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Design of a Car Alarm Against Theft and Breakage Using Microcontroller

تصميم جهاز انذار للسيارة ضد السرقة والكسر باستخدام المتحكم الدقيق

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of M.Sc. in Mechatronics Engineering

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الآيــــــة

قال تعالي:

بسم الله الرحمن الرحيم

۞إِنَّ فِي خَلْقِ السَّمَاوَاتِ وَالْأَرْضِ وَاخْتِلَافِ اللَّيْلِ وَالنَّهَارِ وَالْفُلْكِ الَّتِي تَجْرِي فِي الْبَحْرِ بِمَا يَنفَعُ النَّاسَ وَمَا أَنزَلَ اللَّهُ مِنَ السَّمَاءِ مِن مَّاءٍ فَأَحْيَا بِهِ الْأَرْضَ بَعْدَ مَوْتِهَا وَبَثَّ فِيهَا مِن كُلِّ دَابَّةٍ وَتَصْرِيفِ الرِّيَاحِ وَالسَّحَابِ الْمُسَخَّرِ بَيْنَ السَّمَاءِ وَالْأَرْضِ لَآيَاتٍ لِّقَوْمٍ يَعْقِلُونَ۞

صدق الله العظيم

سورة البقرة الآية (164)

Dedication

TO

My Family

ACKNOWLEGEMENT

Many thanks are due to Allah who owed me with health and courage to accomplish this work. I would also like to express my deep sincere thanks, gratitude and appreciation to my main supervisor , Faculty of Engineering, Sudan University of science and technology for his instructive guidance, interest, continuous scientific support, supervision, encouragement, commitment, concern and interest that have been most valuable, I frankly confess that without his assistance this work would have never come to light.

Finally, I would like to take the opportunity to thank my parents and family for having supported me through the all project and studies.

ABSTRACT

Cars have become an important element in our daily lives, but however, there are several risks to these vehicles, such as theft and fire. In this research, a burglar alarm is designed with a microcontroller circuit, GPS and GSM using © language.

When a break occurs in any part of the vehicle, the GSM device immediately sends a message to the owner`s phone number, which is already pre-programmed in the Ardunio microcontroller and the GPS locates the vehicle. The engine can be stopped immediately by sending the code to the Arduino. According to the practical result, the research has led to the desired results.

المستخلص

أصبح استخدام السيارات في هذا العصر منتشرا بصور كبيرة ولكن تتعرض هذه السيارات لكثير من المخاطر أهما السرقة و الحريق. تم تطوير انظمه مختلفة لتأمينها ضد السرقة والحريق . في هذا البحث سوف يتم تصميم دائرة للحماية ضد السرقة والحرائق وتحديد مكان السيارة وسرعة الوصول اليها عند حدوث حادث باستخدام مجموعة المكونات أهما الاردوينو , GSM , GPS . يمكن هذا النظام من تتبع الأشارة المنبعثة منه وتحديد مكان السياره المسروقة. النتائج المتحصل عليها تبين الأداء الجيد لهذا النظام .

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ACRONYMS:

PC PERSONAL COMPUTER

AC ALTERNATING CURRENT

DC DIRECT CURRENT

USB UNIVERSAL SERIAL BUS

GPIO GENERAL PIN INPUT OUTPUT

GSM GLOBAL SYSTEM FOR MOBILE COMMUNICATION

GPS GLOBAL POSITIONING SYSTEM

SMS SHORT MESSAGE SERVICE

GPRS GENERAL PACKET RADIO SERVICES

Chapter One
Introduction

Chapter One
Introduction

1.1 General Concepts

There are many cases or reports due to the car theft and it keep increase time by time. Therefore there are many ways that have been taken by car owner to protect the car from being stolen or hijacked. Hence, every vehicle it is important to have or install a security system. Car is an automobile for human to move one destination to another destination. Due to the complex' designs that consist of many part, the price of the car is expensive.

Security system is important to protect the car from theft and others bad elements. It is hard for the owner to monitor and protect their vehicles from far. Most of the car security system is not a good feedback features. It has a small range limitation between car and the owner. With the small limitation range, the system is not effective security system. This study of the design of a car alarm against theft and breakout using an electronic circuit containing the controller Arduino Uno connected to the GSM device to send a text message to the owner in the mobile phone immediately to report the theft or break the GPS device connected to determine the location of the car immediately.

Most of the alarm system is using it built in siren to give notification to the car owner. The owner of the car only knows their car status in this range which is based on their alarm sirens only. An alternative method is needed to increase the range of effectiveness and the owner will have better security notification if their vehicle. Cellular mobile phone is the most important things for people nowadays. People can keep on communicate without range limit. The use of harmonized spectrum across most of the globe, combined with GSM's international roaming capability, allows travelers to access the same mobile services at home and abroad. Short Message Service (SMS) is a mechanism of delivery of short messages over the mobile networks. People can send short messages to any other GSM mobile user around the world without limitation using GSM. Real-time monitoring and fast-accurate alarm system have gained popularity among car user and had been widely been applied in order to maximize the effectiveness of the car security system. Because of it unlimited range of distance, car monitoring can be done using GSM. Using GSM module it can acts as the medium of interfacing between alarm system and wireless communication system and it is also an advantage of the alarm system. The blend of GSM technology and car security system will make the alarm is the best protection mechanism for the vehicle [1].

1.2 Problem statement

The global issue related to a constantly increasing crime rate needs to be urgently addressed by both developed and developing countries. Once a vehicle is stolen, it becomes hard to locate it and track it, which considerably decreases the chances of recovering it. So this system is designed to solve this problem.

1.3 Objectives

There is a few objectives need to be determined followed as a guide through the whole completion process of this thesis.

1. To develop a notification security system that can wrap the entire main parts of the vehicle and send messages to the users instantly using GSM/GPS with Ardoino.
2. To improve locking equipment is GSM/GPS built securing system.
3. To reliable and also cost effective product to protect their vehicle.

1.4 Methodology

1. Study the previous studies.
2. Study and understand the main components.
3. Study and understand the protous software.
4. Build the complete proposed system.
5. Evaluate the performance of the proposed system based on the results.

1.5 Thesis layout

This thesis consists of five chapters. Chapter one contains general concepts, problem statement, objectives and methodology. Chapter two includes microcontroller, arduino, sensors and previous studies. In chapter three the complete circuit design is discussed. Chapter four the results and discussion. Finally, chapter five contains conclusion and recommendation.

Chapter Two
Literature Review

Chapter Two
Literature Review

2.1 previous study

In automobile field, the security and theft prevention are one of the main areas in current scenario. The security goals are achieved by the GSM, GPS technology. But it is commonly used for the four wheeler and not in the two wheeler. Using these technologies, we can only track and monitor the vehicle. Previously, GPS is used to get the current position of the two wheeler and that data will be send to the user mobile phone through the GSM. This paper implements for theft prevention in two wheeler using GSM, GPS and Android technology. We can track, monitor and stop the stolen two wheeler too by this system. The two wheeler position is obtained by the GPS module, which is send to the microcontroller, which then sends the message to the user smart phone through the GSM module. Here Atmel microcontroller, air solenoid and water solenoid valves are interfaced with GSM modem and GPS module which will be fixed in the two wheeler. User can stop the vehicle under theft by android application [2]. Security systems and navigators have always been a necessity of human's life. The developments of advanced electronics have brought revolutionary changes in these fields. In this paper, we will present a vehicle tracking system that employs a GPS module and a GSM modem to find the location of a vehicle and offers a range of control features. To complete the design successfully, a GPS unit, two relays, a GSM Modem and two MCU units are used. There are five features introduced in the project. The aim of this project is to remotely track a vehicle's location, remotely switch ON and OFF the vehicle's ignition system and remotely lock and unlock the doors of the vehicle. An SMS message is sent to the tracking system and the system responds to the users request by performing appropriate actions. Short text messages are assigned to each of these features. A webpage is specifically designed to view the vehicle's location on Google maps. By using relay based control concept introduced in this paper, number of control features such as turning heater on/off, radio on/off etc. Can be implemented in the same fashion [3].

Nowadays, a lot of cars have been stolen in the world. Development of Anti-Theft Vehicle and GPS Locator Using GSM or ATVS is an electronic device Installed in a vehicle to track the vehicle's location and disable or enable the vehicle by owner or third party. In addition, ATVS can send early warning Short Message Service (SMS) if vehicle's door forcedly opened. The main objective for this project is to develop a device to control and prevent vehicle from stolen. Even the vehicle they stolen, it can be tracked by using Global Positioning System (GPS). Basically, this project proposed to design an anti-theft system using GPS and Global System for Mobile communication (GSM). ATVS can be divided into two parts which are hardware and software development. The hardware development includes the GSM modem, GPS receiver and microcontroller. This project will use a GSM modem and microcontroller as anti-theft system which is to disable and enable the vehicle engine using hand phone if the vehicle gets stolen. The GSM modem, GPS receiver and microcontroller will work as locator system. Besides, sensor and microcontroller is used to send message warning to user if someone open the car. The function of GPS receiver is to locate the vehicle by indicating the position of the vehicle in term of latitude and longitude. GPS receiver is used to collects the latitude and longitude and then forwards to the microcontroller. After that, the data is sent to the mobile after requested by owner or a third party in form of SMS with the help of GSM modem. For future development, GPS can be replaced with Indoor Positioning System (IPS) because the GPS is not suitable for use in the building. Integrate with Google map [4].

A major problem today for vehicle owners is that they are in constant fear of having their vehicles stolen from a common parking lot or from outside their home. Currently, most of the people are having their own vehicles. Stolen in parking lots and sometimes while driving in insecure places. The safety of vehicles is extremely essential for public. The main theme of this paper is Vehicle tracking which basically concentrates on tracking the vehicle location at the time of vehicle theft. In order to prevent vehicle theft an ignition controlling technique has been used. When the owner removes the key from the ignition lock, the system turns ON. When a person tries to steal the vehicle, an alert will be sent to the owner (authorized person) in the form of message by GSM (Global System for Mobile Communications) and GPS (Global Positioning System) technologies. When vibrations are detected, SMS is send to owner of the vehicle, so that the owner in return can send a 'stop' message [5].

In our project we aim to detect any attempt to steal the inventory from an agricultural land. We have used an RFID Reader and Tag, Arduino Uno Microcontroller, a GPS and a GSM module. Additionally, we have also developed an Android application that lets the user track the whereabouts of his inventory, in the event of it being stolen. In the app a message will be sent at a fixed interval, the message contains GPS Co-ordinates of the missing Inventory and an Alert message.

RFID (Radio Frequency Identification) is an extremely fast growing technology that employs electromagnetic fields to transfer data. Mostly this data transfer consists of identification and/or tracking of target object wirelessly through 'tags'. These tags have electronically imprinted data which maybe read using a variety of different methods, depending upon which the tags may be classified as active, passive or battery assisted. The data is read using two-way radio transmitter- receiver. RFID technology is used in many applications such as tracking of shipment, animals, vehicles and more recently even humans. Unlike the barcode, RFID doesn't require a clear line of sight between the tag and the reader. The RFID market is expected to grow to over 20 billion USD by

2014.Our main aim would be to employ low power, long range RFID smart tags to track mechanized farming equipment, other farm inventory and to develop a Smartphone application for the same. Traditional means of monitoring may prove to be too cumbersome and have many loopholes which may be exploited. The Smartphone application will provide real time monitoring of the inventory as well as generate an anti-theft alarm should the need be. In this project we try to minimize the cost of the monitoring system. Main objective is to design a system that can be easily installed and to provide platform for further enhancement[6].

Chapter three
Software and Hardware Components

Chapter three
Software and Hardware Components

3.1 System Block Diagram

Figure 3.1 shows the main parts of the proposed system.

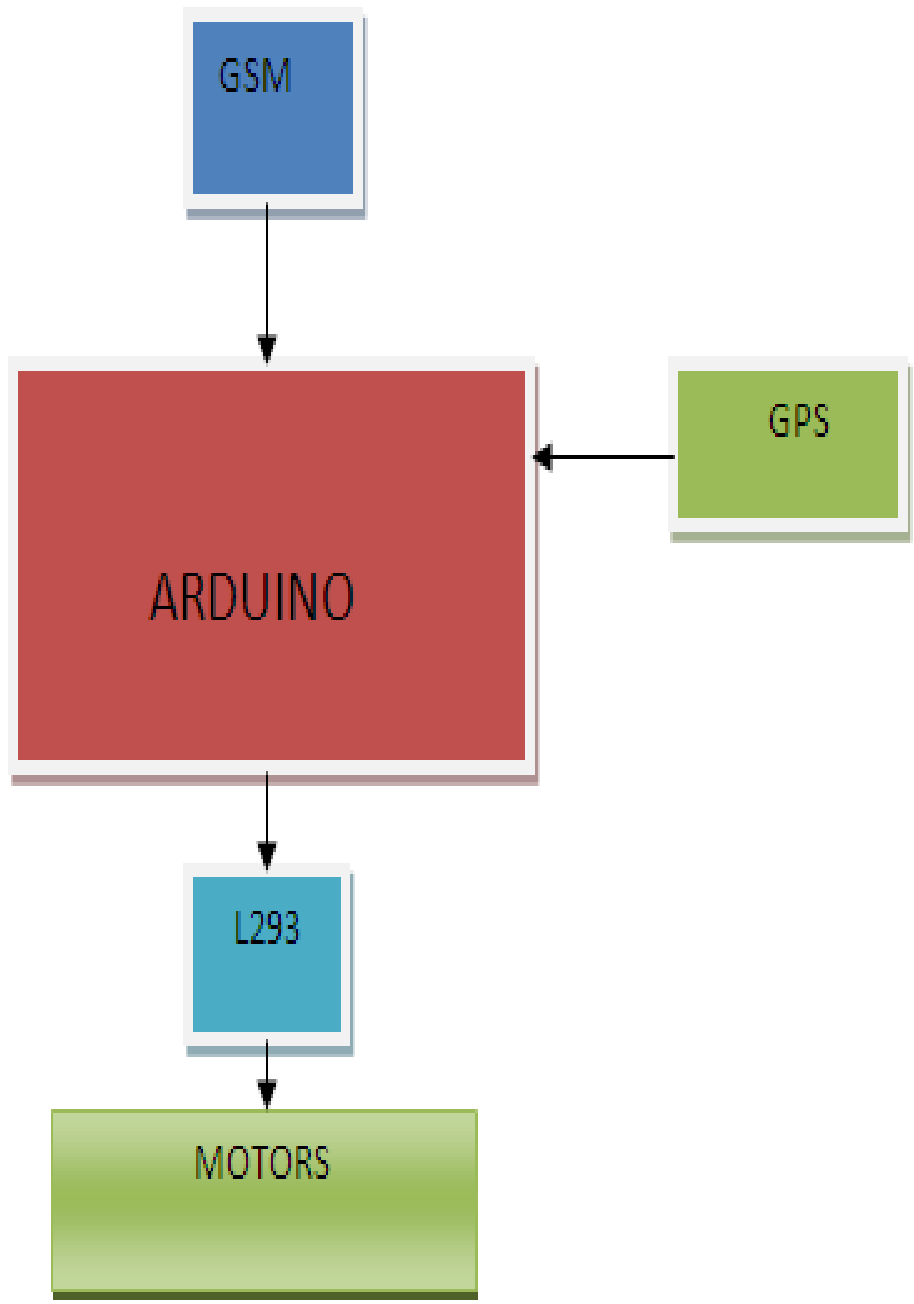

Figure 3.1: The main parts of the proposed system.

3.2 Main Components

The main components are:

3.2.1 Arduino Uno

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone, [7]. Figure 3.2 shows the Arduino Uno board.

Figure 3.2: Arduino Uno board.

➢ **Technical specifications**

- Microcontroller: Microchip ATmega328P

- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by boot loader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g

➢ General pin functions

- LED: There is a built-in LED driven by digital pin 13. When the pin is high value, the LED is on, when the pin is low, it's off.
- VIN: The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- 3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND: Ground pins.

- IOREF: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.
- Reset: Typically used to add a reset button to shields which block the one on the board

➢ Special pin functions

Each of the 14 digital pins and 6 analog pins on the Uno can be used as an input or output, using pin Mode (), digital Write (), and digital Read () functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference () function.

In addition, some pins have specialized functions:

- Serial / UART: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL serial chip.
- External interrupts: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- PWM (pulse-width modulation): 3, 5, 6, 9, 10, and 11. Can provide 8-bit PWM output with the analog Write () function.
- SPI (Serial Peripheral Interface): 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.

- TWI (two-wire interface) / I²C: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- AREF (analog reference): Reference voltage for the analog inputs [8].

3.2.2 Driver L293

A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver act as an interface between Arduino and the motors. The most commonly used motor driver Integrated Circuits (ICs) are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control two Direct Current (DC) motors simultaneously. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. We will be referring the motor driver IC as L293D only. L293D has 16 pins [9]. As shown in figure 3.3.

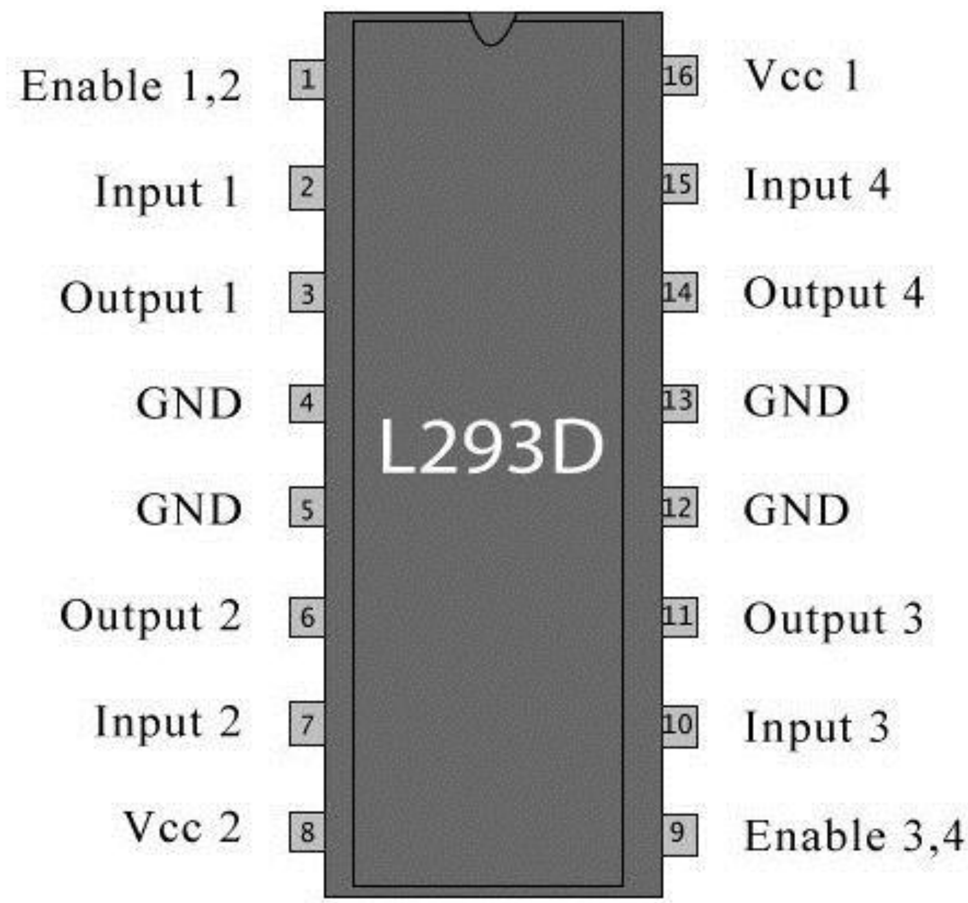

Figure 3.3: L293D pins configuration

3.2.3 GSM module

This is a very low cost and simple Arduino GSM and GPRS module. We use the module SIMCom SIM900A. It’s the cheaper module now available in the market. This post will allow you to make arduino controlled calls and also send text messages. Figure 3.4 shows the GSM SIM900A board.

Figure 3.4: GSM SIM900A board

1**.** SIM900 GSM Module this means the module supports communication in 900MHz band. If you are from another country, you have to check the mobile network band in your area. A majority of United States mobile networks operate in 850 MHz band (the band is either 850 MHz or 1900 MHz). Canada operates primarily on 1900 MHz band.

2. Check the power requirements of GSM module: GSM modules are manufactured by different companies. They all have different input power supply specs. You need to double check your GSM modules power requirements. In this thesis GSM module requires a 12 volts input. So we feed it using a 12V, 1A DC power supply. If you are having a 5V module, you can power it directly from Arduino's 5V out.

Before use GSM module, you must follows these step.

1. Insert the SIM card to module and lock it.

2. Connect the adapter to module and turn it ON.

3. Now wait for some time (say 1 minute) and see the blinking rate of 'status LED' (GSM module will take some time to establish connection with mobile network).

4. Once the connection is established successfully, the status LED will blink continuously every 3 seconds [10].

➢ GSM Features

· Quad Band GSM/GPRS: 850 / 900 / 1800 / 1900 MHz

· Built in RS232 to TTL or vice versa Logic Converter (MAX232)

· Configurable Baud Rate

· SMA (Sub Miniature version A) connector with GSM L Type Antenna

· Built in SIM (Subscriber Identity Module) Card holder

· Built in Network Status LED

· Inbuilt Powerful TCP / IP (Transfer Control Protocol / Internet Protocol) stack for internet data transfer through GPRS (General Packet Radio Service)

· Audio Interface Connectors (Audio in and Audio out)

· Most Status and controlling pins are available

· Normal Operation Temperature: -20 °C to +55 °C

· Input Voltage: 5V to 12V DC

· LDB9 connector (Serial Port) provided for easy interfacing [11].

3.2.4 GPS

The Global Positioning System (GPS), originally Navstar GPS, is a satellite-based radio navigation system owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Obstacles such as mountains and buildings block the relatively weak GPS signals. The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.

The GPS project was launched by the U.S. Department of Defense in 1973 for use by the United States military and became fully operational in 1995. It was allowed for civilian use in the 1980s. Advances in technology and new demands on the existing system have now led to efforts to modernize the GPS and implement the next generation of GPS Block IIIA satellites and Next Generation Operational Control System (OCX). Announcements from Vice President Al Gore and the White House in 1998 initiated these changes. In 2000, the U.S. Congress authorized the modernization effort, GPS III. During the 1990s, GPS quality was degraded by the United States government in a program called "Selective Availability"; this was discontinued in May 2000 by a law signed by President Bill Clinton.

The GPS system is provided by the United States government, which can selectively deny access to the system, as happened to the Indian military in 1999 during the Kargil War, or degrade the service at any time. As a result, several countries have developed or are in the process of setting up other global or regional satellite navigation systems. The Russian Global Navigation Satellite System (GLONASS) was developed contemporaneously with GPS, but suffered from incomplete coverage of the globe until the mid-2000s. GLONASS can be added to GPS devices, making more satellites available and enabling positions to be fixed more quickly and accurately, to within two meters (6.6 ft.). China's BeiDou Navigation Satellite System is due to achieve global reach in 2020. There are also the European Union Galileo positioning system, and India's NAVIC. Japan's Quasi-Zenith Satellite System (QZSS) is a GPS satellite-based augmentation system to enhance GPS's accuracy. When selective availability was lifted in 2000, GPS had about a five-meter (16 ft.) accuracy. The latest stage of accuracy enhancement uses the L5 band and is now fully deployed. GPS receivers released in 2018 that use the L5 band can have much higher accuracy, pinpointing to within 30 centimeters or 11.8 inches.

➢ Fundamentals

The GPS concept is based on time and the known position of GPS specialized satellites. The satellites carry very stable atomic clocks that are synchronized with one another and with the ground clocks. Any drift from true time maintained on the ground is corrected daily. In the same manner, the satellite locations are known with great precision. GPS receivers have clocks as well, but they are less stable and less precise.

Each GPS satellite continuously transmits a radio signal containing the current time and data about its position. Since the speed of radio waves is constant and independent of the satellite speed, the time delay between when the satellite transmits a signal and the receiver receives it is proportional to the distance from the satellite to the receiver. A GPS receiver monitors multiple satellites and solves equations to determine the precise position of the receiver and its deviation from true time. At a minimum, four satellites must be in view of the receiver for it to compute four unknown quantities (three position coordinates and clock deviation from satellite time).

➢ More detailed description

Each GPS satellite continually broadcasts a signal (carrier wave with modulation) that includes:

- A pseudorandom code (sequence of ones and zeros) that is known to the receiver. By time-aligning a receiver-generated version and the receiver-measured version of the code, the time of arrival (TOA) of a defined point in the code sequence, called an epoch, can be found in the receiver clock time scale
- A message that includes the time of transmission (TOT) of the code epoch (in GPS time scale) and the satellite position at that time

Conceptually, the receiver measures the TOAs (according to its own clock) of four satellite signals. From the TOAs and the TOTs, the receiver forms four time of flight (TOF) values, which are (given the speed of light) approximately equivalent to receiver-satellite ranges. The receiver then computes its three-dimensional position and clock deviation from the four TOFs. In practice the receiver position (in three dimensional Cartesian coordinates with origin at the Earth's center) and the offset of the receiver clock relative to the GPS time are computed simultaneously, using the navigation equations to process the TOFs.

The receiver's Earth-centered solution location is usually converted to latitude, longitude and height relative to an ellipsoidal Earth model. The height may then be further converted to height relative to the geoid, which is essentially mean sea level. These coordinates may be displayed, such as on a moving map display, or recorded or used by some other system, such as a vehicle guidance system [12].

3.2.5 Motors

Of the many elements that can be placed in a circuit, none are as versatile or as exciting as the electric motor. Electric motors make it possible for robotic hands to grasp, electric cars to roll, and drones to fly. Quad copters and 3D printers receive a great deal of attention, but to a system designer, they're just specialized motor control circuits.

In addition to being exciting, motors can also be hard to understand. When selecting a resistor, a designer only needs to be concerned with simple properties such as tolerance, temperature, and power rating. But when selecting a motor, there's a long list of questions that need to be addressed:

- Should the motor be direct current (DC) or alternating current (AC)?
- For a DC motor, should it be brushed or brushless?
- For a brushed DC motor, should it be a permanent magnet, serieswound, or shunt-wound motor?
- For a brushless DC motor, should it be an inrunner or an outrunner?
- Is the motor's Kv value sufficient for the system's speed and torque requirements?
- If the motor's torque is insufficient, what type of gears should be attached?

These aren't easy questions, and most books on electronics and robotics don't discuss them in depth. Instead, many books present specific circuits that require specific motors.

They may mention why a particular motor is suitable for a task, but they don't provide enough information to enable you to select the right motor on your own.

Figure 3.5 depicts a cross-section of a rotary motor. As current enters the motor, the central element rotates inside the case. There are two ways to look at the motor's structure—mechanically and electrically. From a mechanical standpoint, the motor consists of two parts. The rotor is the part that moves, and the stator is the part that stays in place. The space separating the rotor and stator is called the air gap Viewed electrically, a motor's structure can be divided into another two parts. The armature is the part that receives current. In Figure 3.5, the motor's central element (the rotor) is the armature because it receives incoming current.

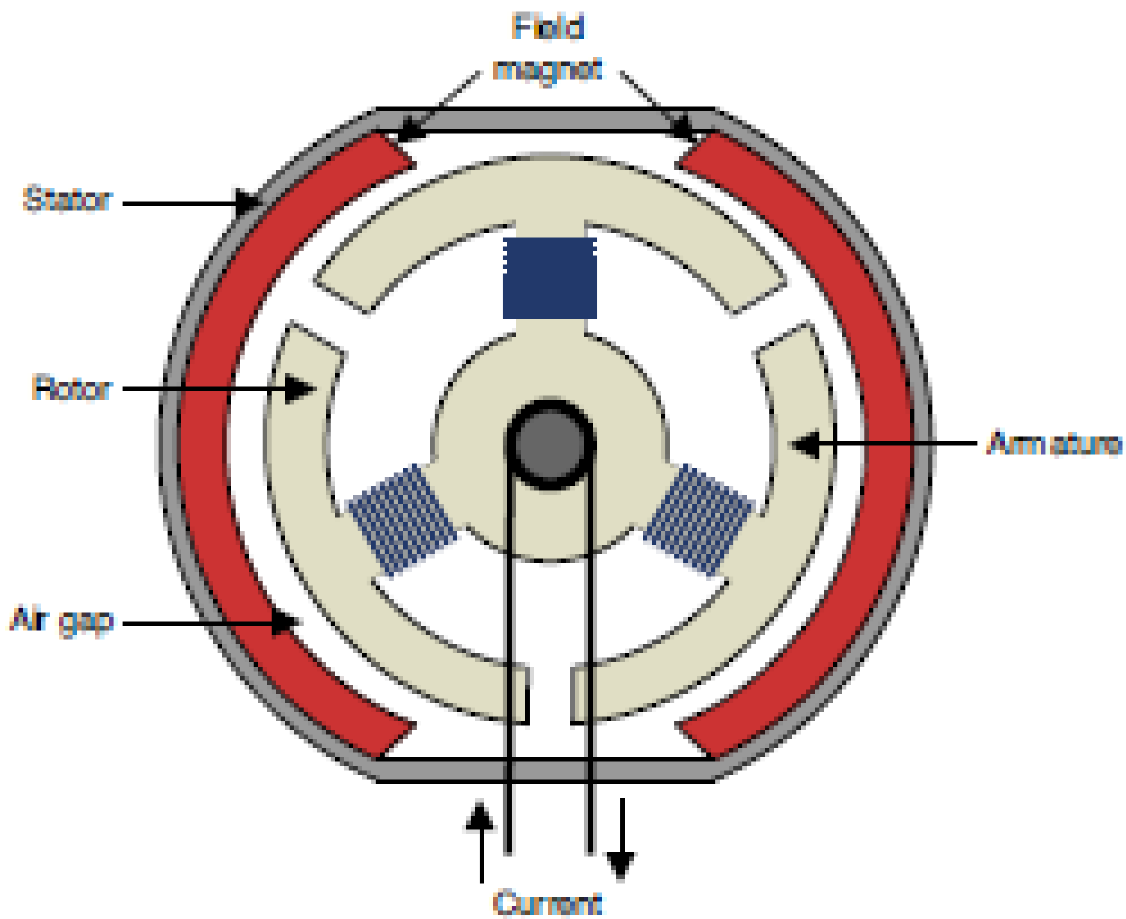

Figure 3.5 Internal Structure of an electric motor

A. DC Motors

DC motors accept DC electrical power, such as that provided by a battery. They're particularly common in maker projects. For example, every motor in a quad copter or a remote-controlled car is a DC electric motor. DC motors are divided into brushed and brushless motors. Primary distinction between them involves the need for a commutator. Put simply, a commutator primary distinction between them involves the need for a commutator. Put simply, a commutator reverses voltage as the motor turns, thereby ensuring that the motor continues to turn. Motors with a mechanical commutator are called brushed motors or commutated motors. These motors are simple and inexpensive, but periodic maintenance is needed to keep them working properly.Brushless DC motors, commonly called BLDCs, don't require maintenance as brushed motors do, but their structure is more complex. This means they cost more money and it takes significantly more effort to control them.

B. AC Motors

AC motors are common in industrial and household settings, and you'll find them in blenders, micro-waves, and washing machines. AC motors come in two types: synchronous and asynchronous. The difference between them depends on how the motor's speed should be controlled. The speed of a synchronous motor is synchronized with the frequency of the incoming AC power.

But the majority of AC motors are asynchronous, which means their speed isn't synchronized with the frequency of the incoming power. These motors, frequently called induction motors, are popular, simple, and reliable [13].

3.2.6 Shock detector

A shock detector or impact monitor is a device which indicates whether a physical shock or impact has occurred. These usually have a binary output (go/no-go) and are sometimes called shock overload devices. Shock detectors can be used on shipments of fragile valuable items to indicate whether a potentially damaging drop or impact may have occurred. They are also used in sports helmets to help estimate if a dangerous impact may have occurred.

Shocks and impacts are often specified by the peak acceleration expressed in g-s (sometimes called g-forces). The form of the shock pulse and particularly the duration are equally important. For example, a short 1 MS 300 g shock has little damage potential and is not usually of interest but a 20 MS 300 g shock might be critical. Depending on the use, the response to this time sensitivity of a shock detector needs to be matched to the sensitivity of the item it is intended to monitor.

The mounting location also affects the response of most shock detectors. A shock on a rigid item such as a sports helmet or a rigid package might respond to a field shock with a jagged shock pulse which, without proper filtering is difficult to characterize. A shock on a cushioned item usually has a smoother shock pulse. And thus more consistent responses from shock detector.

Shocks are vector quantities with the direction of the shock being important to the item of interest, Shock detectors also can be highly sensitive to the direction of the input shock.

A shock detector can be evaluated:

• Separately in a laboratory physical test, perhaps on an instrumented shock machine.

• Mounted to its intended item in a testing laboratory with controlled fix Turing and controlled input shocks.

• In the field with uncontrolled and more highly variable input shocks.

Use of proper test methods and Verification and validation protocols are important for all phases of evaluation

A related use of an impact detector is as automobile air bag sensor. These sophisticated sensors are used to trigger the protective air bag system used on current vehicles.

Active hard-drive protection systems sense impacts to laptop computers to help minimize damage from drops.

Some emergency locator beacons, such as Emergency Locator Transmitters, are activated by a specified shock or impact [14].

➢ Technologies

A wide variety of technologies are available ranging from simple analog indicators to more sophisticated electronics. Usually a device provides an optical indication of a triggered event but sometimes electrical signals can be provided.

- sensors such as accelerometers and associated Micro electromechanical systems
- Spring-mass systems which can be triggered by a shock
- Magnetic balls which can be dislodged from a holder
- Disruption of the surface tension of a liquid
- Breakage of an inexpensive brittle component with a known fragility
- etc.

3.3 Protuos Software

The general circuit simulation designed by protuos software which simulate and operation an Integrated circuits diagram for test and execute. Schematic capture in the proteus design suite is used for both the simulation of designs and as the design phase of a Printed Circuit Board (PCB) layout project. It is therefore a core component and is included with all product configurations.

3.4 Flow Chart

Figure 3.6 shows the complete flow chart for proposed system. First step start program from arduino Personal Computer (pc) and initialize data and check location through GPS and if location correct send SMS to mobile if not return to first step then yes check received SMS, if yes reply SMS no return to first step yes detect location if out send SMS and actuate stop end.

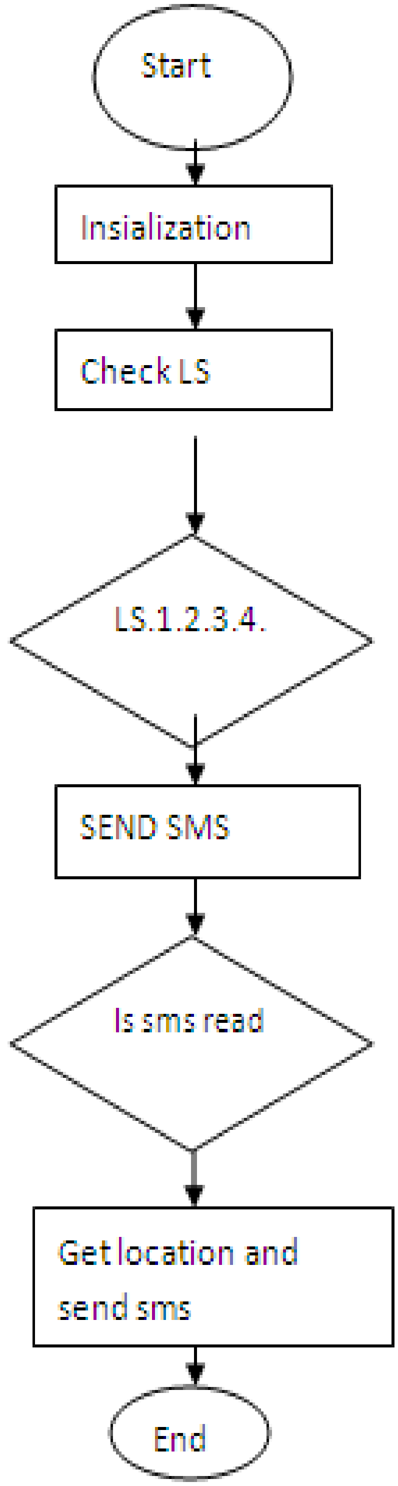

Figure 3.6: The flow chart

Chapter Four
Results and Discussion

Chapter Four
Results and Discussion

4.1 Introduction

Figure 4.1 shows the complete hardware circuit.

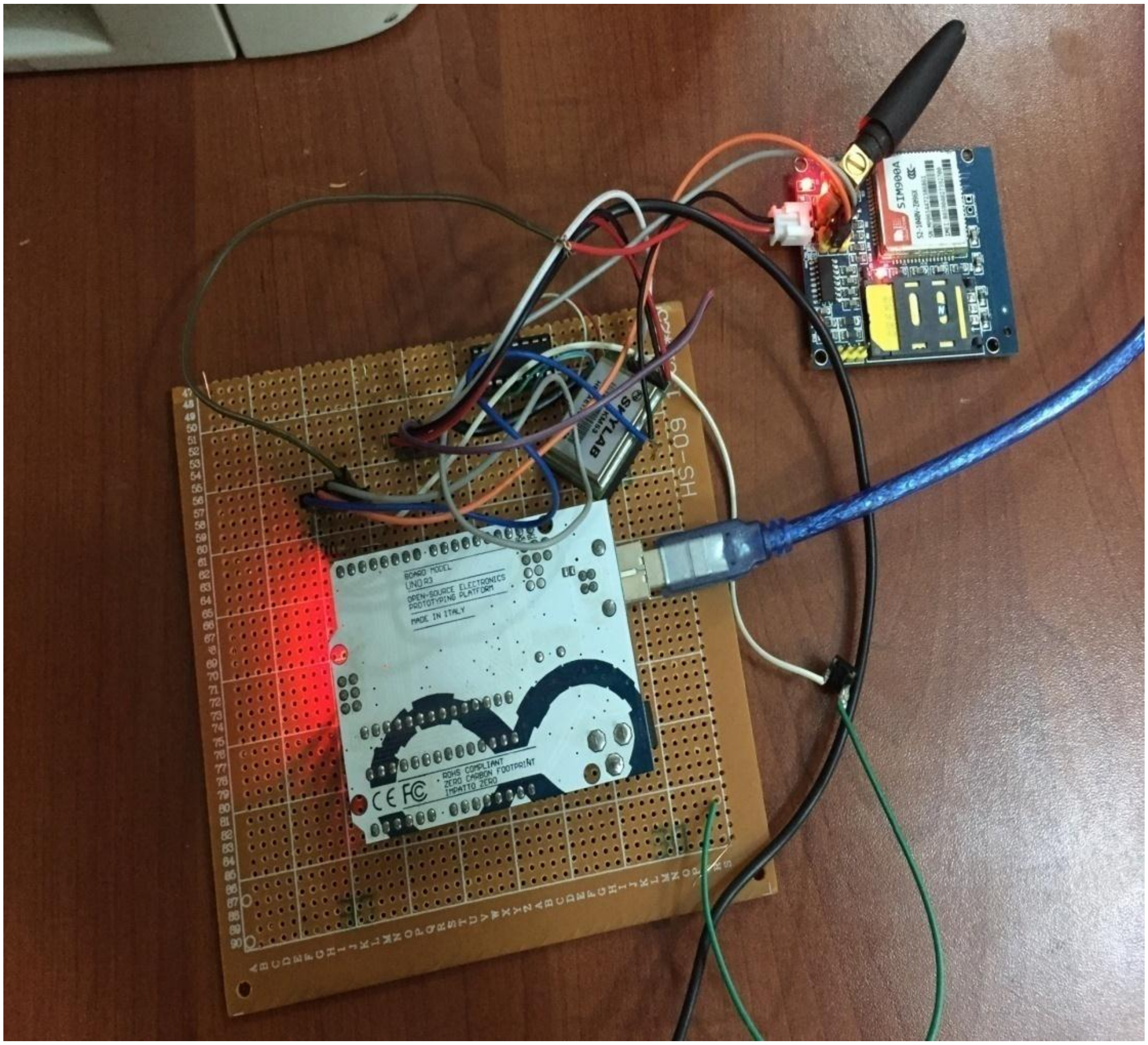

Figure 4.1: Complete hardware circuit.

4.2 Results

Figure 4.2 show the accident location message

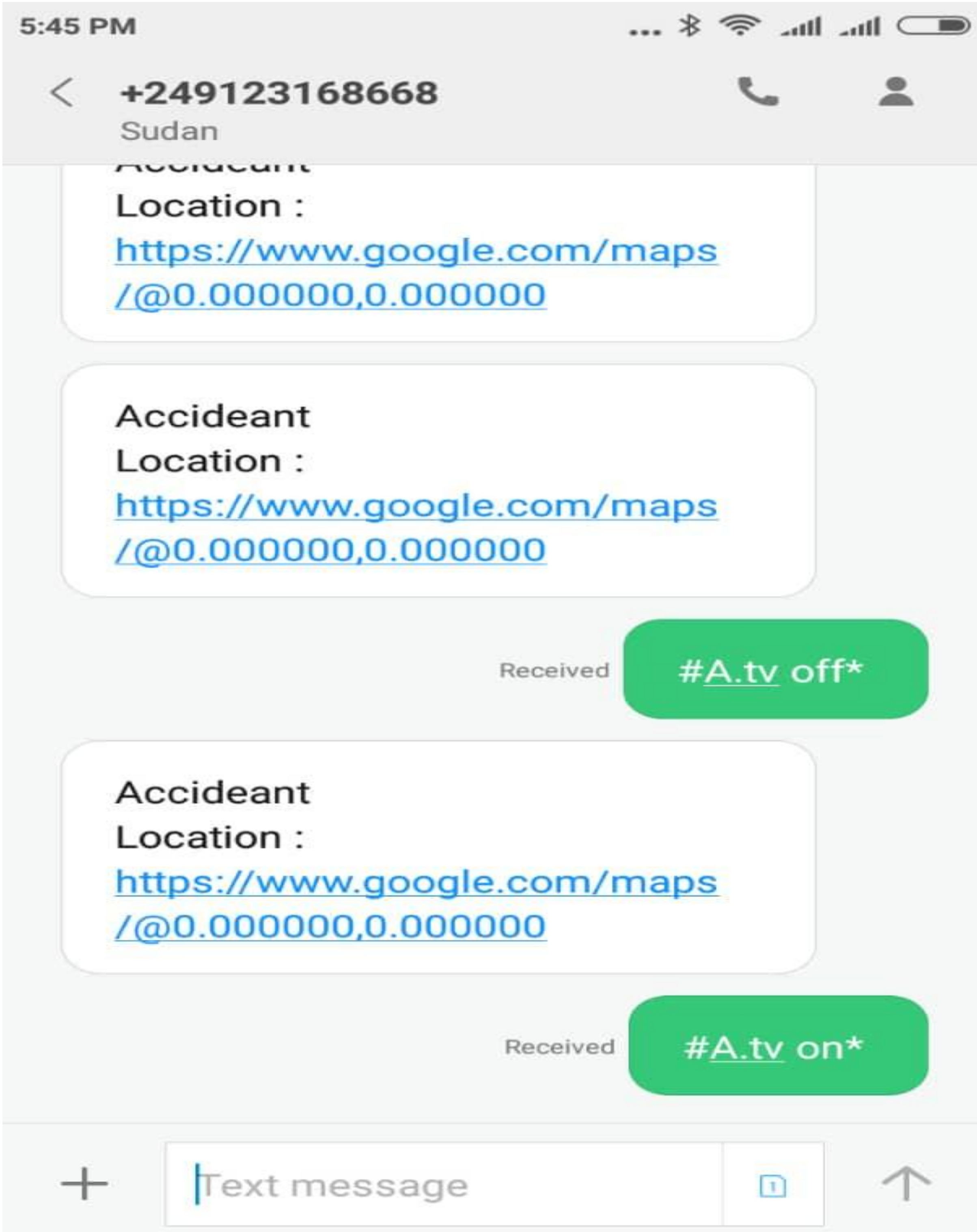

Figure 4.2: the accident location message

Figure 4.3 show the accident location message when received

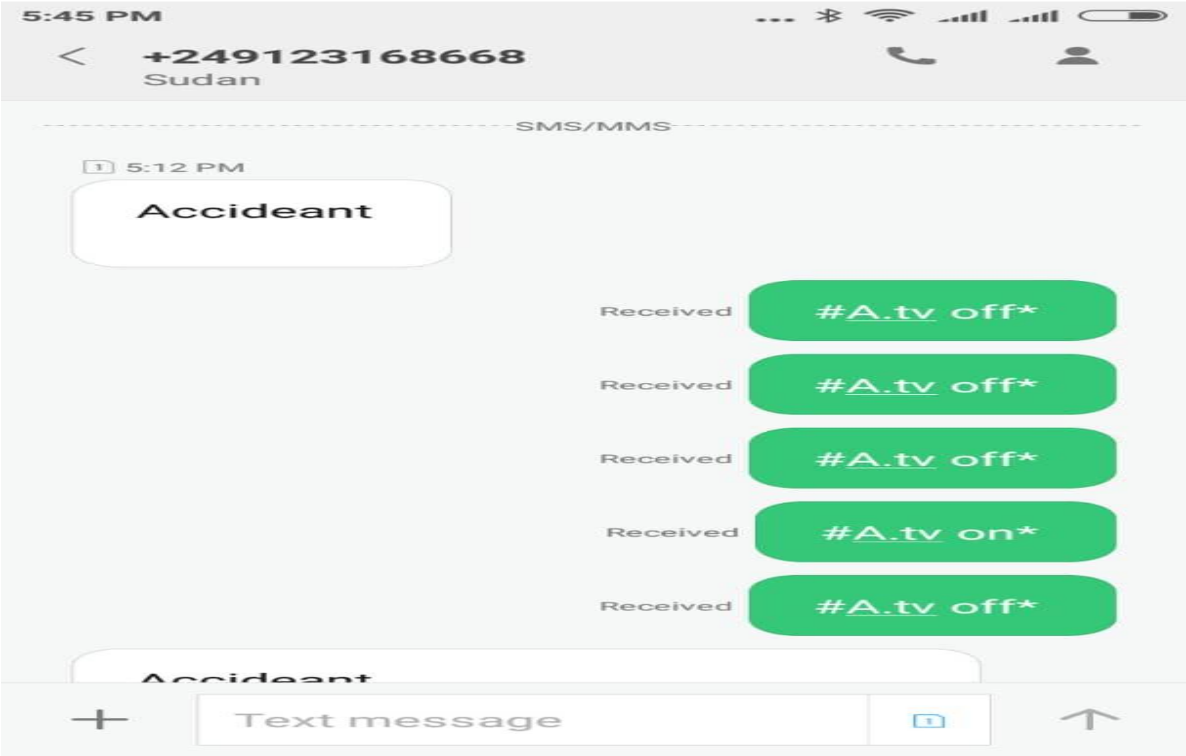

Figure 4.3: The accident location message when received

Figure 4.4 show the car prototype connection with circuit

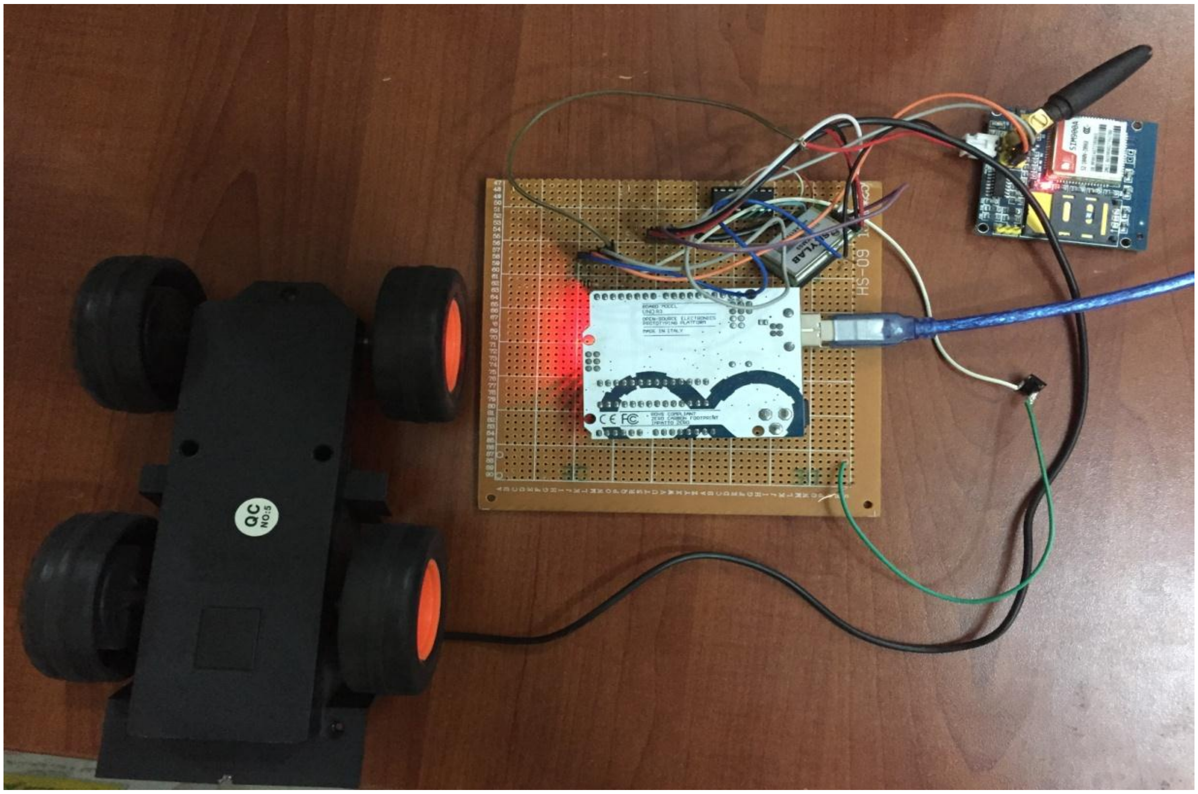

Figure 4.4: The car prototype connection with circuit

4.3 Discussion

Implementation of a smart vehicle tracking GPS/GSM system to be attached to vehicles for monitoring and controlling their speed, destination, and engine turn off. In case of traffic speed violation, a GPS message containing information about the vehicle such as location and maximum speed is sent to a hosting server located in an authorized operator control so that the violated vehicle is knew. Moreover, this system can also track the vehicle's current location on a Google Map, which is mostly beneficial when vehicles should follow a specific road and in case of robbery. Also geo-casting can have a major role in this model.

Chapter Five

Conclusion and Recommendation

Chapter Five

Conclusion and Recommendation

5.1 Conclusion

Arduino based vehicle tracking system is implemented with GPS and GSM communication technology. GPS module provides geographic coordinates at regular time intervals. Then the GSM module transmits the location of vehicle to cell phone of owner/user in terms of latitude and longitude. At the same time, location is displayed on mobile SMS.Google map displays the location and name of the place on cell phone. Finally working on this project helped me define what skills and what knowledge I need to improve in the future, and inspired me to explore more career opportunities either related to web design, Android design or hardware design.

5.2 Recommendations

This project still has many improvements that should be done to improve it accuracy and reliability. There are some suggestions for the future research and development.

1. Additional technology like Radio Frequency (RF) and some touch screen based application can also be adopted.

2. Translating latitude and longitude coordinates to an exact address using software or develop software that can translate the coordinates to the exact location in order to lessen the effort of the vehicle owner in decoding the coordinates and make the GPS data more readable.

3. Using fuzzy logic control.

4. Study the ways on how the GSM modem and GPS receiver may provide a very good signal even in an isolated area to establish a communication between the vehicle and the owner.

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Appendix
Program Code

Appendix
Program Code

```
#include <TinyGPS++.h>
TinyGPSPlus gps;
#include <SoftwareSerial.h>
SoftwareSerial ss(7,8);
#define m1 2
#define m2 3
#define m3 4
#define m4 5
int v=0;
int temp=0,i=0;
float o_lng =0;
float o_lat =0;
//int led=13;
char str[15];
void setup()
{
Serial.begin(9600);
 ss.begin(9600);
//pinMode(led, OUTPUT);
pinMode(m1, OUTPUT);
pinMode(m2, OUTPUT);
pinMode(m3, OUTPUT);
pinMode(m4, OUTPUT);
Serial.println("AT+CNMI=2,2,0,0,0");
delay(500);
Serial.println("AT+CMGF=1");
delay(1000);
movee();
}
void loop()
{
    while (ss.available() > 0)
    if (gps.encode(ss.read()))
```

```
  if (gps.location.isValid())
 {
  o_lng=gps.location.lng();
  o_lat=gps.location.lat();
 }
if(temp==1)
{
check();
temp=0;
i=0;
delay(1000);
}
}
void serialEvent()
{
while(Serial.available())
{
if(Serial.find("#A."))
{
//digitalWrite(led, HIGH);
delay(100);
//digitalWrite(led, LOW);
while (Serial.available())
{
char inChar=Serial.read();
str[i++]=inChar;
if(inChar=='*')
{
temp=1;
return;
}
}
}
}
}
void check()
```

```
{
if(!(strncmp(str,"tv on",5)))
{
 sms(o_lat,o_lng);
 Serial.println("AT+CNMI=2,2,0,0,0");
delay(500);
Serial.println("AT+CMGF=1");
delay(1000);
delay(200);
}
else if(!(strncmp(str,"tv off",6)))
{
//digitalWrite(TV, HIGH);
stopp();
delay(200);
}
}
void sms(char l1,char l2)
{
  Serial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
  delay(1000);  // Delay of 1000 milli seconds or 1 second
  Serial.println("AT+CMGS=\"+249123866238\"\r"); // Replace x with mobile
number
  delay(1000);
  Serial.println("Location : ");// The SMS text you want to send
  Serial.print("https://www.google.com/maps/@");
  Serial.print(gps.location.lat(), 6);
  Serial.print(",");
  Serial.println(gps.location.lng(), 6);
  delay(100);
  Serial.println((char)26);// ASCII code of CTRL+Z
  delay(1000);

delay(10000);
}
void movee()
```

```
{
    digitalWrite(m1, HIGH);
      digitalWrite(m2, LOW);
          digitalWrite(m3, HIGH);
              digitalWrite(m4, LOW);
}
void stopp()
{
    digitalWrite(m1, LOW);
      digitalWrite(m2, LOW);
          digitalWrite(m3, LOW);
              digitalWrite(m4, LOW);
}
```