

IMPROVEMENT IN DESIGN OF GESTURE CONTROL ROVER

Rohit K Rajguru

Student, Mechanical Engineering Dept.
Saraswati College of Engineering,
Navi Mumbai, India
rohitrkrajguru@gmail.com

Nikhil B Kale

Student, Mechanical Engineering Dept.
Saraswati College of Engineering,
Navi Mumbai, India
nikhilkale25@hotmail.com

Omkar Nemade

Student, Mechanical Engineering Dept.
Saraswati College of Engineering,
Navi Mumbai, India
nemadeomkar@gmail.com

Akash S Waghe

Student, Mechanical Engineering Dept.
Saraswati College of Engineering,
Navi Mumbai, India
akash.waghe59@gmail.com

Madan Jagtap

Professor, Mechanical Engineering Dept.
Saraswati College of Engineering,
Navi Mumbai, India
jagtap.aero@gmail.com

Abstract— Rover is a type of robot, which is used for applications such as surveillance, data collections, assigned tasks, etc. Rover is mainly controlled by means of wireless communication. This paper talks about operating rover by using gestures, gives idea about use of hand gesture to control the rover, fabrication of body of rover, assembly of rover which contains components like DC motors, Raspberry Pi, Arduino mega, Accelerometers, Batteries, Servomotor, etc. The use of PVC pipe as a material for rover body increases strength, motion stability and weight carrying capacity of rover. Also, Rocker-Bogie mechanism is used for fabricating body of rover. Raspberry Pi is used for better communication it gives higher bandwidth for radio transmission, which is basic requirement for surveillance as data transmission is very high. Video output give clear idea about motion of rover. Accelerometer is being used to detect motion of hand which gives input to Arduino mega to detect the gesture and transmit the signal to Raspberry Pi which controls the DC motor and hence controls the motion of rover. Servomotors are installed, which gave more degree of freedom to video camera. Programs for DC motor control, Servomotors are coded on Raspberry Pi. Programs for Gesture Detection, motion control by Accelerometer are coded on Arduino Mega.

Keywords--Hand Gestures, Hand Glove, Accelerometer, Raspberry Pi, Arduino, Surveillance.

I. INTRODUCTION

Robots are nowadays, being a modern technology, use to make work more easier for human beings. Most of robots are usually controlled by various gestures using different technologies, circuits, etc. Although, robots are operated by human as per requirement. Robots also required helping hands. The main purpose of using hand gestures is to work robot in more desirable way by which this can be used in various surveillance activity. As gesture robot is worked by human hands where hand gestures are natural, hence it works on wireless communication, in which it works and interact in friendly way. All the behaviours related to robot works by robot are due to gestures of hand.

The objective of making a paper is to build a rover using hand gestures controlled in which Arduino is used and in robot rover Raspberry Pi is used for more effectiveness. The robot moves in direction shown by gesture according to the gesture of palm when we tilt in given direction respectively. Rovers are superior to stationary landers: in terms of examining more territory, directing to absorbing features, they can place themselves in different weather condition, and they can advance the knowledge of how to perform very remote robotic vehicle control.

Jagdish Lal Raheja et al. [1] constructed a system for controlling the robot by using the hand gesture in front of camera. Ivo Stančić et al. [2] gave idea about controlling Robot by using a sensors attached on the user body along with a microprocessor with the help of wireless module for communication with the robot at distance of up to 250 m. Akshunya Mishra et al.[3] explained the working of hand gesture sensing technique using three sensors i.e. accelerometer, flex sensors and finger contact sensors and use it to drive a two wheel drive robot in wireless mode using radio frequency. Vijayalaxmi et al.[4] discussed the Use of Raspberry Pi in image processing for hand gesture controlled robot. The idea is to build a wireless robot using hand gesture. Sarkawt Rostam et al [5] discussed the tensile strength of PVC bar under the load of various working in environment as well load elongation limits for each conditions. Effect of various mix environments on the strengthening behavior of PVC polymer was presented. Michal Sustek et al.[6] Paper provides elementary insight into issue of the Micro-controller and the controlling of the DC motors and servomotors.

We improved the design of rover by changing acrylic material to PVC pipe. Replaced Arduino Uno hardware by Raspberry Pi 3. Replaced myo band with custom made gesture control device.

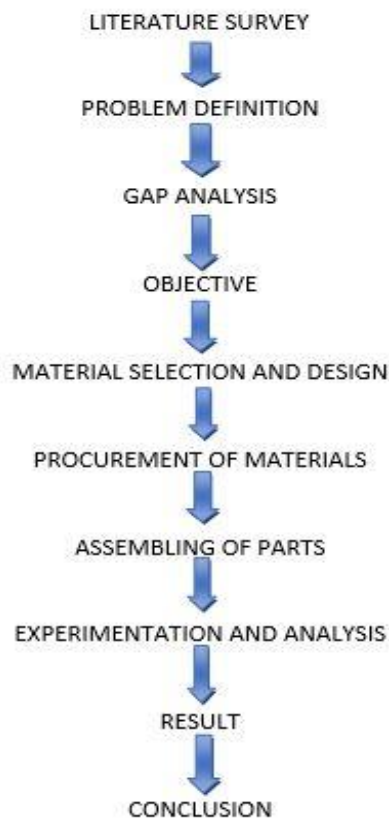


Fig. 1. Overall methodology

II. FABRICATION DETAILS AND MEASUREMENT

The microcontroller used for operating the rover is raspberry pi. To build gesture control rover we require following component:

- gloves
- accelerometer
- Arduino board with Wifi connectivity
- Bread board
- Resistor
- Raspberry pi

Accelerometer is sensor which is used for calculating acceleration due to gravity on various axis, here we are using MPU-6050 as gyroscope as well as accelerometer. Arduino board is used for receiving output from sensor, process it and send to our rover. On rover we are using raspberry pi to receive signal from arduino in enable gesture control glove, process it and control the dc motor as per the gesture.

III. FABRICATION OF MODEL

Making of glove :

To make glove for controlling rover, we need glove, accelerometer and Wifi enabled arduino board.

We have to attach sensor on pointing finger. By using tape and glue gun we have to fix bread board on top of the glove. We have to provide 5V power to arduino via USB port.

Making of rover:

The chasis of rover is built by using PVC pipes, as per design requirement ;we cut pipes and joined together according to rocker bogie mechanism.

Acrylic plate is fixed on top of body of rover on which various other components including Raspberry pi, dc motor controller , camera etc are installed.

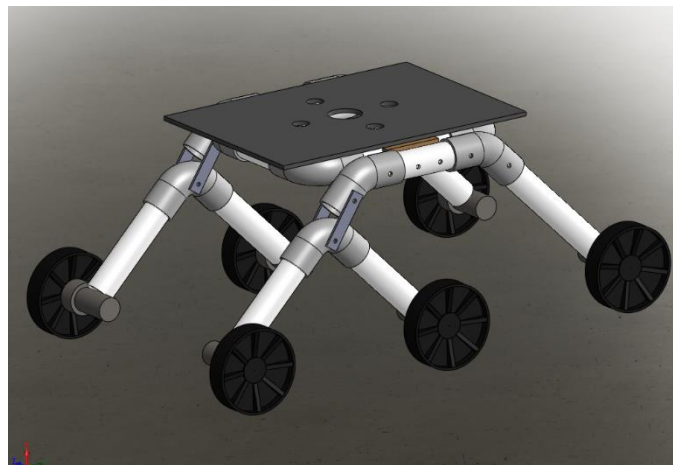


Fig.2. Cad model of Rover

IV. RESULTS AND CONCLUSIONS

The rover can work upto 2 hours and upto the range of bluetooth. Rover can carry as much as 5kg of weight of other devices. The bigger wheel base helps rover move on different terrains.

Stability and Strength of the structure of the Rover increased due to use of PVC pipe. Due to use of Raspberry Pi the higher video data transfer rate , motor control is achieved. Though overall weight of the Rover is Increased due to use of PVC pipe but it also increased the load carrying capacity of the Rover.

REFERENCES

1. Jagdish Lal Raheja et al., “Controlling a remotely located Robot using Hand Gestures in real time: A DSP implementation”, 5th IEEE International conference on Wireless Network and Embedded Systems, India, Oct 16-17, 2016, pp. 1-5. Electronic ISBN: 978-1-5090-0893-Print on Demand(PoD) ISBN: 978-1-5090-0894-0
2. Ivo Stančić et a, “Gesture recognition system for real-time mobile robot control based on inertial sensors and motion strings”, Engineering Applications of Artificial Intelligence 66 (2017) 33–48; ISSN.
3. Akshunya Mishra et al.[3], “Design of Hand Glove for Wireless Gesture Control of Robot”, International Journal of Pure and Applied Mathematics Volume 114 No. 8 2017, 69-79, ISSN: 1311-8080 (printed version); ISSN: 1314-3395

4. Vijayalaxmi et al.[11], “Image processing based and gesture controlled robot on Raspberry Pi”, IJESR/March 2016/ Vol-6/Issue-3/49-54
Vijayalaxmi / International Journal of Engineering & Science Research; ISSN:2277-2685
5. Sarkawt Rostam et al [5], “Experimental Investigation of Mechanical Properties of PVC Polymer under Different Heating and Cooling Conditions”, Hindawi Publishing Corporation Journal of Engineering Volume 2016, Article ID 3791417, 5 pages;
6. Michal Sustek et al.[6], “Using of Inputs and Outputs on Microcontrollers Raspberry and Arduino”, International Journal of Applied Engineering Research ISSN 0973-4562 Volume 12, Number 13 (2017) pp. 3944-3949

IJSER