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Ministry of Higher Education
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Design of Antitheft system for vehicles

A graduation project

Submitted to the College of Engineering/Al- Musayab / Automobile Engineering Department in Partial Fulfillment of Requirements for the Degree of Bachelor of Science in Automobile Engineering

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By:

حسين محمد غازي ..... سجاد ناصر شلاكه

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ

الاهداء.....

إلى شمس الضحى بدر الدجى نور الهدى . .... سيدي محمد واله صلى الله عليه وسلم

إلى الأرواح الطاهرة التي لونت ارض الطف بالدماء والكبرياء ...

إلى روح كل شهيد دفع دمه ثمنا للحرية.

الى من يسري بدمي وينبض بقلبي ويملك عرش حسي وطني.

إلى الذي بذل جهد السنين سخيا وصاغ من الايام سلام العلا لأرتقي.

بها سلم الحياة ومصدر فخري ..... والدي العزيز.

إلى التي أوقدت عمرها شموعا في دربي ينبوع الحنان ..... والدتي الحبيبة.

امدهما الله بالصحة والعافية.

الى من اشد بهم ازري أعز ما املك . إلى شذى المحبة ونور البراءة .

عائلتي.

إلى الوجوه النظرة والقلوب العطرة ..... اصدقائي.

إلى الشموع التي اضاءت لي طريق العلم اساتذتي.

اهدي ما وفقني اليه ربي ردا قليلا للجميل..

شكر وتقدير

لا يفوتني وأنا في غمار المراحل النهائية لبحثي من أن أتقدم بالشكر والعرفان لكل من أعانني على انجاز هذا البحث، و أولهم ((الأستاذ الفاضل حامد حسين هدوان)) لدوره القيم في الأشراف والذي كان له الأثر الكبير في اخراج هذا البحث بشكله النهائي. أقدم خالص شكري ومتناني له ولكل من ساعدني في انجاز هذا البحث وأقدم احترامي وثنائي الجليلين لعائلتي الكريمة بكلمات معطرة وفاء الصبرهم وما وفروه من ظروف ملائمة لإتمام هذا البحث وادعوا الله سبحانه وتعالى أن يديم عليهم فضله ونعمته وستره ويتولاهم برعايته ورحمته في كل وقت وأينما كانوا وعذرا لكل من فاتني ذكره . والحمد لله أولا وأخرا وله المنة والفضل ومنه السداد والتوفيق.

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Abstract

On average, 2,000 cases of car theft are reported each year in Morocco, and the number is still increasing. If not recovered soon, stolen vehicles are generally sold, revamped or even burned if the resale price is considered to be too low. Once a vehicle is stolen, it becomes hard to locate it and track it, which considerably decreases the chances of recovering it. The system designed to treat cases that occur in most countries of the world, car thefts. The purpose is to provide special protection for cars and it is not expensive.[1] **The system depends on the presence of vibration that occurs in the case of breaking glass, where the breakage leads to activation of the emergency system, disabling the fuel pump, which is the main element in the car, which leads to Engine disabled.**

Introduction

1.1 Overview Work

Now a day the cases of vehicle theft increases very much and the existing methods have various shortcomings like the logics used cannot be implied in all situations. Also the available security systems in the market contain either a locking system or a GPS based tracking system. The problem with this normal locking system is that an expert can easily unlock the vehicle if he has the necessary tools. There are so many recent technologies evolving and new methods are being upgraded in overcoming this issue.[2]

A car with Electronic control unit security system helps the user to lock and unlock doors at the press of a button. Mainly two types of Electronic control unit are used in Auto industry -Automatic Electronic control unit and Manual Electronic control unit that ensures smoother and secured operation. Again this system could not prove to provide complete security and accessibility of the vehicle in case of theft. So a more developed system makes use of an embedded system based on vibration technology. The designed & developed system is installed in the vehicle.[2]

The car anti-theft system guarantees the best insurance[2]

The car is from different types of burglary cases. We can secure the car from theft by changing the fuel route in the event of any vibration in the car. Anti-theft car[2]

and tracking system is a total security and fleet management solution. It is the technology used to detection robber, lock engine and determine the location. Determine the location of a vehicle using different methods like GPS and other navigation system operating via [2]satellite and ground based stations. Modern vehicle tracking system use GPS technology to monitor and locate our vehicle anywhere on earth, but sometimes different types of automatic vehicle location technology are also used.

The system consists of two very important parts, the first being the fuel trajectory change. The system is designed to stop the engine from running in the event of theft, and the second system relies on tracking the thief through the GPS system.[2]

1.2 Problem Statement

Cars are expensive items and probably one of the most stolen possessions around the world. In the last decade stolen cars increased with urban cars increase, an efficient security mechanism is needed for cars in order to protect it from robbery.[2]

1.3 Proposed Solution

This project provides solution to protect vehicle from robbery. It provides real-time information such as location from anywhere through the mobile phone app. Also when the vehicle has been stolen the owner can lock or unlock the engine from his mobile phone application.[2]

1.4 Aims and Objectives

The main aim is to propose anti-vehicle theft system which will protect cars from robbery

To achieve this goal:-

- to design and build a remote-controlled anti-theft vehicle
- To disable the car from theft by changing the fuel route, i.e. stopping the engine from running permanently[2]

1.5 Methodology

Before start implementing the project, problem statement need to be analyze. And why the project is conducted. Problems that need to be identified would not only be the one which might occur during conducting the project but also with the system that is to be design. That includes the type of microcontroller that is going to be used. Therefore, a suitable component to achieve the propose solution. After choosing the suitable microcontroller and component, then the next step is to choose a programming language in order to program the microcontroller and to use it. Thus, research needed to be done in order to know which programming languages can provide the better solution with the programming by knowing each languages pros and cons. In order to start designing a system, The main number controller in the system design has two types of sensors (the first type is the fuel sensor and the second type is the vibration sensor) and the alarm that works on the alarm system[2]

Literature Review

2.1 Overview

Thousands of vehicles are lost each year in the state and thousands of vehicles are also recovered by the police from when they catch the robbers or even when the robbers leave the vehicles they have stolen after they have used them. The usual problem with the recovered vehicles did not be found in the same jurisdiction as one in which the complaint was launched. So, when a vehicle is recovered, usually the Police try to trace out the actual owner of the vehicle from the RTO based on the license and chassis number. But this is a lengthy and time consuming process for the RTO to trace out the actual owners from the records and inform back to the Police stations. Because of these delays, vehicles that are recovered all long time to actually reach their owners. Despite the various technologies that have been introduced in recent years to detect car thefts and tracking it.[2]

Vehicle security is always been an important priority in the automobile industry. Various techniques like central locking system with alarm were one of the security parameter, which could only protect against thefts only when the vehicle was stationery. However, to keep in touch with a remote vehicle and track its other aspects like speed and location are being developed and tested, Today's generation phones are not only capable of sending mails, making phone or video calls but also have the capability to control other smart[2]

Phones. Therefore an intelligent auto theft detection system is designed in such a way it can predict the event of theft accurately

Vehicle theft system tracking and control ensures the best guarantee

To protect your car from different types of theft situations. It is a car safety device Provides excellent protection for your car. Central security lock car the system helps the user to lock and unlock the engine with the push of a button. Vehicle tracker and lock system is used to keep track of the driving password using GPS technology and a car fuel lock system It has become popular because it is an inexpensive, convenient and accessible method To transmit and receive data with high reliability

2.2: Related Work

In 2013, Kashyap proposed Tracking and Controlling of Theft Car, vehicle tracking and locking systems used to track the theft vehicle by using GPS and GSM technology. This system puts into the sleeping mode vehicle handled by the owner or authorized persons; otherwise goes to active mode. The mode of operations changed by persons or remotely. When the theft identified, the responsible people send SMS to the micro controller, then microcontroller active the relay and issue the control signals to stop the engine motor. After that location of the car is send to the owner and nearby police station with the image of thief taken by spy camera. To start the motor again we have to send the SMS to the microcontroller again, and then it issues the signal to the relay to start the engine again[2]

In 2014, Prakash and K.Sirisha presented Design and Implementation of a Vehicle Theft Control Unit using GSM and CAN Technology. In this paper for avoiding vehicle theft uses a mobile phone that is embedded in the vehicle with an interfacing to Engine Control Module (ECM) through Control Area Network (CAN) Bus, which is in turn, communicated to the ECM. The vehicle being stolen can be stopped by using GPS

feature of mobile phone and this information is used by the owner of the vehicle for future processing. The owner sends the message to the mobile which is embedded in the vehicle which has stolen which in turn controls the vehicles engine by locking the working of the engine immediately. The developed system accept the message and broadcasted to the Vehicle Network through CAN Bus. The engine can be unlocked only by the owner of the vehicle by sending the message again[2]

In 2015, Zacharia proposed VTDS: Vehicle Theft Detection System. In this paper vehicle tracking and locking systems used to track the theft vehicle by using GPS and GSM technology. This system is in active mode whenever the user leaves the vehicle and in any case of intrusion the system will detect it and inform the owner. Owner can control his vehicle remotely using is android device. When the theft identified, the owner can send SMS to the micro controller, then issue the control signals to stop the engine motor. After that all the doors locked. To open the doors or to restart the engine authorized person needs to enter the passwords[2]

In 2015, M. Ahire proposed Android App for Stolen Vehicle Tracking and Engine-Disengaging System. In this paper the system has Mobile Phone that is embedded in the vehicle with an interfacing to Engine Control Module (ECM) through microcontroller (ATMEGA328), which in turn communicates to the ECM. The vehicle being stolen can be stopped by using GPS feature of mobile phone and this information is used by owner of the vehicle for further processing. The owner sends a notification to mobile which is embedded in the vehicle that has stolen which in turn controls the engine of vehicle by locking it immediately. The engine can be unlocked by only by the sending the password to microcontroller by Authorized person only[2]

In 2016, Champa proposed paper name Vehicle Theft Detection and Prevention Using GSM and GPS. In this paper the system provides two levels of security, password protection for the vehicle and remote ignition cutoff mechanism. This system also provides provision for vehicle tracking using GPS. GSM technology is used for intimating the owner. An alert message is sent to the owner if the wrong password is entered. Message is also sent when the ignition system of the vehicle is started. The owner can respond with an SMS to stop the engine. A buzzer is also activated to alert the nearby people or the security personnel if the right password is not entered after maximum number of trials. Message is sent to owner even when vehicle is started using correct password[2]

2.3 Parts of the pieces used in the project

2.3.1 Arduino Microcontroller

Arduino is an open source single board microcontroller, intended to formulate a process of exploiting electronics in multidisciplinary projects more accessible. An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. And an important aspect of the Arduino is its standard connectors, which means users connect the CPU board to a variety of interchangeable add-on modules called as shields. Some shields communicate with the Arduino board directly over various pins, but most of the shields are individually addressable via an I²C serial bus so many shields can be stacked and used in parallel alignment.

A hand full of other processors have been used by Arduino compatibles. Most boards have include a 5 volt linear regulator and a 16 MHz crystal oscillator , although some designs like the LilyPad run at 8 MHz and dispense with the onboard voltage regulator due to specific form factor restrictions. An Arduino microcontroller is also programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory and compared with other devices that typically need an external programmer, which makes

using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer.

At a conceptual level, when using the Arduino software stack, all boards are programmed through an RS-232 serial connection, but the way which is implemented varies by hardware version. Serial Arduino boards contain a special circuit called level shifter circuit to convert between RS-232- level and TTL-level signals. The ongoing Arduino boards are programmed through USB, implemented using USB-to-serial adapter chips such as the FTDI FT232. Some alternatives such as the Arduino Mini and the unofficial Arduino, use a detachable USB-to-serial adapter board or cables, Bluetooth or other methods. (When used with traditional microcontroller tools instead of the Arduino IDE, standard AVR ISP program is used.) The Arduino board exposes most of the microcontroller's I/O pins for use by variant circuits. The Diecimila, Duemilanove, and current Uno provide 14 digital I/O pins, six of fourteen which can produce pulse-width modulated signals, and six analog inputs, this can also be used as six digital I/O pins as seen in figure [2]

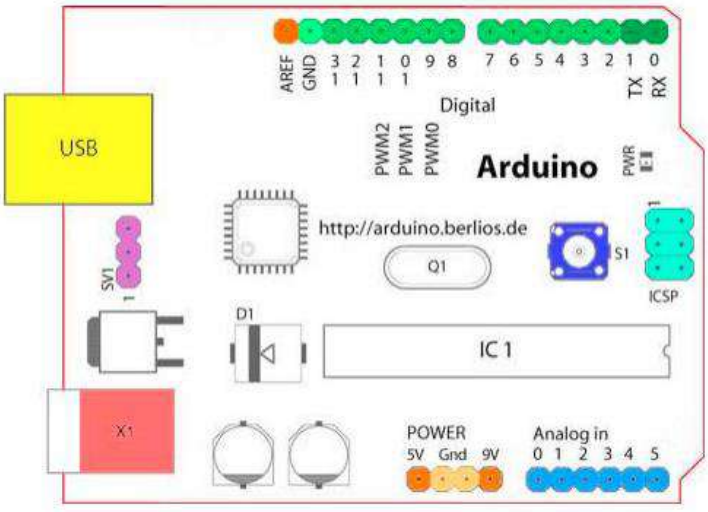


Figure 1 Arduino Microcontroller

These pins are on the top of the board, via female 0.10- inch (2.5 mm) headers. Several plug-in applications shields are also commercially obtainable. The Arduino Nano, and Arduino-compatible Bare Bones Board and Arduino boards may provide male header pins on the underside of the board that can plug into solderless breadboards. There are many Arduinocompatible and Arduino-derived boards. In which some are functionally equivalent to an Arduino and can be used vice versa. Many enhance the basic Arduino by adding output drivers, often used in school level education to simplify the construction of buggies and small scale robots. Others are electrically equivalent but change the form factor sometimes retaining compatibility with shields, sometimes not. Some revision use completely different processors, with varying levels of similarity.[2]

The Arduino integrated development environment (IDE) is a crossplatform application written in Java and which is obtained from the IDE for the Processing programming language and the Wiring projects. It is sketched to introduce programming to artists and other newcomers unfamiliar with software development. It comprises a code editor with features such as syntax spotlighted, brace matching, and automated indentation and is also capable of compiling and uploading programs to the board with a single click. A program or codes written for Arduino is called a sketch. The Arduino programs are written in C or C++. An Arduino IDE comes with a software library called "Wiring" from the original Wiring projects, which makes many common input/output operations much simple[2]

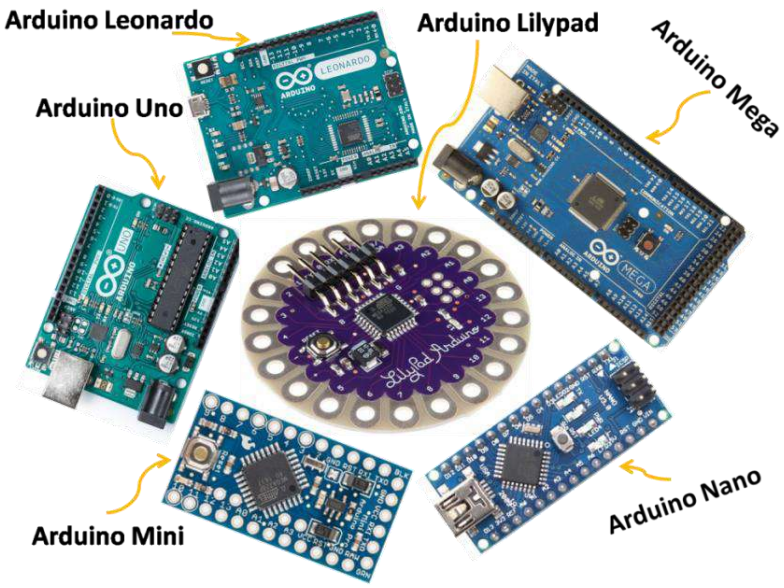


Figure 2 Type Of Arduino

2.3.2 Fuel Sensor

This is a crucial input-side block for the microcontroller. Liquid level serves the purpose of detecting changes in fuel level and provides varied output voltage in response to those changes. Any liquid type may be used with this Moisture level sensor. Therefore, it may be used for both gasoline and diesel, and in some circumstances, it can also be used for water level sensing. Here we use moisture sensor as fuel sensor for detecting the liquid level.[3]

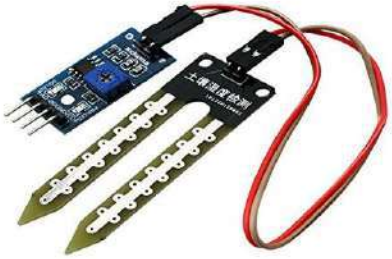


Figure 3 Fuel Sensor

2.3.3 **Vibration Sensor**

Also known as a piezoelectric sensor, the vibration sensor measures vibrations. Monitoring vibration levels over time enables problem prediction before significant damage can take place. Machine-mounted sensors are essential for vibration analysis and monitoring. Displacement, velocity, and acceleration are the three variables that vibration monitors use to represent motion.[3]

Figure 4 Vibration Sensor

2.3.4 **Ignition Key**

The conducting channel in an electrical circuit can be disconnected or connected by a key, halting the flow of electricity or switching it from one conductor to another. An electromechanical device with one or more sets of movable electrical contacts coupled to external circuits is the most typical type of Key. Current can flow between two contacts when they are touching, but it cannot when the contacts are apart.[3]

Figure 5 Ignition Key

2.3.5 LCD Display

A particular kind of flat panel display known as an LCD operates primarily on liquid crystals. Liquid Crystal Display is the name given to it. Messages such as " VEHICLE system," " VEHICLE fULL," "Petrol theft is underway," " VEHICLE OFF," and " VEHICLE died " are displayed. Additionally, it shows changes in the fuel level. 16 by 2 alphanumeric display is what we've used. LCD is mostly necessary for project testing; nevertheless, in practical use, LCD is optional.[3]

Figure 6 LCD Display

2.3.6 Buzzer:

An inexpensive yet effective part to include sound characteristics in our system is a buzzer. Its 2-pin structure is so small and compact that it can be utilized on breadboards, perf boards, and even PCBs with ease, making it a common component in most electronic applications. When there is fuel theft or fuel is stolen, it is activated. When the fuel level drops without the ignition key, the buzzer will start to sound. Buzzers that are loud

enough to be heard from a distance will alert others nearby that something is wrong with the vehicle.[3]

Figure 7 Buzzer

2.3.7 Relay

Relays are electromagnetically attracted switches that are powered by electricity. By opening and closing contacts in another electrical circuit, relays manage one electrical circuit. They are used to measure the time between contact opening and closure. Low voltage signals are utilized to operate relays, which regulate high voltage circuits. Additionally, they are employed to regulate high-current circuits with low-current signals.[3]

Figure 8 Relay

2.3.8 MALE/FEMALE CABLES These

These cables are used for making wiring and jumpering between the different headers on PCB's. In this project [1]

Figure 9 MALE/FEMALE CABLES

2.3.9 Pump

and this pump is a circular cavity made of iron, and it contains two lines or two holes, and the first hole is called the intake hole, and it is designed to enter water and pull it into the pump, while the second hole is called the expelling hole and is designed to pump water and It is removed from the pump, and it contains another small hole designed for the purpose of venting, which is blocked by a screw.

Figure 10 pump

2.3.10 solenoid valves

Electromagnetic solenoid valves (otherwise also known as solenoid valves) are valves controlled by electric current. They consist of two main parts - the valve body and the solenoid (coil). The solenoid is composed of a wound copper wire that surrounds a core with a movable closing plunger. The task of the coil is to create a magnetic field by means of a passing electric current, which then moves the piston and either opens or closes the valve. Solenoid valves thus use electric current to convert into linear motion. Solenoid valves are used for many purposes. There are suitable for liquid and gaseous media - for closing, opening, dosing, distribution or mixing in distribution systems. Classic applications include heating systems, irrigation, dishwashers and washing machines, refrigeration and air conditioning systems, medicine, dentistry, industrial cleaning and water tanks. Solenoid valves come in the common two-way, or even more complex three-way and multi-way constructions used for flow switching and mixing. Most often, valve bodies are made of brass, stainless steel, aluminum or even plastic. Before purchasing always check that the material is suitable for the intended use and is compatible with the medium.

Figure 11 solenoid valves

2.3.11 water hose

Figure 12 water hose

2.3.12 plastic tub

Figure 13 plastic Box

chapter

3

System Design

3.1 Vibration Sensor Module with Arduino

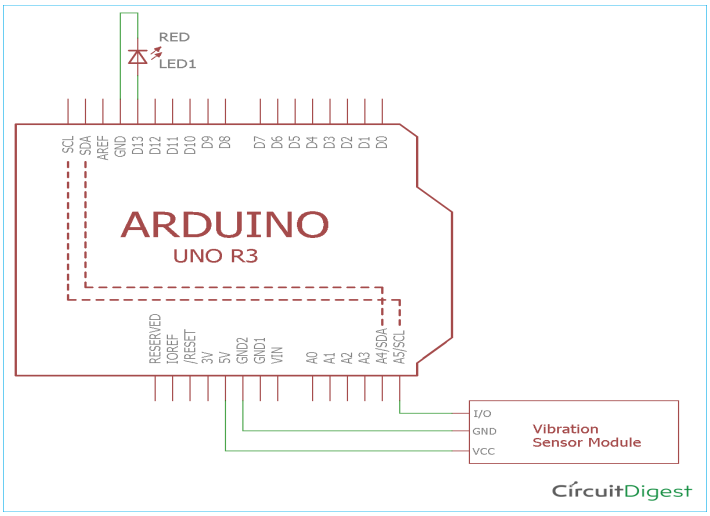


Figure 14 Vibration Sensor Module with Arduino

There are several critical machines or expensive equipments which suffer damages due to vibrations. In such a case, a vibration sensor is required to find out whether the machine or equipment is producing vibrations or not. Identifying the object which is continuously vibrating is not a tricky job if the proper sensor is used to detect the vibration. There are several types of vibration sensors available in the market which can detect the vibration bys sensing acceleration or velocity and could provide excellent result. However, such sensors are too expensive where the accelerometer is used. Accelerometer is very sensitive and can be used to make Earthquake detector circuit. But, there are few

[4]dedicated and cheap sensors are also available to detect the vibrations only, one such vibration sensor is SW-420 which we are going to interface with Arduino Uno.

So in this project, a basic vibration sensor module is interfaced with popular Arduino UNO and whenever the vibration sensor detects any vibration or jerk an LED will start blinking.[4]

3.2 Soil Moisture Sensor Works and Interface it with Arduino UNO

Introduction

For agriculturalists and farmers, moisture is a huge difficulty. Unnecessarily high moisture levels can harm the soil. As a result, yield is reduced, and seed loss is a negative effect. Crops and plants are in jeopardy. It also has an impact on the irrigation system. As a response, the designers created a tiny and portable soil moisture sensor to prevent mild moisture concerns. The sensor with interfacing with Arduino calculates the volumetric content of the water and displays the result. So, in this tutorial, we are going to interface " Soil Moisture Sensor with Arduino UNO". But, before making the circuit, let us briefly discuss the soil moisture sensor.[5]

An Overview of Soil Moisture Sensor

A Soil Moisture Sensor is an electronic sensor that detects the moisture content of the soil. The volumetric level of water within the soil can be measured with this sensor. The Sensing Probs and the Sensor Module are the two primary components of this sensor. The probes enable current to flow through the soil, and the resistance value is calculated based on the moisture content of the soil. The Sensor Module collects data from sensor probes, examines it, and transforms it into a digital or analog output. As a result, the Sensor can produce both digital and analog output.[5]

Pinouts of Soil Moisture Sensor

Pin Number	Pin Name	Description
1	**VCC**	+5 v power supply
2	**GND**	Ground (-) power supply
3	**DO**	Digital Output (0 or 1)
4	**AO**	Analog Output (range 0 to 1023)

Figure 15 Arduino with Moisture Sensor

3.3 One Channel Relay Module with Arduino

Figure 16 One Channel Relay Module with Arduino

This is where relay modules come into play. These well-contained modules are inexpensive, simple to connect, and ideal for home-brew projects that require switching modest amounts of AC or DC power. The only downside is that, because these are electro-mechanical devices, they are more prone to wear and tear over time[6]

Relay Operation

A relay typically has five pins, three of which are high voltage terminals (NC, COM, and NO) that connect to the device being controlled.[6]

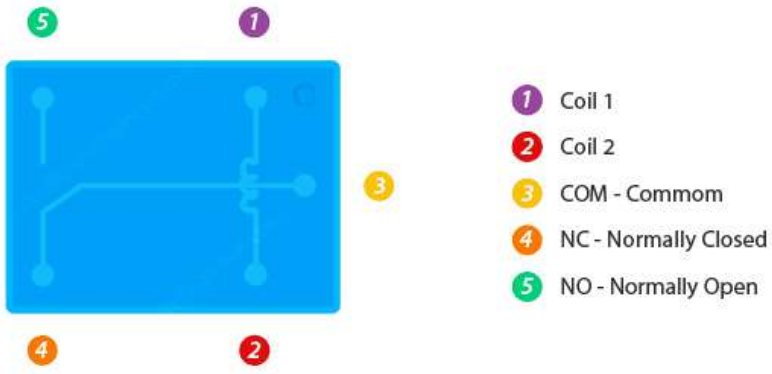


Figure 17 controlled

The device is connected between the COM (common) terminal and either the NC (normally closed) or NO (normally open) terminal, depending on whether the device should remain normally on or off.[6]

Between the remaining two pins (coil1 and coil2) is a coil that acts as an electromagnet.[6]

Normally (initial position), the COM terminal is connected to the NC terminal and the NO terminal is open.[6]

When current flows through the coil, the electromagnet becomes energized, causing the switch's internal contact to move. The COM then connects to the NO terminal, disconnecting from the NC terminal.[6]

When the current stops flowing through the coil, the internal contact is returned to its initial position, re-connecting the NC terminal to the COM and re-opening the NO terminal.[6]

To put it another way, the relay functions as a single-pole-double-throw switch (SPDT).[6]

3.4 Buzzer to Arduino

Figure 18 Buzzer to Arduino

Piezo buzzers are used for making beeps alarms and tones. They can be used in alarm systems, for keypad feedback, or some games. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers[7]

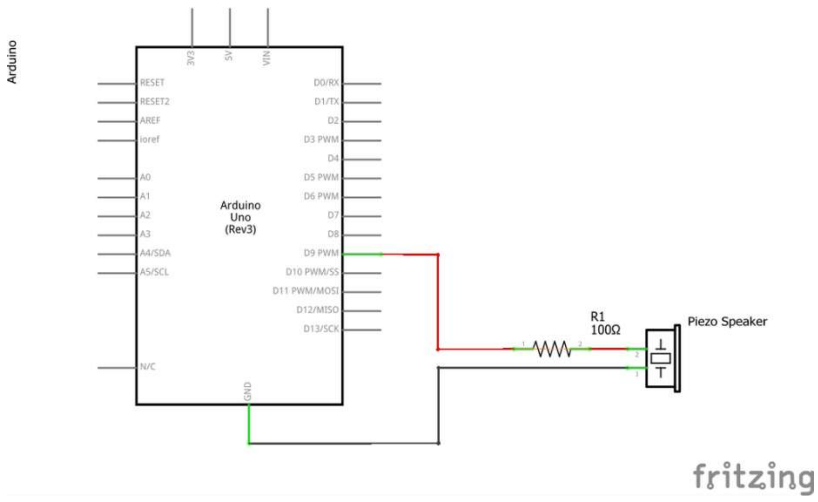


Figure 19 Buzzer to Arduino

3.5 Connect 12v solenoid valve to relay board

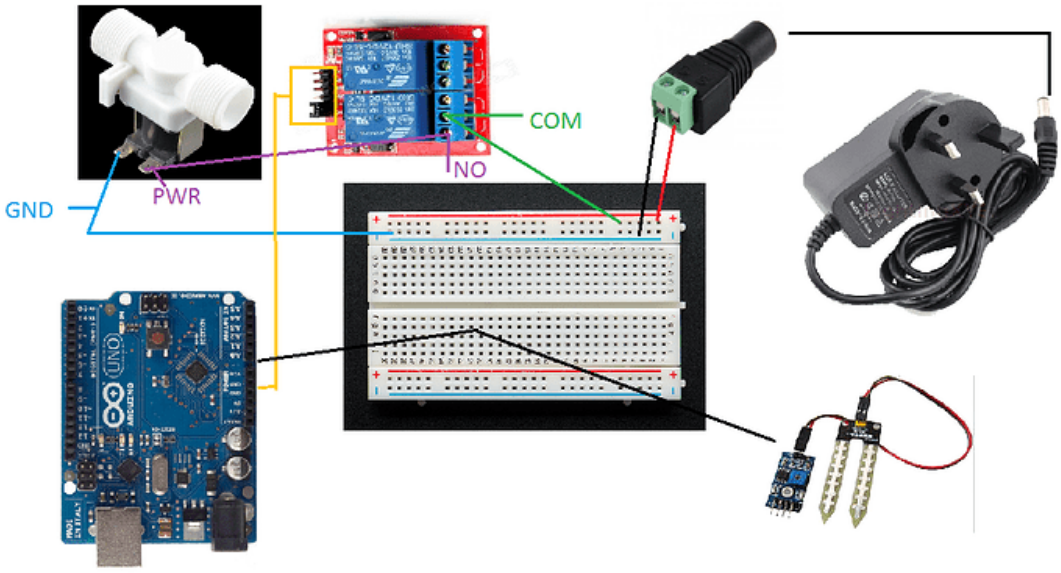


Figure 20 Connect 12v solenoid valve to relay board[8]

3.6 Arduino - Control Pump

Figure 21 Control Pump

12V Pump usually has two pins: Negative (-) pin (black): needs to be connected to GND of DC power supply Positive (+) pin (red): needs to be connected to 12V of DC power supply[9]

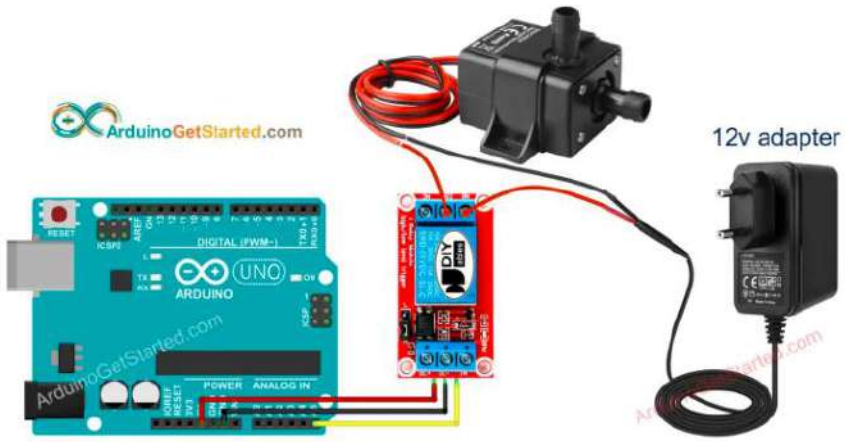


Figure 22 Arduino with Control Pump

12V pump is powered by 12V power supply, it works. To control a pump, we need to use a relay in between Arduino and pump.

Connect Arduino to PC via USB cable

Open Arduino IDE, select the right board and port

code and open with Arduino IDE

Click Upload button on Arduino IDE to upload code to Arduino

See the pump's state[9]

chapter

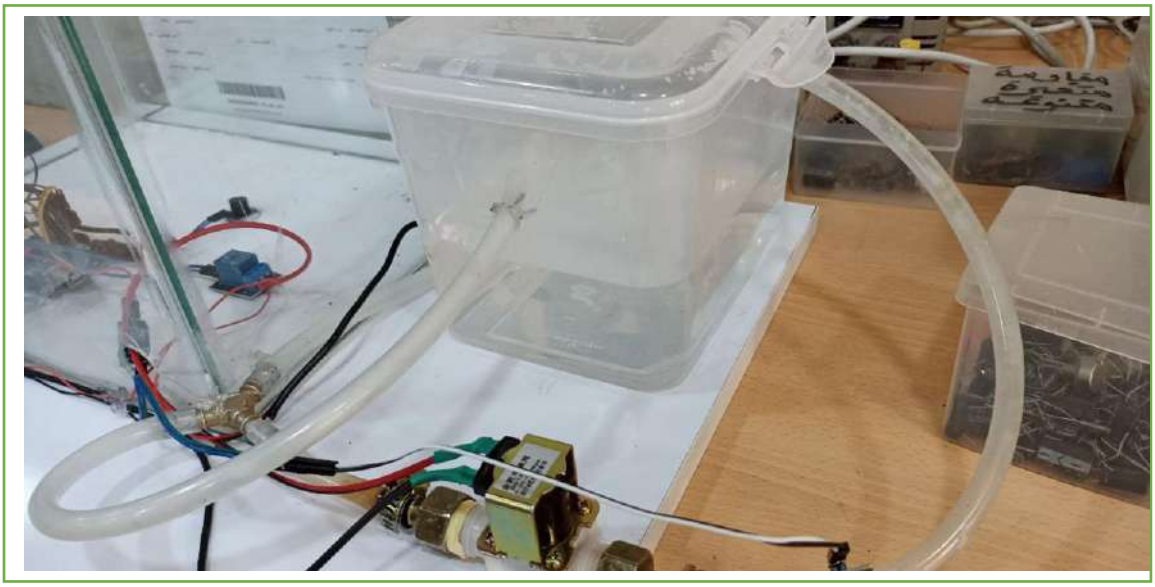
4

1- System work

After merging all the parts of the sensors and the display screen, we arrange them in the glass box to protect the electronic parts from water, because in the practical part, we use water in the experiment.

After working on the other part, we connect the water pump to the tank and connect the pipes.

After that, we connect a path with a transparent tube, and put it in the middle of the path to connect with a cruciform division that leads to the basin, and the other in the electric valve.



We connect the system to electricity

Figure 25 work System

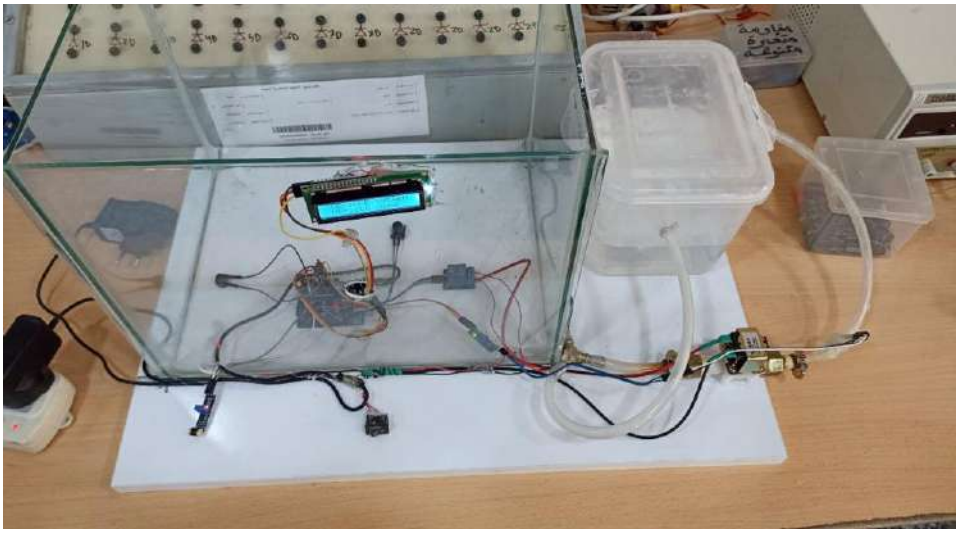


Figure 26 connect the system to electricitv

He has knocks on the vibration sensor, we notice that the water pump has stopped working permanently

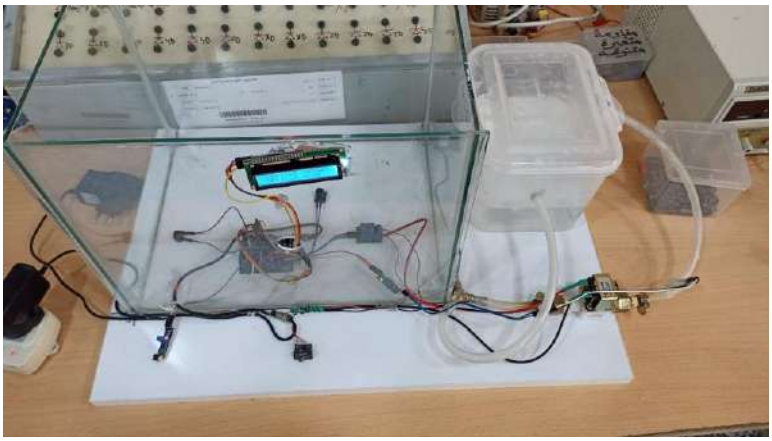


Figure 27 connect the system to electricity

And open the valve on the water sensor

Figure 28 valve on the water sensor

After the display appears in its display on the system screen for the presence of fuel, we notice that the pump stops permanently, even in the event of a restart of the system

And return the work of the therapeutic system to the pump in case of emptying the water from the sensor.

2 Discussion and Malfunctions

Malfunctions	the solution
Malfunction of the sensors	Automatic reprogramming through the code update button in the Arduino
A malfunction in one of the sensors	Verify the connection or a malfunction in the wires
Error in regulating the work of the sensors	The system needs to be reprogrammed
The system is not responding	Re-enter the code

3- Conclusion

When the car's glass is broken, the emergency system is activated, noise occurs in the car, and the protection system works, as it aims to disable the fuel pump, which leads to a stroke in the engine and an obstacle in the operation of the car. The car is hard to steal.

Appendix Apply the system to the vehicle

To apply this type of protection, some things must be changed to become an effective system

1-Vibration sensor

It is a sensor that is placed on all sides of the car's windows. It is used to sense any break in the glass to transmit the signal to the brain. An example of a rain sensor in the windshield of a car

2-controller

In the practical project, we used the controller, but in an application on modern cars, we use a special brain that connects the sensors

Some other accessories to increase the efficiency of the system can be added

ITEAD GPS SCHIELD

ITEAD GPS Shield is a GPS module breakout board based on the RoyalTek REB-4216 GPS

module. It was designed as a Global Positioning System receiver that can store GPS data into

an SD card. Its main pins are RX which stands for receiver pin, TX which stands for transmitter pin, 5V pin and a Ground pin.

Figure 29 controller

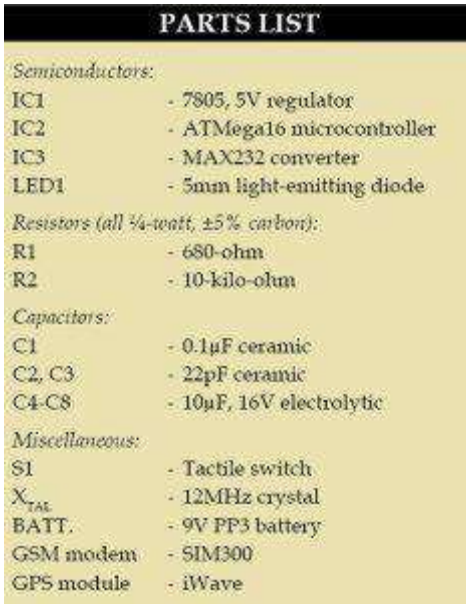
USB WIFI DONGLE

This Wifi Adapter is based on the Realtek 8188CU Chip assures the Wifi connectivity to external networks.[1]

Figure 30 USB WIFI DONGLE

- DIY Vehicle Tracking System using GPS and GSM

This is a cheaper solution than a two-way GPS communication system wherein communication is done in both ways with GPS satellites. This project uses only one GPS device and two-way communication is achieved using a GSM modem. A GSM modem with a SIM card implements the same communication technology as a regular cellphone.[10]



PARTS LIST

Semiconductors:

IC1	- 7805, 5V regulator
IC2	- ATMega16 microcontroller
IC3	- MAX232 converter
LED1	- 5mm light-emitting diode

Resistors (all ¼-watt, ±5% carbon):

R1	- 680-ohm
R2	- 10-kilo-ohm

Capacitors:

C1	- 0.1µF ceramic
C2, C3	- 22pF ceramic
C4-C8	- 10µF, 16V electrolytic

Miscellaneous:

S1	- Tactile switch
X_{TAL}	- 12MHz crystal
BATT.	- 9V PP3 battery
GSM modem	- SIM300
GPS module	- iWave

Figure 31 • DIY Vehicle Tracking System using GPS and GSM

The system can be mounted or fitted in your vehicle in a hidden or suitable compartment. After this installation, you can easily track your vehicle using your mobile phone by dialing the mobile number of the SIM attached to the GSM modem. You will automatically get the location of the vehicle in the form of an SMS (short message) on your mobile phone.

This system allows you to track your vehicle anytime and anywhere. Whether you own a company with a fleet of hundreds of vehicles or you have an expensive piece of equipment and you want to keep an eye on them, this tracking system can inform you of the status without you having to be actually present on the site.[10]

Below you can see the block diagram of the GSM-based vehicle tracking system using GPS.[10]

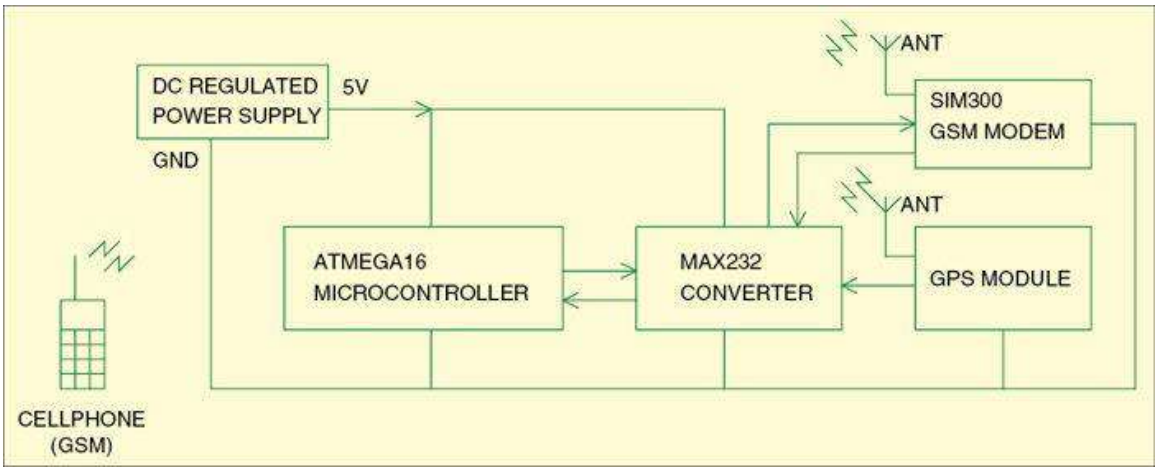


Figure 32 Applications and Benefits

Applications and Benefits

1. You can locate your stolen vehicle easily using your mobile without any extra cost.
2. It can be used for trucks carrying valuable goods, to keep track of the status of delivery and location of the truck at all times.
3. The device ensures vehicle security and smooth fleet management.
4. You can easily install it in any vehicle such as cars, boats, and motorbikes. An SMS will inform you whether the vehicle is stationary or on the move.
5. You can also use it to keep tabs on your driver. It reduces vehicle abuse and ultimately results in significant cost savings for individuals, fleet owners, and the like.[10]

Before delving into the detailed working of the project, let's discuss some basics of GPS and[10]

GPS – Global Positioning System

GPS is a space-based satellite navigation system. It provides location and time information in all weather conditions, anywhere on or near the Earth. GPS receivers are popularly used for navigation, positioning, time dissemination, and other research purposes.[10]

The GPS consists of satellites that orbit the earth. These satellites are geosynchronous with an orbital period that is the same as the Earth's rotation period. So they maintain exactly the same position with respect to the earth below them. All the GPS satellites transmit radio signals, which are then captured by a GPS receiver and used to calculate their geographical position. A minimum of four satellites may be required to compute the four dimensions of X, Y, and Z (latitude, longitude, and elevation) and time. GPS receiver converts the received signals into position and estimates the time and some other useful information depending on the application and requirements.[10]

GPS determines the distance between a GPS satellite and a GPS receiver by measuring the amount of time taken by a radio signal (the GPS signal) to travel from the satellite to the receiver. To obtain accurate information, the satellites and the receiver use very accurate clocks, which are synchronized to generate the same code at exactly the same time.[10]

If accuracy is important, you need GPS with a wide-area augmentation system (WAAS) capability. This is a satellite service providing additional correction information to the GPS receiver in order to increase its accuracy.[10]

Before purchasing a GPS receiver, it's good to know the protocols supported by it. Some popular protocols for GPS receivers are:

GPS Protocols

NMEA 0183

An industry-standard protocol is common to marine applications defined by National Marine Electronics Association (NMEA), USA. NMEA provides direct compatibility with other NMEA-capable devices such as chart plotters and radars.[10]

TSIP (Trimble standard interface protocol)

A binary packet protocol that allows the designer to configure and control the GPS receiver for optimal performance in any number of applications.[10]

TAIP (Trimble ASCII interface protocol)

Designed specifically for vehicle tracking applications. It is a bidirectional protocol using simple ASCII commands with associated ASCII responses.[10]

GSM Modem

GSM is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe technologies for second-generation (2G) digital cellular networks.

A GSM modem is a specialized type of modem that accepts a SIM card and operates over a subscription to a mobile operator just like a mobile phone.[10]

GSM modems are a cost-effective solution for receiving SMS messages because the sender is paying for the message delivery. To perform these tasks, a GSM modem must support an extended AT command set for sending and receiving SMS messages, as defined in the ETSI GSM 07.05 and 3GPP TS 27.005 specifications.[10]

It should also be noted that not all phones support this modem interface for sending and receiving SMS messages, particularly most smartphones like the Blackberry, iPhone, and Windows mobile devices.[10]

Vehicle Tracking System using GPS – Circuit Diagram

the circuit of a GSM and GPS-based vehicle tracking system. It consists of a microcontroller, GPS module, GSM modem, and 9V DC power supply. GPS module gets [10]the location information from satellites in the form of latitude and longitude. The microcontroller processes this information and sends it to the GSM modem. The GSM modem then sends the information to the owner's mobile phone.[10]

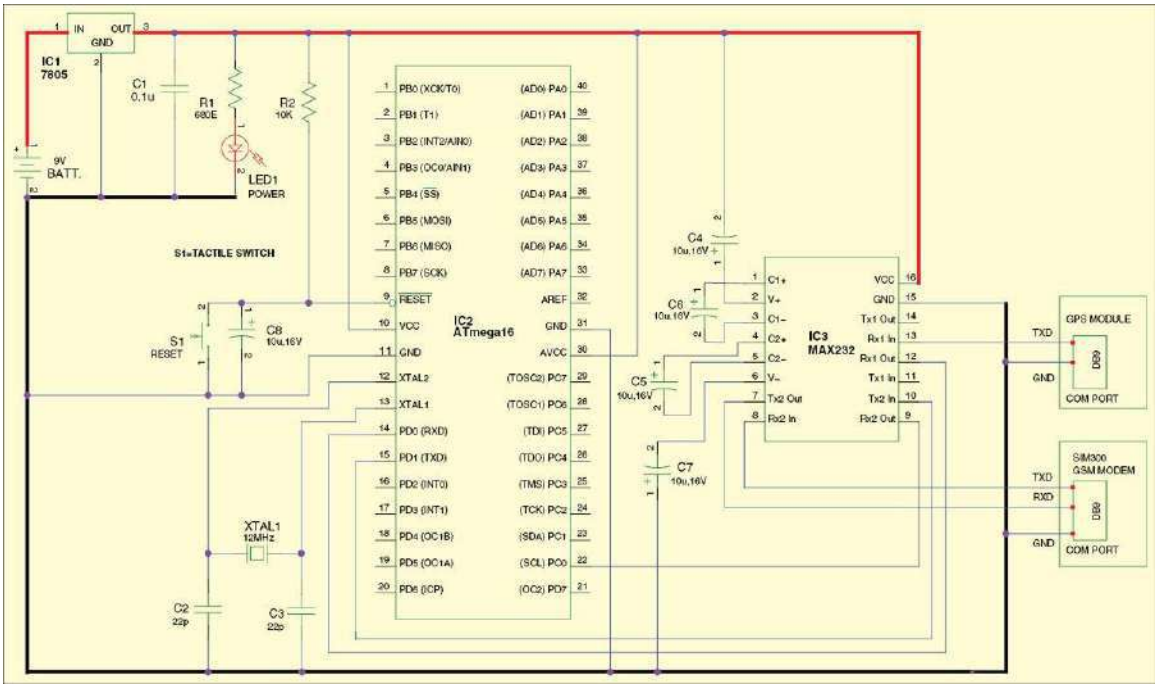


Figure 33 Circuit Diagram

ATmega16 Microcontroller

ATmega16 microcontroller (IC2) is the heart of the project that is used for interfacing with various hardware peripherals. It is a low-power CMOS 8-bit microcontroller based on the AVR-enhanced RISC architecture.[10]

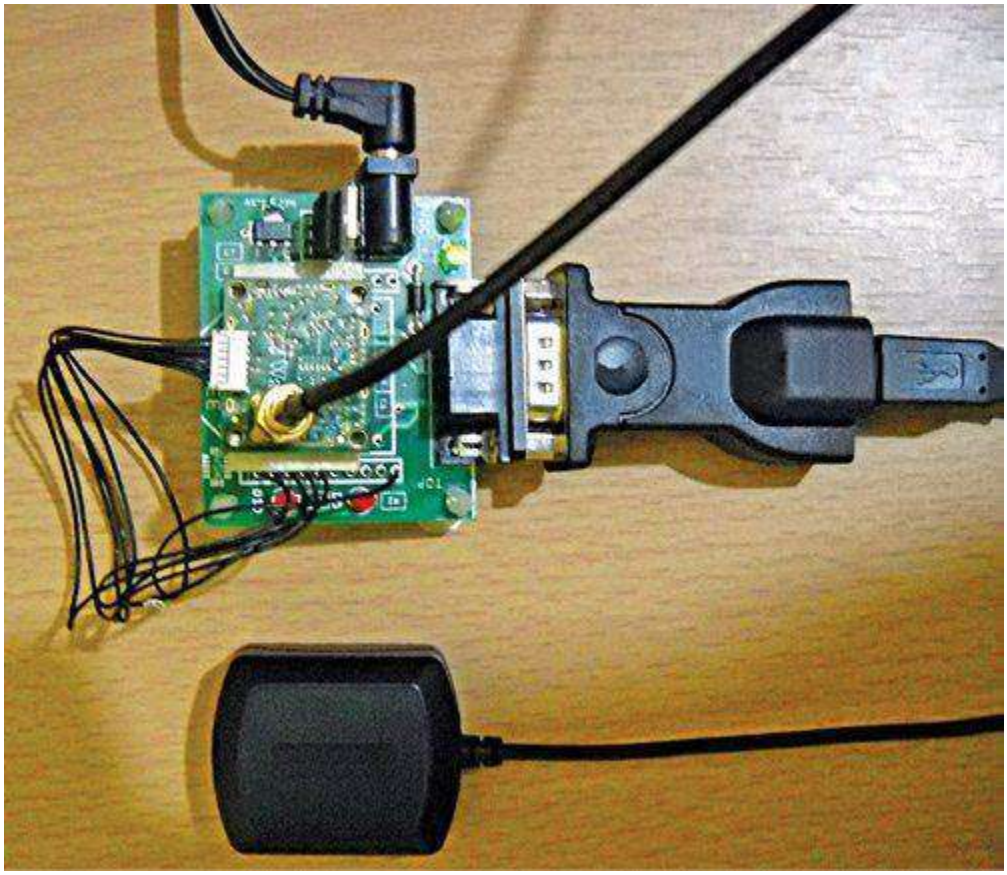


Figure 34 Microcontroller

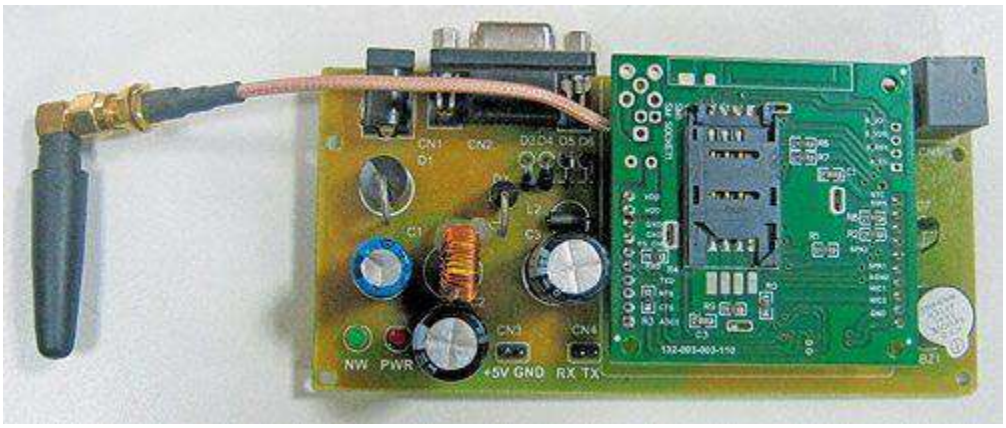


Figure 35 GPS module and GSM modem

ATmega16 microcontroller is interfaced serially to a GPS module and GSM modem. The GPS module outputs many data but in this project, only the NMEA data is read and processed by the microcontroller. The processed data is sent to the user's mobile through a GSM modem.[10]

This GPS-based vehicle tracking system implements RS-232 protocol for serial communication between the microcontroller, GPS, and GSM modem. A serial driver IC MAX232 (IC3) is used for converting RS-232 voltage levels into TTL voltage levels.

The user's mobile number should be included in the source code written for the microcontroller. Thus the user's mobile number resides in the internal memory of the MCU.[10]

iWave GPS Module

In this project, we have used the iWave GPS module (refer to Fig. 3). GPS always transmits the data to the microcontroller. Transmit pin TXD of GPS is connected to the microcontroller via MAX232. NMEA defined an RS-232 communication standard for devices that include GPS receivers. The iWave GPS module supports the NMEA-0183 standard which is a subset of the NMEA protocol. It operates in the L1 frequency (1575.42 MHz) and provides information with an accuracy of up to 10 meters in the open

sky. The antenna should be placed in an open space and there should be at least 50 percent space visibility.[10]

GSM Modem

This vehicle tracking system using GPS uses a SIM300 GSM modem (refer to Fig. 4). GSM modem transmits and receives the data. Modem SIM300 is a tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz, and PCS 1900 MHz.

Transmit pin TXD and receive pin RXD of the GSM modem are connected to the microcontroller (IC2) via MAX232 (IC3). The microcontroller's port pin PD0 (RXD) and port pin PD1 (TXD) are connected to pins 12 and 10 of MAX232, respectively.[10]

Power Supply

The circuit is powered by a 9V battery. 7805 regulator (IC1) is used to convert 9V into 5V. The microcontroller and MAX232 are powered by 5V. LED1 indicates the presence of a power supply.[10]

Vehicle Tracking System using GPS – Code

The program for the microcontroller is written in 'C' language and compiled using AVR Studio. The user's mobile number should be included in the source code in order to receive the call from the SIM card used in the GSM modem. The hex code of the program is burnt into the MCU using PonyProg2000 software. You can use any other suitable tool for the same.[10]

A GPS module with a 9600 baud rate is used to receive the data from the satellites, which is defined in the software. The software is developed to decode the NMEA protocol. This

protocol includes a set of messages that use an ASCII character set and has a defined format that is continuously sent by the GPS module to the interfacing device.[10]

The GPS module or receiver provides data in the form of ASCII comma-delimited message strings. Each message starts with a dollar sign '$' (hex 0x24) and ends with (hex 0x0D 0x0A).[10]

References

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1- System's Code Apply to the vehicle

```
//GPS Vehicle tracker

#define F_CPU 12000000                    //12Mhz

#include <avr/io.h>                       //Header file for AVR device specific I/O
Definitions.

#include <avr/pgmspace.h>                 //Header file for incorporating program space string
utilities.

#include <util/delay.h>                   //Header file for incorporating delay
routines.

#include<inttypes.h>



#define USART_BAUDRATE 9600

#define BAUD_PRESCALE (((F_CPU / (USART_BAUDRATE * 16UL))) - 1)


void WaitMs(unsigned int ms);


void usart_init();

unsigned int usart_getch();

void usart_writech(unsigned char data);

void usart_message(unsigned char *var);
```

```
unsigned char value,i,lati_value[9],lati_dir, longi_value[10], longi_dir,
final_message[30];

unsigned char deg = 0xB0;


int main()

{


DDRC=0x00;

PORTC=0xff;


   usart_init();


   while(1)

         {

          a:

          value=usart_getch();

          if(value=='$')

          {


         value=usart_getch();

                  if(value=='G')

         {
```

```
value=usart_getch();
if(value=='P')
{
value=usart_getch();
if(value=='G')
{

value=usart_getch();
if(value=='A')
{
value=usart_getch();
if(value==',')
{
value=usart_getch();
while(value!=',')
{
value=usart_getch();
}

for(i=0; i<9; i++)
{
```

```
        lati_value[i] = usart_getch();


        }
        value = usart_getch();

        lati_dir=usart_getch();
        value=usart_getch();
        for(i=0; i<10; i++)
        {

        longi_value[i] = usart_getch();
        }
    value = usart_getch();

                for(i=1;value!=',';i++)
        {
                longi_value[i]=usart_getch();

                value=longi_value[i];
                }
        longi_dir=usart_getch();
        }
```

```
            }
            }
            }
            }
            }
            if(*lati_value && *longi_value)
            {
   for(i=0; i<9; i++)
            {
            final_message[i] = lati_value[i];

             }

final_message[9] = lati_dir;
final_message[10] = ' ';
            for(i=0; i<10; i++)
            {

            final_message[i+11] = longi_value[i];
}
```

```
        final_message[21] = longi_dir;
         final_message[22] = '\0';
}
        else
         goto a;
        while(PINC==0xff);
 WaitMs(1000);
         usart_message("ATH");
         WaitMs(50);



         usart_message("AT+CMGF=1");
         usart_writech(0x0D);
         WaitMs(20);

        WaitMs(20);
        usart_message("AT+CMGS=\"+919873635988\"");
         usart_writech(0x0D);
         usart_message(final_message);//message
         usart_writech(0x1A);
         WaitMs(10000);
                goto a;
```

```
    }


        return 0;

}


void WaitMs(unsigned int ms)
{
        unsigned int i;

        for(i=0;i<=ms;i++)
        {
                _delay_ms(1);
        }
}


void usart_init()
```

```
{

UCSRB =  (1 << RXEN) | (1 << TXEN);

// Use 8-bit character sizes

UCSRC |= (1 << URSEL) | (1 << UCZS0) | (1 << UCZS1);

// Load lower 8-bits of the baud rate value into the low byte of the UBRR register

UBRRL = BAUD_PRESCALE;

UBRRH = (BAUD_PRESCALE >> 8);

}



unsigned int usart_getch()

{

while (!(UCSRA & (1 << RXC)));

return(UDR);

}
```

```
void usart_writech(unsigned char data)
{


 while(!(UCSRA & (1<<UDRE)));
 UDR = data;
}


void usart_message(unsigned char *var)
{
int h;
while(*var)
usart_writech(var++); // send message
for(h=0;h<=200;h++);
}
```

2-code for System work

```
#include <Arduino.h>
#include <stdio.h>

#define ON 1
#define OFF 0



 #include <LiquidCrystal_I2C.h>   //اضافة//
 LiquidCrystal_I2C lcd(0x27,16,2);
 int val = 0 ;



/*
 * Pin Description
 */
int vibration_Sensor = A1;
int LED = 13;//and buzzer
int buzzer = 6; //and buzzer2
```

```
/*
 * Programme flow Description
 */
int present_condition = 0;
int previous_condition = 0;

/*
 * Pin mode setup
 */
void setup() {
pinMode(vibration_Sensor, INPUT);
pinMode(LED, OUTPUT);

/*
 * Led blink
 */
void led_blink(void);

/*
 * main_loop
 */


 Serial.begin(9600);  //اضافة//
 lcd.init();
 lcd.backlight();
```

```
 pinMode(3,INPUT); // pir sensor output pin connected  OR OUTPUT//
 pinMode(4,OUTPUT);
// pinMode(5,OUTPUT);
 pinMode(6,OUTPUT);
 digitalWrite(3,HIGH);
   lcd.backlight();
   lcd.begin(16,2);
   lcd.clear();
 lcd.setCursor(0,0);
 lcd.print(" VEHICLE system");   // الى //


 }

void loop() {
previous_condition = present_condition;
present_condition = digitalRead(A1); // Reading digital data from the A1 Pin
of the Arduino.


 val = digitalRead(3); // soil moisture sensor output pin connected  //اضافة//
 Serial.println(val); // see the value in serial mpnitor in Arduino IDE  //اضافة//
 delay(1000);


if (previous_condition != present_condition)
```

```
{
led_blink();//WITH BUZZER
lcd.setCursor(0,1);
lcd.print(" VEHICLE OFF ");
digitalWrite(4,HIGH);     ///Sensor Vibration
//digitalWrite(3,LOW);
digitalWrite(6,OFF);

}
else if (val == 1 )
{

lcd.setCursor(0,1);
lcd.print(" VEHICLE died ");
digitalWrite(4,OFF);
digitalWrite(6,ON);
delay (200);
digitalWrite(6,OFF);
delay (900);
}
else
{
digitalWrite(LED, OFF);
digitalWrite(4,ON);
digitalWrite(3,LOW);
digitalWrite(6,OFF);
```

```
lcd.setCursor(0,1);
lcd.print(" VEHICLE fULL ");
  }
}


void led_blink(void)
{
digitalWrite(LED, ON);
delay(250);
digitalWrite(LED, OFF);
delay(250);
digitalWrite(LED, ON);
delay(250);
digitalWrite(LED, OFF);
delay(250);



}
```