

Autonomous Vehicle Navigation System Based on the Global Positioning System

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Abstract-- The autonomous vehicle navigation system based on the Global Positioning System (GPS) is a new and promising technology, which uses real-time location data obtained from several GPS satellites to calculate longitude, latitude, speed and field to assist vehicle navigation. The goal of the project is to create a mobile car model that can go through well-known or pre-configured automated automates without human control. It is designed to show the feasibility of using a cheaper system to navigate and avoid the obstacle automatically. The current hardware consists of a controller, ultrasonic sensor, IR sensor, motion sensor, driver board, gear motors and GSM. This project demonstrates the development of an independent car prototype to enable it to achieve the required independence and maintain satisfactory automatic driving performance. The design objectives include simplicity, durability, flexibility and advanced performance tools. The non-driving car has an advanced driving control system, with pre-configured GPS coordinates. The acquisition of interactive computing and software has led to the development of success on the smooth running of the track. If a car crash is detected it means sending an SMS notification to an authorized person using the GSM connection.

INTRODUCTION

A few decades from now, a child from today will not admit that people are not used to driving cars physically. The march to private cars or self-driving cars is still going on and although it may take a few years to get there, the destination may be closer than most people realize. The usefulness of Autonomous Vehicle (AV) in such a wide range of applications has prompted us to focus on the development of this program. This project explores the promises and challenges in the development of self-driving automotive technology (SDV). We begin with the idea that a combination of computer-generated SDVs could be a highly skilled tool for communication, data collection, processing, and storage. However, with a focus on efficiency, SDVs provide a new form of industrial transport. SDVs also promise increased safety, speed and ease, as well as reduced power consumption. Research on autonomous vehicle

Technology can be a solution to our road problems and congestion, reduce the number of road accidents and save people time while engaging in other activities.

To accomplish a specific task the AV must be equipped with sensors and actuators. However, for any useful Purpose the AV must automatically move based on the data of the navigation sensor. The control system must know at least two things, its current location and direction of travel in order to navigate the vehicle independently. Position can be determined from an external source with new inventions such as the Global Positioning System (GPS). GPS has an advantage over other location tracking tools which in addition provides an estimate of the car's current title based on the previous two location links. Although the current GPSenabled title is sometimes incorrect, it is thought to fit GPS as a stand-alone vehicle guidance sensor that follows the direction of external applications.

OBJECTIVE

The main objectives of this project are to and an appropriate technique of navigation based pre programmed GPS coordinates.

This system will be helpful to navigate without any human control.

Electronics and software based control systems are introduced and implemented in providing positioning and directional while performing the driving tasks

I. LITERATURE SURVEY

The control component includes a network of tracking channels. These tracking stations are constantly monitoring satellite traffic; checks satellite clocks, atmospheric conditions, satellite almanac, provides necessary compensation for clock error, and uploads data to satellites. OCS (Performance Management System) consists of a central control station (MCS), several monitoring stations, and ground control stations. MCS is located in the United States at Shriver Air Force Base, Colorado Springs, Colorado.[1]

Part of the atmosphere contains a constellation of 24 satellites along the orbits. Each satellite continuously transmits GPS signals around the

world, including two company network waves, digital codes, and a navigation message. Network company frequency and codes used to determine satellite distance from recipients. The navigation message contains information such as satellite location and clock compensation.[2]

The car then sends the information to the cell phone. After this, the car waits until the user (Mobile) responds. The mobile user can determine the destination and can change it continuously. In the direction section, the system calculates the distance between the two points and draws a hypothetical line between them. After this procedure the small controller calculates the angle to the area to integrate and sets the car angle. After calculating the destination links, it will begin to move forward toward the destination. A Driver circuit that takes power from a small controller will be responsible for speed and alignment of motors. We used four engines, one for one wheel. As proposed under this Research work, the vehicle can travel to a designated barrier area so a barrier system is installed.[3]

Design and develop a “Prototype of Autonomous Vehicle based on GPS navigation” with the aim of enhancing navigation with the ATmega2560 microcontroller system that can be used as a control unit to display autonomous AV behavior. In this research project the required data is extracted from the GPS and sent to the cell phone connected to the car via the Bluetooth module. The first data is the location of the vehicle and the second data is the destination that is continuously detected by the controller with the help of a GPS sensor. The Navigation and Navigation System built under this project is responsible for collecting and analyzing GPS data. As GPS starts, it finds the car and sends the information to the cell phone. [4]

In addition to this, directional sensors are also used to determine the vehicle's current title values so that it can be directed to its destination. GPS is more advantageous than other location detection tool in addition to providing measurement of the current car title based on the previous two links. Although the current GPSenabled title is sometimes incorrect, it is thought to fit GPS as a stand-alone vehicle

guidance sensor that follows the direction of external applications. [5]

II. EXISTING METHOD & PROPOSED METHOD

EXISTING METHOD:

In the present system, come up with a new way to solve the problem of location movement planning in the area of private cars. Instead of producing a few primitives and choosing the right trajectory for that, we find the car’s status for the next step, and adapt that to the local clothed trajectory by solving a flexible planning problem. The generated trajectory is smooth enough and meets both ego car variables and traffic control issues. Repeating this process, the private car can find its future route continuously. This method has good performance in comparisons using Malta and Rescan. This method has a faster computer speed that can be used to drive a private car on a real road online compared to other methods.

PROPOSED SYSTEM:

The proposed system of this project is to build and develop an autonomous navigation car based on the pre programmed GPS coordinates. The overall process is divided in to three parts. In the first part, the car is set at the start waypoint where GPS receiver and compute current latitude and longitude. In the second part, the programmed in the microcontroller computes the direction of the destination waypoint from the current waypoint and drives the car. In the third step, the obstacle is detected by using ultrasonic sensor and automatically avoids the obstacle while driving. The two IR sensors are used in this vehicle for obstacle detection in left and right side, If the obstacle is detected by means the robot automatically changes the direction. The vehicle fall down condition is monitoring by using tilt sensor. If the vehicle fall down condition is detected means the SMS notification will be send to authorized person with the help of GSM module.

III. SYSTEM FUNCTION

ARCHITECTURE DESIGN:

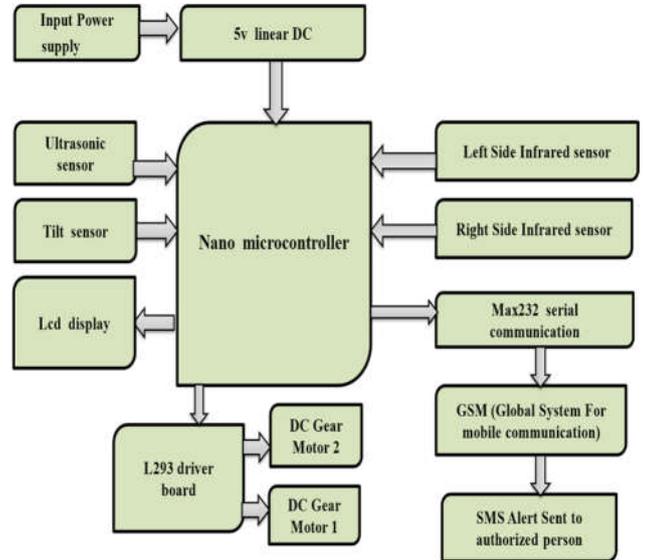


Fig.no:1 Architecture Design

Block Description

The above block diagram represents the autonomous navigation vehicle based on global positioning system GPS. The vehicle consists the blocks of nano controller, ultrasonic sensor, IR sensor, tilt sensor, GSM module, driver board, DC gear motors, power supply, 5v liner DC. The proposed system of this block diagram is to build and develop an autonomous navigation car based on the pre programmed GPS coordinates. In this system the input 12v is regulating to 5v by using 5v liner DC device. Then linear 5v DC supply is given to nano controller and all other blocks. The nano controller board will controlling the vehicle . DC gear motors is used in this block for connecting vehicle wheels. The vehicle can be controlled instruction from the controller. The ultrasonic and IR sensors will be used for obstacle detection and avoidance. The ultrasonic sensor will be placed in the front side of the vehicle and the IR sensor are

fixed left and right side of the vehicle , if the obstacle is detected means the vehicle can avoid the obstacle and move on continuously . The vehicle fall down condition is monitoring by using tilt sensor .If the vehicle fall down condition is detected means the SMS notification will be send to authorized person with the help of GSM module.

CIRCUIT DIAGRAM:

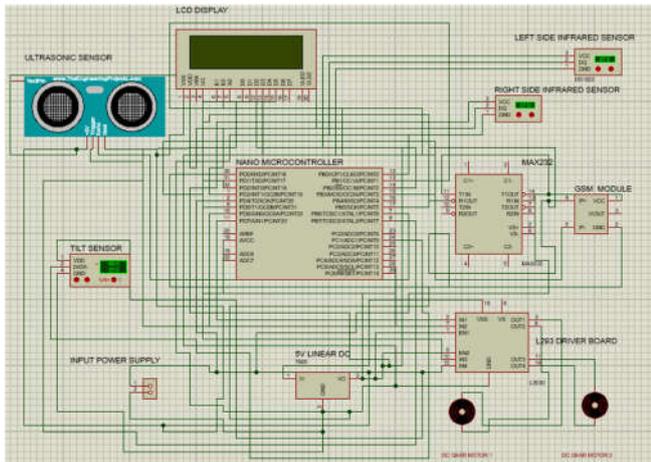


Fig no: 2 circuit diagram for proposed system

CIRCUIT DESCRIPTION

The nano controller is heart of the above circuit, it controls the whole circuit.

The 12v input power supply is given to 5v linear DC for voltage regulating 12v to 5v. Then the 5v supply is given to controller.

Ultrasonic sensor has 4 pins. Echo, Trigg pins are connected to controller pins.5v supply is connected to 5v supply. GND pin is connected to ground. Tilt sensor has 3 pins. The VDD supply pin is connected to 5v supply. GND pin is connected to ground. Output pin is connected to controller analog pin.

Infrared sensor has 3 pins. The 5v supply pin is connected to 5v supply. GND pin is connected to ground. Output pin is connected to controller digital pin. L293 Driver board controlling the robot DC motors. The driver board instruction pins are connected in controller digital pins.

GSM modules are connected to controller TX and RX pin.

In LCD display VSS pin is connected to ground, VDD pin is connected to 5v and data pins are connected to AVR controller digital pins.

IV. SYSTEM SOFTWARE AVR STUDIO

AVR Studio is associate degree Integrated Development Center (IDE) for writing and writing AVR applications on Windows 9x / Maine / NGO / 2000 / XP / visual image / 7/8 Environments. AVR Studio provides a project management tool, supply file editor, template, compiler and front-end C / C ++, editing, simulation and on-chip debugging Studio supports a full vary of ATMEL AVR tools and every unleash can continuously contain the most recent updates. . On each tools and support for brand new AVR devices. AVR Studio four includes a standard style, which permits for added communication with thirdparty computer code vendors. GUI plugging and alternative modules are often written and coupled to the system.

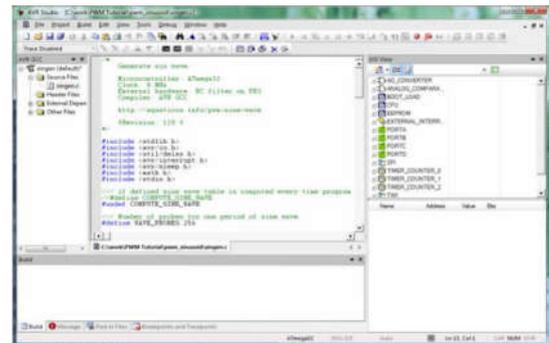


Fig no: AVR studio window page

EMBEDDED C PROGRAM

Embedded C is a set of C language programming language extensions by the C Levels Committee to address similar issues that exist between C extensions for different embedded systems. Historically, C-embed editing requires unusual extensions in the C language to support unusual features such as fixed-point arithmetic, many different memory banks, and basic I / O functions.

V. HARDWARE REQUIERMENTS & SPECIFICATIONS

NANO MICROCONTROLLER

The Nano board is supposed in such the best method that it's extremely straightforward for beginners to urge started with microcontrollers. This board particularly is bread board friendly is improbably straightforward to handle the connections. Let's begin with powering the Board.



Fig no: 3 C-TYPE CH 340 NANO CONTROLLER

GSM (Global System for Mobile Communication)

The GSM modem can accept any SIM card of the GSM network operator and act as a mobile phone with its own unique phone number. The modem can be connected to the PC serial port directly or to any microcontroller via MAX232. It can be used to send and receive SMS or to make / receive voice calls. It can also be used in GPRS mode to connect to the Internet and perform many data entry and control programs. In GPRS mode you can also connect to any remote FTP server and upload files to log data. This GSM modem is a very flexible plug and plays quad band SIM900A GSM modem straightforward and easy integration into RS232 systems. Supports features such as voice, SMS, Data / Fax, GPRS and integrated TCP / IP stack.

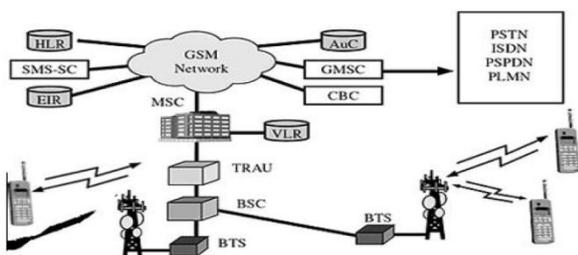


Fig.no:4 GSM Network architecture

MAX232

IC MAX232 is used for the conversion of TTL / CMOS to RS232. Which means most of our Microcontrollers (PIC / ARM / AVR) operate on smart TTL / CMOS which means it communicates with 0V or + 5V, but our computers operate with the help of RS232 operating at logic level -24V or + 24V. Therefore, if we have to connect these small controls via a computer we need to convert TTL / CMOS logic to RS232 logic.

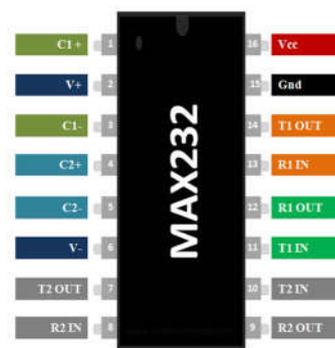


Fig.no:5 MAX232 Pin out

INFRARED SENSOR

Infrared technology deals with a wide variety of wireless applications. The main areas are sensors and remote controls. In the electromagnetic spectrum, the infrared component is divided into three regions: the near infrared region, the central region and the infrared distance.



Fig no: 6 IR sensor

TILT SENSOR

The tilting sensors are devices that generate electrical signals that vary depending on the angular motion. These sensors are used to measure the slope and orientation within a limited range of motion. Sometimes, moving sensors are called inclinometers because the sensors

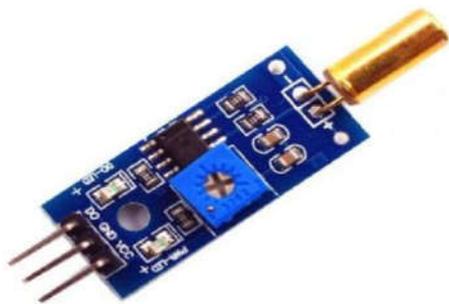


Fig no:7 tilt sensor

to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive **ULTRASONIC SENSOR**

Ultrasonic transducers and ultrasonic sensors are devices that generate or feel the power of ultrasound. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can transmit and receive ultrasound.

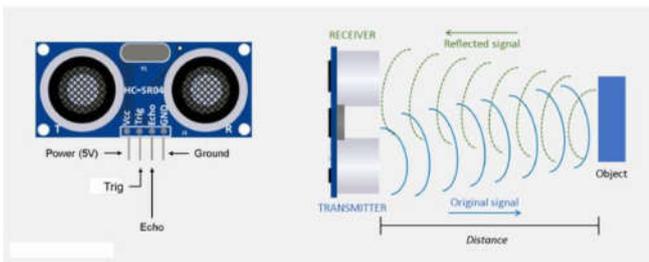


FIG NO: 8 ULTRASONIC SENSOR

L293 DRIVER BOARD

An H bridge is AN electronic circuit that permits a voltage to be applied across a load in any direction. Hbridge circuits are overtimes utilized in artificial

intelligence and plenty of different applications to permit DC motors to run forward & backward. These control circuits are principally utilized in completely different converters like DC-DC, DC-AC, AC-AC converters and plenty of different kinds of power electronic converters. In specific, a bipolar stepper motor is often driven by a motor controller having 2 Hbridges

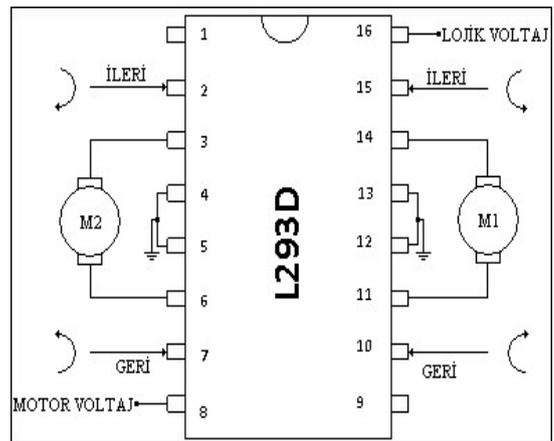


Fig. no: 9 L293 diver board IC

DC GEAR MOTOR

Geared DC motors can be described as a DC car extension that already has its Insight details downloaded here. Geared DC Motor has a gear assembly connected to the engine. The speed of a car is calculated according to the rotation of the shaft per minute and is called RPM. Gear consolidation helps increase torque and reduces speed. Using the right combination of gears in a gearbox, its speed can be reduced to any desired number. The idea of having gears slows down a car but increasing its torque is known as gear reduction. This Insight will check all the small and large details that make up the gear head as well as the performance of the geared DC motor.



Fig no: 10 Gear motor

VI. CONCLUSION

The task is to design an independent driving system based on a global GPS system that will make the driver of a small car safe enough to drive on the road. The goal was to develop a system that would work in the area of the sensor and microcontroller and would be able to control the car, thus taking on the responsibilities of the driver, providing manageable control over it. If a car crash is detected it means sending an SMS to an authorized person using the GSM connection.

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