

# Short Distance Autonomous Vehicle

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**Abstract:** Automation is necessary, in this society and lot of fields are moving towards automation. People who have some disability and handicaps are helped by peoples. So, automation and robotics can be used to help them by various techniques. Transportation is one of the main parts of helping them. This project is a prototype that senses the obstacles and move from one place to other by GPS system. This system is developed as “Short Distance Autonomous Vehicle” based on location which can be implemented for transportation in future.

**Keywords:** Location, GPS and GSM module, Obstacle sensing, Arduino program.

## 1. Introduction

Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics forms an attractive medium for low cost automation. The main advantages of all pneumatic systems are economy and simplicity. Automation plays an important role in various fields like medical, manufacturing and etc.

Autonomous vehicles are emerging as high part in the society. They are also used for transportation for peoples. Mainly it is applied in particular areas where people cannot easily move. So, this vehicle plays a role for peoples to move from point A to point B.

And this vehicle is designed to move from a particular point to another point. This process is done by detecting the latitude and longitude values with GPS. Based on the values the vehicle gets move from the point.

A self-driving vehicle is also known as autonomous vehicle, driverless or robotic vehicle. It is capable of sensing its environment and moving safely with little or no human input.

This vehicle is raised with components such as GPS, GSM, DC Motor, Arduino UNO processor and IR sensor. The IR sensor is the device that is used for sensing the obstacles at the front of the vehicle to move in a safety manner.

IR sensor is used to guide the movement of the vehicle, where it is a combination of IR transmitter and photo diode. GPS can be integrated in two forms such as autonomous route calculation which provides way direction and control algorithm provides the navigation of the vehicle.

Battery used for this vehicle is a solid battery with a capacity of 12V with 7.2 Amps. The battery is a rechargeable battery and power coil can also be used for recharging while the vehicle moves.

The power stored in the battery is used to drive the DC motor that causes the movement to Vehicle. The speed of rotation of DC motor i.e., velocity of Vehicle is controlled by the microprocessor controller.

This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

### A. GPS

It is an ultra-highly sensitive and smart antenna GPS module that enables high performance navigation in most stringent applications.

The two main data that we get from GPS module are:

- Current data and time based on Coordinated Universal Time.
- Our current position coordinate in terms of latitude and longitude.

### B. GSM

Global System for Mobile Communication which is one of the leading digital cellular system. GSM uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency.

### C. IR Sensor

An Infrared Sensor is an electronic device, that emits in order to sense some aspects of the surroundings. IR sensor is a light sensitive optoelectronic component with a spectral sensitivity in infrared wavelength range of 850nm. Passive IR sensors are most often used for motion detection, that measures IR light radiation from object in its field of view.

### D. Arduino Uno

The Arduino UNO is an open source microcontroller board based on the Microchip ATmega 328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input and output pins that may be interfaced to various expansion boards and other circuits.

### E. DC motor

A DC Motor is a class of rotary electrical motors that converts direct current electrical energy into mechanical energy the forces produced by magnet.

## 2. Inter Components

### A. GPS

The general concept of the system is to use the satellite based Global Positioning System (GPS) to determine the 3-dimensional positions and velocity of the aircraft. This information is then broadcasted via radio frequency (RF) at periodic intervals to other aircrafts with the same system in a 30km vicinity. While the system is not transmitting its position and velocity, it will be on standby mode in other words receiving and monitoring the positions and velocities of other aircrafts in the same area. All this information will then be displayed on a personal digital assistant (PDA), showing the aircrafts position and other aircrafts within the 30km radius.



### B. GSM

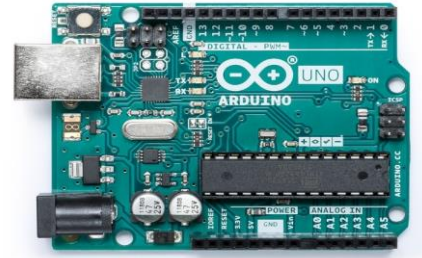
It is the most popular standard for mobile phones in the world. Its promoter, the GSM Association, estimates that 82% of the global mobile market uses the standard. GSM is used by over 3 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs from its predecessors in that both signaling and speech channels are digital, and thus is considered a second generation (2G) mobile phone system.



### C. Arduino Uno

The Arduino Uno board is a microcontroller based on the ATmega328. It has 14 digital input/output pins in which 6 can be used as Arduino is a single-board microcontroller meant to make the application more accessible which are interactive objects and its surroundings. The hardware features with an

open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Current models consists a USB interface, 6 analog input pins and 14 digital I/O pins that allows the user to attach various extension boards.

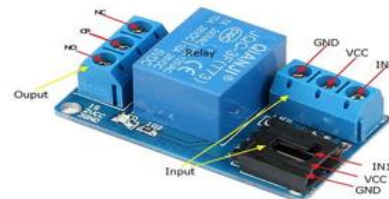


### D. DC motor

The electrical motor is an instrument, which converts electrical energy into mechanical energy. According to faraday's law of Electromagnetic induction, when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force whose direction is given by Fleming's left-hand rule.

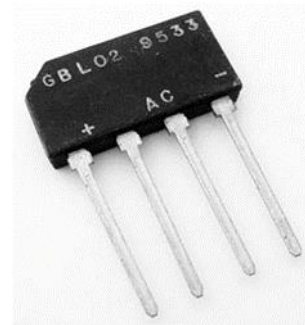
### E. Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.



### F. Rectifier

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction.



## 3. Operation

The straight-line motion drive is provided by the DC motor fixed at the rear wheel shaft of vehicle. The supply of the

current is given by the battery provided on the sheet metal.

The stored energy from the battery is supplied to D.C motor.

The straight-line movement of the vehicle is done by the D.C motor (12 V/ 2A). The motor is fixed at the rear wheel shaft of the vehicle. The supply to the motor is given by battery (12 V/7 Ah). This battery also gives the supply of current to the microcontroller.

The already energy stored in battery is sent to D.C motor control circuit. The D.C motor works according to the program written on the microcontroller chip. (i.e.) vehicle moves to a distance of specified value and at that instant power supply to D.C motor is cut off and again a power supply is given to the D.C motor so that the vehicle moves in a curved path. So the specified path which is needed for us is obtained by the above procedure.

Dry solid battery is used. The batteries output is given to the control unit. Control unit having four relays, they are connected to the two D.C motor in Forward and reverse rotation of operation.

- Relay 1 - Forward Direction
- Relay 2 - Reverse Direction
- Relay 3 - Left Turn
- Relay 4 - Right Turn

At first vehicle is moving in forward direction when the switch is on. The path is already programmed in a control unit. Then the control unit activates the proper relay so that the vehicle moves in forward direction for particular time period. Then the vehicle turns in left direction for particular time period. Then the vehicle turns right for particular time period.

The straight line motion is provided in the back wheel drive with the help of spur gear mechanism. The straight-line movement of the vehicle is done by the D.C motor (12 V/ 2A). The motor is fixed at the rear wheel shaft of the vehicle with the help of proper arrangement.

The Left/Right motion is provided in the front wheel drive with the help of rack and pinion mechanism. The left/right movement of the vehicle is done by another D.C motor (12 V/ 2A). The motor is fixed at the front wheel shaft of the vehicle with the help of proper arrangement.

#### 4. Advantages of Autonomous Vehicle

1. Without the necessity for a driver, cars could become mini-rest rooms. There would be a lot of space and no need for everyone to face forwards. Entertainment technology, such as video screens, could be used to gleam long journeys without the concern of disturbing the driver.
2. Over 80% of car crashes in the USA are because of driver negligence. There would be no bad drivers and less mistakes on the roads, if all vehicles became driverless.
3. Travelers would be able to journey overnight and sleep for the duration.
4. Sensory technology could potentially perceive the environment better than human senses, seeing farther

ahead, better in poor visibility, detecting smaller and bigger obstacles.

5. Efficient traveling also means fuel savings, cutting costs.
6. Reduced need for safety gaps means that road capacities for vehicles would be significantly increased.

#### 5. Disadvantages of Autonomous Vehicle

1. Driverless cars would be costly for ordinary people when introduced in the market.
2. Truck drivers and taxi drivers will lose their jobs, as autonomous vehicles increased.
3. Hackers getting into the vehicle's software and handling or affecting its operation would be a major security issue.
4. Self-driving cars would be great news for terrorists, as they could be loaded with explosives and used as moving bombs.
5. Human behavior such as hand signals are difficult for a computer system to understand.
6. If the car crashes, the fault cannot be detected, whether it is due to Google/software designer or the owner of the car.
7. Police cannot interact with the driverless cars especially in the case of accidents and crime.

#### 6. Result and Conclusion

##### A. Result

The Short Distance Autonomous Vehicle is designed and fabricated, the links are made up of mild steel. DC motors are used for the driving of rear wheels. The steering controls are designed in the front wheels. The ARDUINO software is used for the command of vehicle to move from point A to point B.

The GPS working is achieved by detecting the latitude and longitude point of the vehicle. And GSM is used for knowing the movement of the vehicle. The integrated program runs the vehicle in current path and the process is achieved.

##### B. Conclusion

This brings you to the end of this project a challenging venture. It has been a valuable experience for us thought out this project. We have had opportunity to learn more about the automation.

Finally, efficiency obtained could be further improvement by adding solar panel, so that increasing efficiency of the vehicle. By selecting suitable material, we can increase the efficiency. This is very useful in all industries material handling department. The man power requirement in the industries is reduced by adding automated guided vehicle.

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