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Autonomous Vehicle with Obstacle Avoidance and Tracking

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Abstract: - In this paper we proposes a driverless vehicle that has an onboard GPS module which is capable of driving the vehicle from one point to another without human operator. This system makes use of an Embedded System based on GSM and GPS technologies. The design and developed system installed in the vehicle. Through this project our expectation is that the vehicle should start when authorized person send predefined message on the external SIM. Smart vehicle sends current location on the predefined mobile number. The obstacle detection is required for autonomous robot. Some sensing devices used for obstacle detection like pump sensor, infrared sensor and ultrasonic sensor etc. The ultrasonic sensor is most suitable for obstacle detection and it is low cost, and has high ranging capabilities. This project used in various application such as in city wars and military applications etc.

Keywords: Autonomous vehicle, Obstacle avoidance, Tracking, GSM, GPS.

I. INTRODUCTION

Now a day, the use of autonomous vehicles is growing in various applications such as manufacturing, hazardous materials handling, surveillance, etc. An autonomous vehicle (driverless vehicle, self –driving vehicle, robotic vehicle) is a vehicle that is capable of sensing its environment and navigating without human input. Autonomous vehicles are machines that are capable of reaching the target with autonomy or performing a job or set of jobs with intelligence. An autonomous vehicle needs to be developed to allow the vehicle to reach the desired destination using tracking and obstacle detection schemes. The ultrasonic sensor is mainly used for detecting obstacles and measuring distance between robot and objects.

A. Vehicular structure

A four wheeler vehicle robot is selected for this project which is a modified version of readily Available RC car.

II. BLOCK DIAGRAM

The block diagram of project system is shown in figure 1. The microcontroller is the heart of the system; it is interfaced between GSM Module and GPS receiver. In this system the Microcontroller is programmed in such a way that it's stimulating the GSM Module in message forwarding when a request is send by a user. A GSM Module is used to send the position of the vehicle from a remote place. The GPS Module will continuously give the latitude and longitude indicating the position of the vehicle. We have used 16x2 LCD which indicates 16 columns and rows.

III. BLOCK DIAGRAM EXPLANATION

A. Power Supply

Power supply is the main basic thing for working with electronics. For the proper working of each and every component, it is important to give exact amount of voltage and the current. If the voltage or current exceeds its limit, it can be fatal. The available voltage signal from mains is 230V/50Hz, AC voltages, but the required is DC voltage (no frequency) is 3.3V and 5V. In this section the transformer and bridge rectifier are connected serially. Useful voltage regulators for 3.3V and 5V are LM1117T and 7805 respectively. This project requires 3.3V DC supply as operating voltage for the LPC2148 board. GSM Module and GPS Module require 5V supply.

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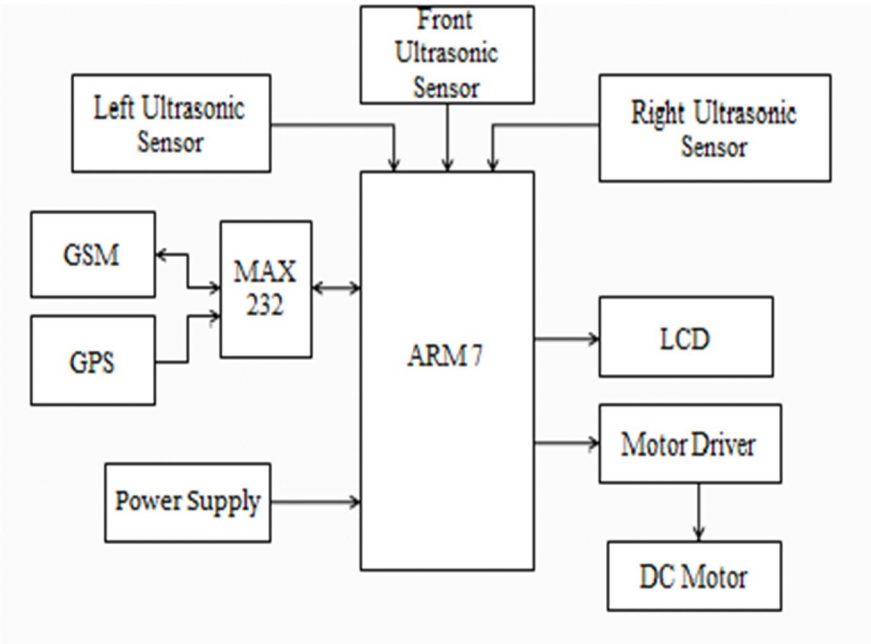


Fig.1. Block Diagram

B. Ultrasonic Sensor

Ultrasonic Sensor is very common type of sensor detecting object and measuring the distance. The GH- 311 Ultrasonic Motion Sensor provides precise, non-contact distance measurements from about 2cm to 3m. It is very easy to connect to microcontroller. The sensor is mainly used for detecting obstacles and measuring the distance between robot and the objects. The ultrasonic sensor works by transmitting an ultrasonic(well above human hearing range) burst and providing an output pulse. By measuring the echo pulse width, the distance from the object can be calculated.

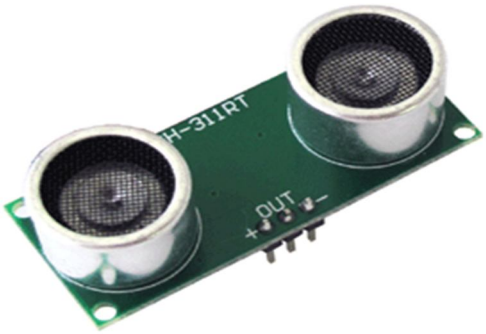


Fig.2. Ultrasonic Sensor

C. Pin Description

1) GND
2) 5V Supply
3) SIG.

The ultrasonic sensor has a male 3-pin header used to supply ground, power (+5 VDC) and signal. The header may be plugged into a directly into less breadboard, or into a standard 3-wire extension cable. The ultrasonic sensor is used to detect object by continuously transmitting a ultrasonic waves and then receiving the echo pulse from object. The ultrasonic sensor emits a ultrasonic waves at a range of 40KHz. This waves travels through the air, strikes on objects and then reflected back to the sensor.

D. GSM Module

GSM modem is connected with the ARM-7 microcontroller. These GSM modem is used to provide mobile Internet connectivity,

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most of them can also be used for sending and receiving SMS. GSM modem must operate on AT commands for sending/receiving SMS. GSM modem is cost effective solution for receiving SMS, because the sender is paying for the message delivery.

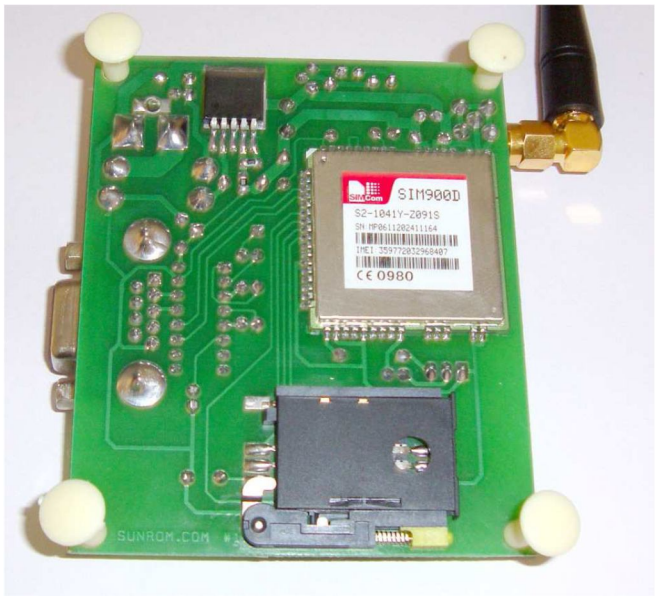


Fig.3.GSM Modem

E. GPS Module

The Global Positioning System (GPS) is a satellite based system consists of a network of 24 satellites located into orbit. The system provides essential information to military, civil and commercial uses around the world which is freely accessible to anyone with a GPS receiver. GPS works in any environment at anywhere in the world. Generally no subscription fees to utilize GPS. A GPS receiver must be locked on to the signal of at least three satellites to estimate 2D position (Latitude and Longitude) and track movement. With four or more satellites in sight, the receiver can determine user's 3D position (Latitude, longitude and altitude).Position of the vehicle can be determined by using GPS technology. GPS can also determine information like speed, distance to destination, time etc. GPS receiver is used to detect the vehicle location and provide information to responsible person through GSM technology.



Fig.4.GPS Receiver

F. Features of GPS

1) Completely self-contained (GPS Antenna, and velocity- to-pulse convertor).
2) 16 channel GPS receiver.
3) Low cost alternative to radar type speed sensor.

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IV. TRACKING SYSTEM

In this paper it is proposed to design an Embedded System which is used for tracking vehicle by using Global Positioning System (GPS). In this device ARM-7 microcontroller is used for interfacing to various hardware peripherals. The design of an autonomous vehicle is an example of embedded system which can continuously monitor a Vehicle and report the status of the Vehicle to authorized person. For doing so an ARM-7 microcontroller interfaced serially to a GSM Modem and GPS Receiver. A GSM modem is used to send position (Latitude and Longitude) of the vehicle from a remote place. The GPS module will continuously give the data which indicates the position of the vehicle in the form of latitude and longitude. The GPS modem gives many parameters as the output, but only the NMEA data coming out and sends to the mobile at the other end from where the position of the vehicle is demanded.

V. OBSTACLE AVOIDANCE

The main objective of this autonomous vehicle is to detect and avoid obstacle. The ultrasonic sensor is used to detect an object. After detecting object the vehicle may be controlled via DC motor. The ultrasonic sensor emits ultrasonic pulses continuously.

VI. RESULT

In order to experimentally verify the proposed Block Diagram, the desired System design is build and Keil Compiler with Embedded C and flash magic were used and the desired system design is as shown in fig.5.

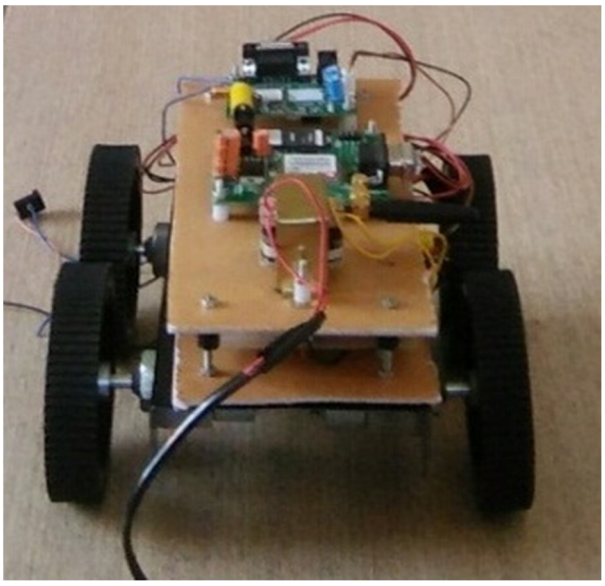


Fig.5. Autonomous Vehicle with Obstacle Avoidance and Tracking

VII. CONCLUSTION

We have developed an autonomous vehicle that can reach the destination without a human operator. As a human involvement is less, errors are reduced.

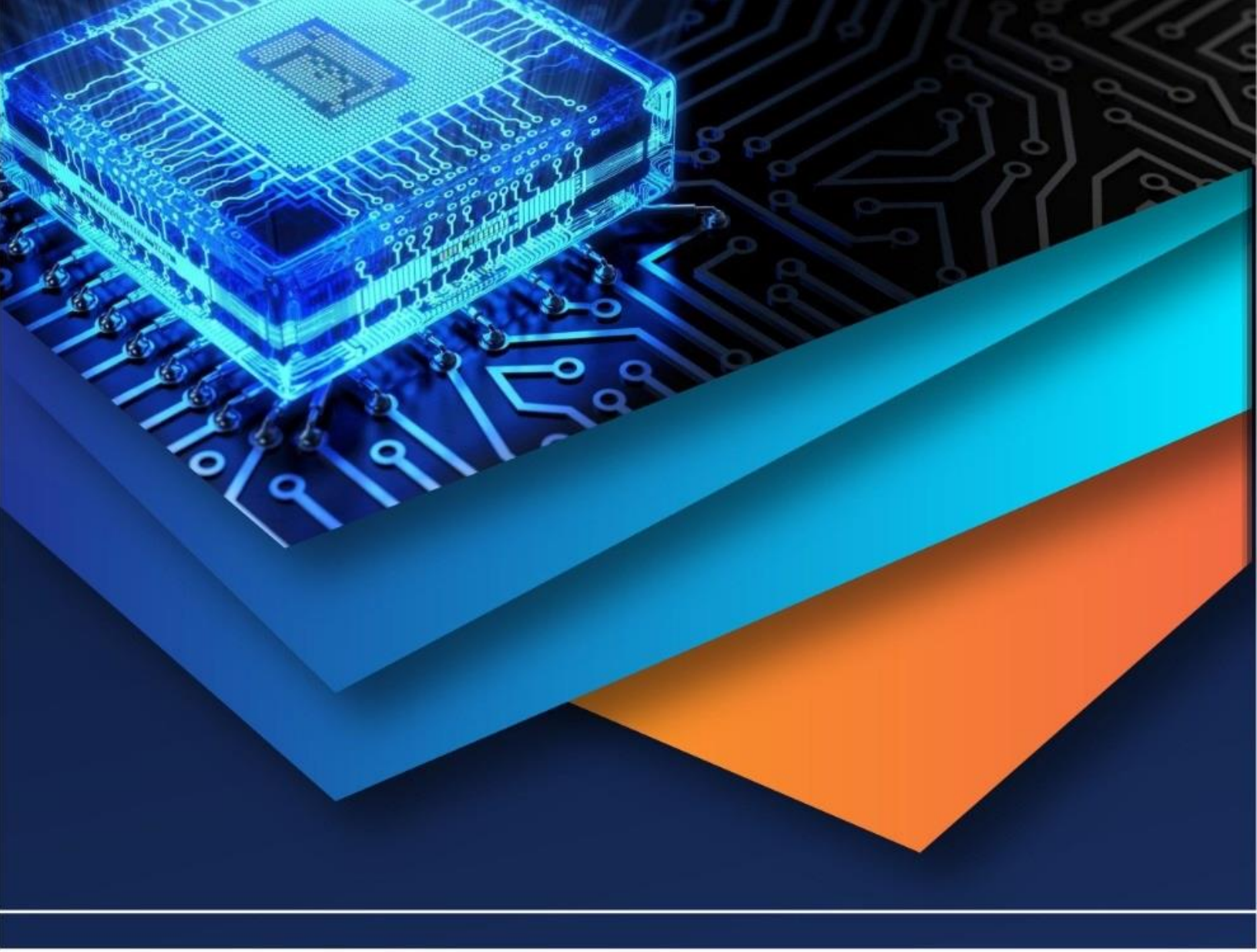
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