this work has plenty of future scope as it can be suitably modified to serve multipurpose applications. The idea can be applied in a wheelchair where the wheelchair can be driven by the movements of rider's hand rather than controlled switches on it. Also Wi-Fi can be used for communication to access it from a greater distance. Camera can be installed on the RGC which can record and send the data to the computer or cell phone. Modern Arduino chips support internet as well as internet connection which can be utilized to a greater extent .This vehicle can be enhanced to work in the military surveillance where it can be sent to enemy camps and tracks its activity via internet. The possibilities are endless with the mind full of creation.

ACKNOWLEDGEMENTS

We would like to thank our project mentor Dr. Sachin Sawant for his invaluable guidance and kind cooperation. Further, we all are also thankful for the support extended by the Management, Dr. R. M. Jalnekar, Honorable Director, Vishwakarma Institute of Technology and Dr. C. M. Mahajan, Head, Department of Engineering Sciences and Humanities (DESH), VIT Pune.

REFERENCES

[1] K.Root, R.Urnieziusski, Research and Development of a Gesture-Controlled Robot Manipulator System Proc. IEEE lntemational Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI) Kongresshaus Baden-Baden, Germany 2016, 19-21.

[2] X. Chen, X. Zhang, Z.Y. Zhao, J.H. Yang, Hand Gesture Recognition Research Based on Surface EMG Sensors and 2D-accelerometers, *1-4244-1453-9/07/$25.00* ©2007 IEEE

[3] K. Vyas, A. Pareek, S.Vyas, Gesture Recognition and Control, *International Journal on Recent and Innovation Trends in Computing and Communication 1(7)*, 2013, 575-581.

[4] M. Jain, Aditi , A. Lohiya , M.F. Khan , A. Maurya, Wireless Gesture Control Robot: An Analysis, *International Journal of Advanced Research in Computer and Communication Engineering, 1(10), 2012*, 855- 857.

[5] C. Gupta, N. Garg, Gesture Controlled Car, *International Journal of Electronics, Electrical and Computational System 3(9)*, 2014, 59-63.

[6] S.K. Jena, S. K. Nayak, S. K. Sahoo, S. Sahoo, S. Dash, S. K. Sahoo, Accelerometer Based Gesture Controlled Robot Using Arduino, International Journal Of Engineering Sciences & Research Technology 4(4), 2015, 469-475.