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OBSTACLEAVOIDINGROBOT

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ABSTRACT:
The Aim of the project is to design an Obstacle Avoiding Robot. Robotics is an Interesting and fast growing field. Being a branch of engineering, the applications of robotics are increasing with the advancement of technology. The concept of Mobile Robot is fast evolving and the number of mobile robots and their complexities are increasing with different applications. There are many types of mobile robot navigation techniques like path planning, self – localization and map interpreting. An Obstacle Avoiding Robot is a type of autonomous mobile robot that avoids collision with unexpected obstacles. In this paper, an Obstacle Avoiding Robot is designed. It is an Arduino based robot that uses Ultrasonic range finder sensors to avoid collision. The automated cars detection is one of the part and it works with internet, gps and sensors.

1. INTRODUCTION:

1.1 EMBEDDEDSYSTEMS:

An Embedded System is a controller programmed and controlled by a Real Time Operating System (RTOS) with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors manufactured are used in embedded systems.

Examples of properties of typical embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact

with. However, by building intelligence mechanisms on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functions, well beyond those available. For example, intelligent techniques can be designed to manage power consumption of embedded systems.

Modern embedded systems are often based on microcontrollers (i.e. CPUs with integrated memory or peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more complex systems. In either case, the processor(s) used maybe types ranging from general purpose to those specialized in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).

Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, and largely complex systems like hybrid vehicles, MRI, and avionics. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

Fig:1.1 Microcontroller Chip

1.1.1 Characteristics:

Embedded systems are designed to do some specific task, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs.

Embedded systems are not always standalone devices. Many embedded systems consist of small parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself.

The program instructions written for embedded systems are referred to as firmware, and are stored in read-only memory or flash memory chips. They run with limited computer hardware resources: little memory, small or non-existent keyboard or screen.

1.1.2 : Features of Embedded Systems:

The versatility of the embedded computer system lends itself to utility in all kinds of enterprises, from the simplification of deliverable products to a reduction in costs in their development and manufacture. Complex systems with rich functionality employ special operating systems that take into account major characteristics of embedded systems. Embedded operating systems have minimized footprint and may follow real- time operating system.

The special computer system is usually less powerful than general-purpose systems, although some expectations do exist where embedded systems are very

powerful and complicated. Usually a low power consumption CPU with a limited amount of memory is used in embedded systems. Many embedded systems use very small operating systems; most of these provide very limited operating system capabilities.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Some embedded systems have to operate in extreme environment conditions such as very high temperature & humidity. For high volume systems such as portable music players or mobile phones, minimizing cost is usually the primary design consideration. Engineers typically select hardware that is just "good enough" to implement the necessary functions. For low volume or prototype embedded systems, general purpose computers may be adapted by limiting the programs or by replacing the operating system with a real-time operating system.

2. EXISTINGS YSTEM:

2.1 INTRODUCTION:

In simple robot, steering algorithm is used for robotic actions in which driver or a human being is controlling the robot using remote. Here driver is present, who can see the obstacle and navigate robot accordingly. Robot is design to allow robot to navigate in unknown environment by avoiding collisions. Obstacle avoiding robot senses obstacles in the path, avoid it and resumes its running. There are some very famous methods for robot navigation like wall-following, edge detection, line following. ROBOTICS are a fast growing and interesting field. ROBOT has sufficient intelligence to cover the maximum area of provided space. Introduce the design and implementation of an autonomous obstacle -avoiding robot car using ultrasonic wave sensor. By sending pulses, the obstacle avoidance distance can be measured. At the

same time, we can control steering gear to realize the obstacle avoidance function. The robot car uses front axle steering, rear wheel drive arrangement. Two drive tires are driven by two DC motors with gear reduction mechanisms. Using Arduino MCU chip as the control core of the Robot car. Through the design of the hardware and software system, we build the robot car platform and obtain a good experimental effect.

3. PROPOSED SYSTEM:

3.1 INTRODUCTION:

The project proposes a autonomous robotic vehicle, In which no remote is used for controlling the robotic actions. It intelligently detects obstacles present on its path through the sensors, avoid it and take decision on the basis of internal code that we set for it. The detail information is given in the following subtopics which will help you to understand the whole system and its design.

We have considered in the project as shown in below:

Hardware Requirements Software Requirements

3.2 HARDWAREREQUIREMENTS

3.2.1 ARDUINOUNO:

3.2.1.1 Introduction:

The word UNO means “one” in Italian and was chosen to mark the initial release of Arduino software. The Arduino Uno is an open source microcontroller board based on the microchip ATmega328P microcontroller and developed by Arduino.cc. This controller comes with 2KB SRAM, 32KB of flash memory, 1KB of EEPROM. Arduino Uno is a very valuable addition in the electronics that consist of USB interface, 14 digital I/O pins, 6 analog I/O pins. It also supports serial communication using TX and RX pins and it totally consists of 40 pins. It is programmable with the Arduino IDE (Integrated

Fig 3.1ArduinoUno

Development Environment) which is free to use and required some basic skills to learn it. It can be programmed using C and C++ language.

3.2.1.2 Pin Configuration:

A typical example of the Arduino board is Arduino Uno. It includes an ATmega328 microcontroller and it has 28-pins.

The pin configuration of the Arduino Uno board is shown in the above. It consists of 14-digital i/o pins. Where in 6 pins are used as pulse width modulation o/ps and 6 analog i/ps, a USB connection, a power jack, a 16MHz crystal oscillator, a reset button, and an ICSP header. Arduino board can be powered either from the personal computer through a USB or external source like a battery or an adaptor.

Fig3.2 Arduino Pin Diagram

Arduino board can be powered either from the personal computer through a USB or external source like a battery or an adaptor. This board can operate with an external supply of 7-12V by giving voltage reference through the IO Ref pin or through the pin in figure.

3.2.4 GSM MODULE:

3.2.4.1 Introduction:

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at bell laboratories in1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

GSM system was developed as a digital system using Time Division Multiple Access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular timeslot. The digital system has an ability to carry 64kbpsto 120mbpsof data rates.

There are various cell sizes in a GSM system such as macro, micro, pico and umbrella cells. Each cell varies as per the implementation domain. There are five different cell sizes in a GSM network macro, micro, Pico and umbrella cells. The coverage area of each cell Firies according to the implementation environment.

Fig3.3GSM module

3.2.5 MOTORDRIVER(L239D):

3.2.5.1 Introduction:

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive oneither direction. L293D is a 16-pinIC whichcancontrola set oftwo DC motors simultaneously in any direction.

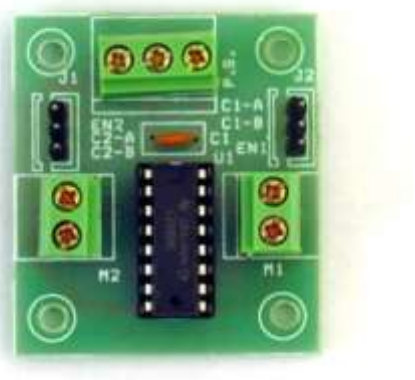


Fig3.4. L239Dmotor driver

It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltageneed to change its direction for being able to rotate the motor in clockwise or anticlockwise

direction, Hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due to its size it is very much used in robotic application for controlling DC motors.

3.2.6 GPSMODULE:

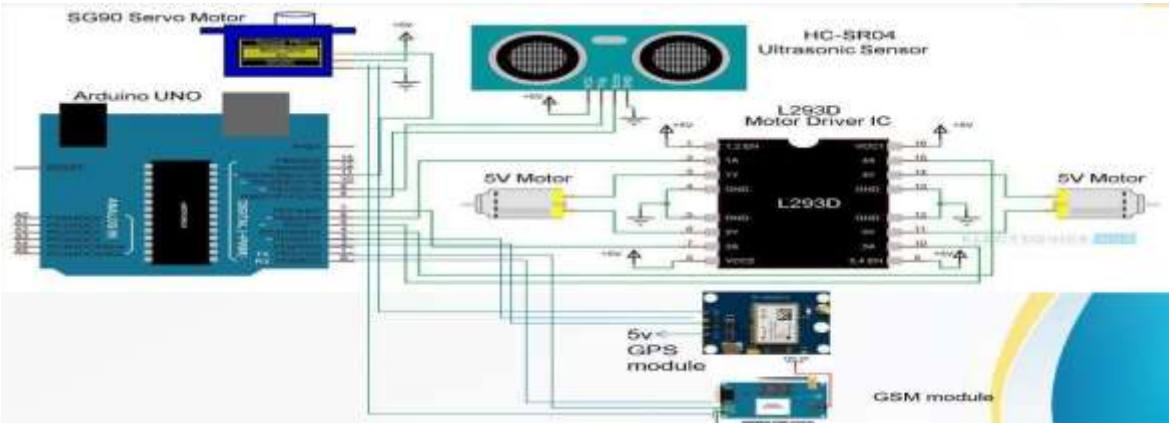
You have probably used or benefitted from a GPS receiver. They are found in most smart phones, many new automobiles, and they are used to track commerce all over the globe. These tiny devices can instantaneously give your exact position and time, almost anywhere on the planet, for free! All you need is a GPS receiver, and receivers are getting less expensive and smaller every day. Antenna - Remember,

that little GPS module is receiving signals from satellites about 12,000 miles away, not only above your head, but anywhere in the sky. For the best performance, you want a clear path between the antenna and most of the sky. Weather, clouds, snow storms, shouldn't affect the signal, but things like trees, buildings, mountains, the roof over your head, will all create unwanted interference and your GPS accuracy will suffer.

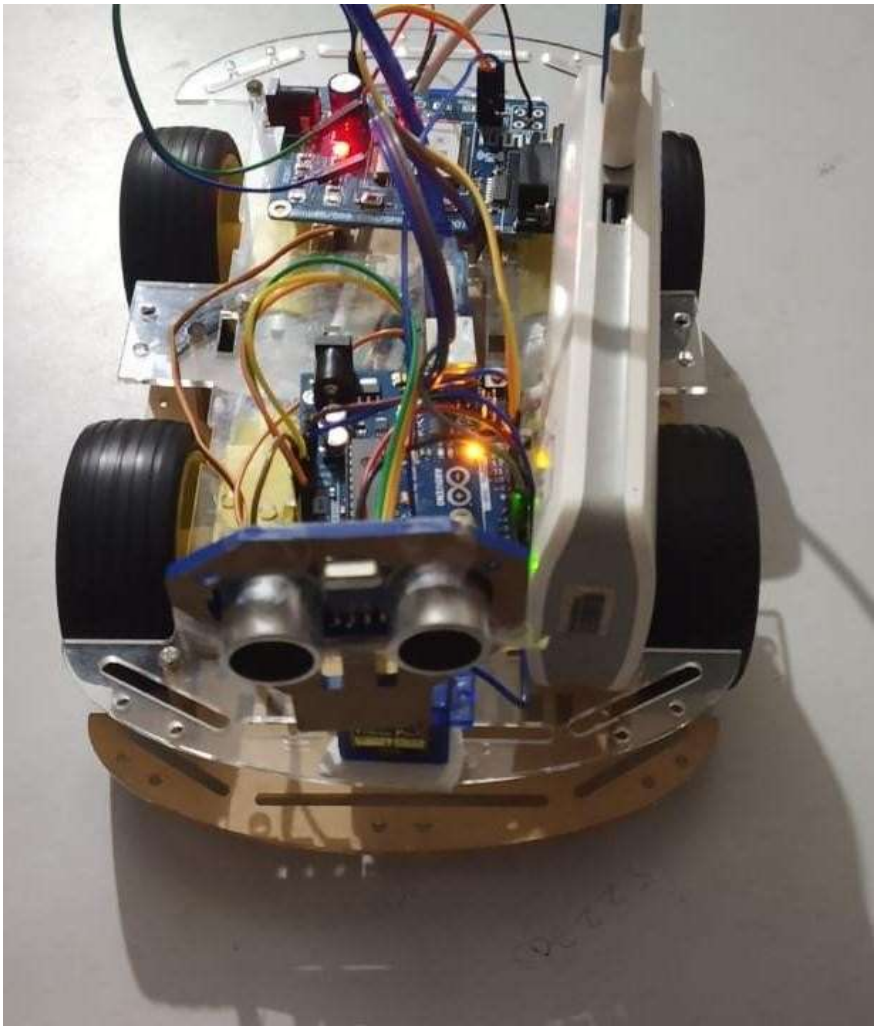
4. WORKING:

Ultra sonic sensor is used to detect the obstacle in the path. It takes trigger pulse as a input from the arudino and transmit to the signal to outside surroundings and receiving echo pulses and it gives as input to the arudino uno. depending on the received echo pulse it can be defines the distance between the vehicle and the obstacle. If the obstacle is detected then ultrasonic sensor changes its direction using servomotor. The servo motor is used to rotate both directions in required angles. Motor driver ic is used to drive the wheels of the vehicle. It consists of four input pins and four output pins. The driver takes input from the digital pins of arudino and the dc motors are attached with wheels. These dc motors receive inputs from the outputs of the motor driver ic. It takes an external power supply to drive the dc motors depending upon the inputs given to the driver ic the vehicle can move right, left or front. Whether if the obstacle is detected in three directions there is no movement in the vehicle then by using GPS module it tracks the location of the vehicle and send the required message signal to the registered mobile number by using GSM module.

BLOCKDIAGRAM


SG90 Servo Motor
HC-SR04
Ultrasonic Sensor
Arduino UNO
L293D
Motor Driver IC
5V Motor
L293D
5V Motor
5v
GPS
module
GSM module

5 RESULT:



6. CONCLUSION AND FUTURESCOPE:

This paper developed an obstacle avoiding robot to detect and avoid obstacles in its path. The robot is built on the Arduino platform for data processing and its software counterpart helped to communicate with the robot to send parameters for guiding movement. For obstacle detection, three ultrasonic distance sensors were used that provided a wider field of detection. The robot is fully autonomous and after the initial loading of the code, it requires no user intervention during its operation. When placed in unknown environment with obstacles, it moved while avoiding all obstacles with considerable accuracy. The work done in this project can act as a base for further improvements to increase accuracy and adaptability of obstacle detection in diverse environments. In future, the authors of this project intend to test the feasibility of integrating different types of sensors to complement each other's disadvantages. For instance, imaging sensor can be beneficial when ultrasonic sensor may not correctly identify obstacles in environment subjected to ambient noise and varying temperature or air pressure. The accuracy of determining the distance to the obstacles can be increasedby the inclusion of an electronic barometer for automatic adjustment of the speed of sound in air. Also the addition of a Bluetooth device can offer the flexibility of remotely changing control parameters in the code.

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