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HAND MOTION CONTROLLED ROBOTIC VEHICLE WITH OBSTACLE DETECTION

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Abstract – *This paper proposes Hand Motion Controlled Robotic Vehicle with obstacle detection identifies trends in technology applications and usability. We present an approach that is based on detection of motion of hand which will control vehicle movement and refrains movement of vehicle if obstacle is detected in path. Also alarming user about obstacle. The person must move his hand to move the vehicle in forward, backward, left or right direction. So, the user does not have to press any buttons. The Transmitter circuit that is on the top of a glove includes micro-controller inter-faced to the accelerometer. The system includes a receiver circuit designed which will be mounted on a top of the robotic vehicle consisting motors. This project is developed as a travel buddy and industrial uses. Having future scope of advanced robotics that are designed and can easily be controlled using hand gesture only. It is having proposed utility in field of construction, hazardous waste disposal and field survey near borders etc.*

***Key Words*: Obstacles, Detection of motion, Micro-controller, Accelerometer, travel buddy**

1. INTRODUCTION

In this system, a gesture driven robotic vehicle is developed, which also includes ultrasonic sensors which prevents the robotic vehicle from colliding with any obstacle. The vehicular movements i.e. handling and control, depends on the gesture of the user. In this system, gesture is captured by accelerometer which is mounted on person's hand and are forwarded to micro-controller and encoder circuit. This encoded signal is transmitted by RF transmitter. In the receiver section, the RF receiver holds down the received signal and after decoding it is processed with micro-controller and gives those parameters to the robotic vehicle so that it acts accordingly to the gesture.

2. LITERATURE REVIEW

[1] Riyaz Mansuri, Sandesh Vakale, Ashish Shinde, Tanveer Patel

In this paper, we introduce a hand-gesture-based Control interface for navigating a car-robot. A 2-axis accelerometer is adopted to record a user's hand trajectories. The trajectory data is transmitted wirelessly via an RF module. The received trajectories are then classified to one of four commands for navigating a car-robot and two control commands for claw/robotic arm.

[2] Mr. Pravin Vaishnav, Mrs. Shalini Tiwari

This paper presents an integrated approach is real time detections, gesture based data which control vehicle movement and manipulation on gesture of the user using hand movements. A three-axis accelerometer is adaption. As the person moves their hand, the accelerometer also moves accordingly. The gesture is capture by accelerometer and processed.

[3] Mr. Dineshkumar Bhusare, Ms. Shilpa Karale, Ms. Pooja Pawar

In this paper, Machine based gesture recognition was developed for upper extremity of physical impairment. In this work robot can directly contact with people, so we focused on the manipulation and navigation in the environment and robotic system is used for finding the solution to the requirements. In this work, we give the command to robot for different specific actions and the commands are generated according to the gesture.

3. SYSTEM ANALYSIS

A. Problem Definition

The user has device on his hand which restricts normal hand movement.

Capacity of battery: As the project is Battery operated, the capacity of the cell decides the durability of the robot. Larger Battery makes the robot more bulky and smaller battery affects the capacity.

Range of operation ultrasonic sensor: The range of operation is up to 2cm to 4m, which is efficient for small scale but if we want to apply this project on large scale obstacles detection needs to be increased.

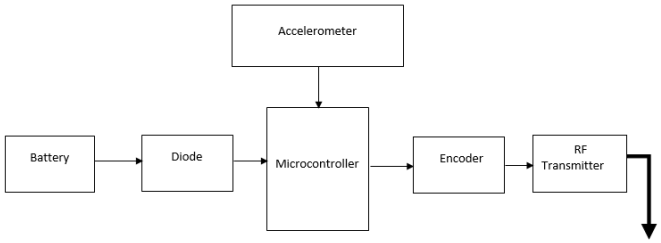
B. Methodology

Recognizing Hand Movements:

The handheld controller is a 3D rigid body that can be rotated about the three Orthogonal axes. Yaw, pitch and roll are referred to as rotation. These rotation takes place as Z axis is called yaw, the next rotation X-axis is called pitch and last rotation about the Y-axis is called roll. Any orientation can be achieved by the composing those three-elemental rotation.

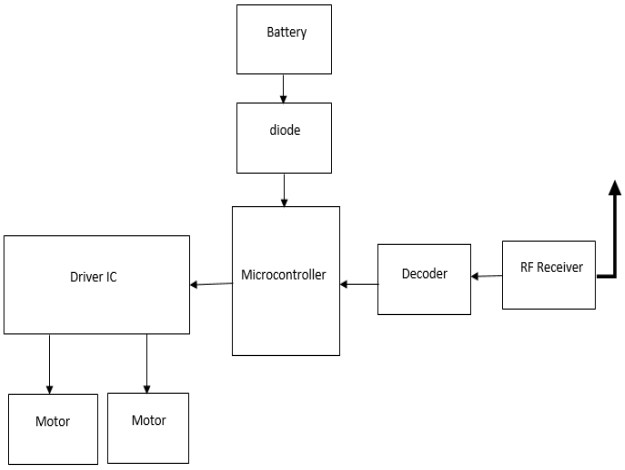
User vehicle interaction:

Transmitter:



An RF transmitter module can transmit a radio wave and modulate that wave to carry data. Transmitter modules are usually implemented alongside a micro controller which will provide data to the RF module which is transmitted. RF transmitters are usually subject to regulatory requirements which dictate the maximum allowable transmitter power output.

Receiver:



An RF Receiver module receives the modulated RF signal, and then it demodulates. There are two types of RF receiver module. Super-regenerative modules are usually of low cost and low power designs using a series of amplifiers use to extract modulated data from a carrier wave. Super-regenerative modules are generally imprecise as their frequency of operation varies in a fair amount with temperature and power supply voltage. Super heterodyne receivers having a performance advantage over super-regenerative; they offer increased in accuracy and stability over a large voltage and temperature range. This stability comes from a fixed crystal design which in turn leads to a comparatively more expensive product. Radio receiver which receives the transmitted coded signal from the transmitter are converted to digital format and output is available to the microcontroller. We based on the input coded signal, the input is given to motor driver IC and robot will behave as follows.

- Moves in forward direction
- Moves in reverse direction
- It can even turn left or right while moving forward or in reverse direction.
- In case of obstacle, moves reverse turn left or right and wait for the next instruction.
- On the spot left or right turn to pass through the narrow space

Movement of robotic vehicle:

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers as they take a low-current control signal and provide a higher current signal. This higher current signal is used to drive the motors. L293D contains two inbuilt H-bridge driver circuits. In common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high impedance state. This project controls a robotic vehicle through RF. AT89S52 microcontroller is used in this project. It is radio controlled and can be operated at a radial distance of 100m radius.

3. CONCLUSIONS

Since the updating possibilities are endless, updating the system has been kept as a future scope. The built device is cheap, and is easy to carry from one place to another. The addition of camera will make it more productive. The limitation of the hardware being associated with a system has been reduced to a great extent. The system will allow the user to control it in a way that reduces the gap between the physical world and the digital world with an output more intuitive.

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