



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 Issue: VI Month of publication: June 2021

DOI: <https://doi.org/10.22214/ijraset.2021.35879>

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Vehicle Anti-Theft Technology

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Abstract: Property crimes are said to hover around 10 million annually. Of this, vehicle theft tops the list and often occurs in all parts of the world. In response to a Right to Information (RTI) query made by The Indian Express shows that a total of 2,801 motor vehicle thefts took place in 2020 Mumbai, where in 1,085 cases account for 39 per cent of the total cases detected. Of the total 2,801 vehicle theft cases, 2,019 cases were of two-wheelers, 185 were four-wheelers and the remaining 623 cases were thefts of other vehicles like rickshaws, tempos etc.. The methods currently involved in vehicle theft detection such as buzzers and alarms have become cognizant to everyone including the burglars and effortlessly override the system and steal the vehicle. This paper proposes a system presenting a mechanism to mitigate the possibility of vehicle thefts. The system provides security by sending an SMS message as soon the vehicle is moved or crosses Geo-Barrier grid without knowledge of owner and also provides the owner with set of actions that can also be taken. System also offers location updates timely to the registered devices through SIM7600E. New features can be periodically be added hence making it future proof.

Keyword: Tracking, Vehicle, Embedded, Control, Arduino Uno, Sim7600E, Neo 8M

I. INTRODUCTION

Embedded system is a combination of hardware and software that is designed to do a specific function or functions you can think of. An embedded system acts as a controller that's part of a larger design. Embedded systems are used to control many devices or simply a part of the device that are in common use today such as aero-plane, medical equipment or household appliances, auto mobile. The list goes on and on modern embedded systems designs are system on Chip (SOC) or field programmable gate array (FPGA) technologies these are integrated circuits that are designed to carry out specific computation within the embedded system. Embedded systems work by taking an analogue or digital input. The input is then processed based on the software of the system and how it is configured further resulting into certain output. Embedded systems engineering can be classified into main two forms one being the embedded hardware engineering and another being embedded software engineering. In embedded hardware engineering it mostly comprises of a design job and person working in such particular fields should have knowledge of hardware components such as auto coupler transformers and relay without which they cannot be a good hardware engineer you should always have a good understanding of how current flows through different components to design a real time efficient system.

Embedded software engineering on the other hand programs the embedded system, embedded software engineering puts life into the hardware system. Embedded Software engineers mostly use C Assembly languages, Python has also been in use but mostly all embedded systems operate on C C++ and assembly level programs these include architectures such as ARM, Intel and Freescale. The person operating as embedded software engineer should also have a understanding of how operating systems works this is necessary because such systems are necessary when designing for example a washing machine interface or microwave interface there you also need to have a knowledge of Linux. This also deals with how kernels and drivers work when put into operating system. But in today's day and age with advancement in the technology and fabrication industry this field has diversified now we have embedded software engineer, embedded hardware engineers, PCB design engineers, Field application engineers, test engineers, support engineers, technical sales engineers, technical data sheet writers, FPGA and ESIC engineers and these are just a few to mention.

1) *Applications:* Embedded systems are generally being used in consumer electronics every product in your house as a chip health care and medical electronics for example x-ray machine CT scan machine and such robotics and computer industry has also been founded on embedded systems only, drones and robotics manufacturing, automated industry is only getting involved into the embedded system to reduce man made errors. ,

There is an uprising of a concept of smart factory in with the no manpower and only machines will manufacture the products and these systems generally use RS232 RS485 artificial intelligence embedded AI telecommunication aerospace and automobile. The traditional vehicle is transforming into electronic vehicle this is a huge shift for the automobile industry. Power electronics internet of things this is all about collecting data service and cloud management. This list goes on and on you will find them in almost all sectors and industries since every other product these days uses microchips and sensors.

II. PROPOSED SYSTEM

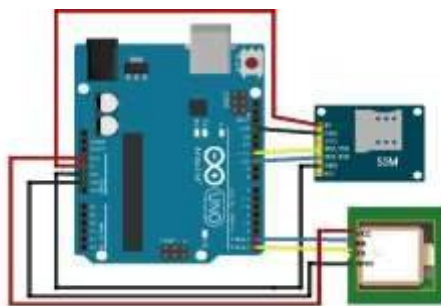


Fig2.1 Example of proposed system

- 1) *Arduino Uno*: In any microcontroller board the heart of the board is the central processing unit. In Arduino the processing unit is ATmega328p which belongs to 8-bit AVR architecture, it's also called Arduino chip because it runs a special software called Arduino boot loader. It is manufactured by Atmel Corporation. Apart from this the board has 14 digital pins labeled from 0 to 13 these are generally used to connect digital sensors, as in today's day and age digital sensors are quite common such as LEDs LCDs. Pin number 3-9 and 10,11 have tilde sign these pins are enabled with PWM which means they are pulse wave modulation enabled. These have the ability to generate analogue voltage. Pin number A0 to A5 are used to connect analog sensors such as temperature sensors light sensors proximity sensors. It has a USB type B connector, DC volt adapter these can be used to module power up the board. many pins on the microcontroller come with an alternate pin function. For example pin number zero and one have UART (universal asynchronous receiver and transmitter) pins. Moreover pin A5 can be used as a serial clock and pin A4 SDA can be used as a serial data line. These pins are I2C pins. I2C protocol is a very important communication protocol it is been widely used in sensors and electronics, I2C stands for Inter-Integrated Circuit. It is a bus interface connection protocol incorporated into devices for serial communication. Pins 10, 11, 12 and 13 SPI pins these are generally used to connect your arduino vehicle to ethernet and external storages. Some ROM chips come with SPI protocol, stands for Serial Peripheral Interface (SPI) which are synchronous serial communication interface specification used for short-distance communication primarily in embedded systems.

Then we have the ICSP header pins. these are generally used to flash the ATmega chip or upload USB drivers to the chip.



Fig2.3 SiM7000E module

- 2) *SiM7600E*: These 7000 series GSM modules they can be used to send and receive Data from the mobile interface using servers. All sim7000 modules can also be used to in the proposed system and will be future proof. SiM7600E has 3-Band LTE-FDD antenna and 2-Band GPRS/EDGE module antenna solution in a SMT type which supports various standards from LTE CAT-M1(eMTC) and NB-IoT up to 375kbps uplink data transfer and downlink up to 300kbps, it's fabricated on a silicon of dimensions: 24 X 24 X 2.6mm. There are multiple versions of Sim7000 series each version is manufactured base on need and all version caters to specific purposes. SIM7000E modules are backward compatible with SIM800F modules. This also secures the investments of customers, and enables a short development time.
- 3) *Neo m8 GPS Module*: Neo m8 is a very popular GPS module manufactured by U-blox comes with concurrent reception of up to 3GNSS (GPS, Galileo, GLONASS, BeiDou). On this it provides industry leading -168 dBm navigation sensitivity. These modules are future proof as they come with various jamming and spoofing detection. Supporting various automotive grade standards and also operating temperatures between -40 to +85.

III. WORKING

The proposed system has a geo-barrier and override controls to the electronic control module of the vehicle. Once theft is detected the vehicle sends an alert message to the registered devices and appropriate action can be taken. In such case vehicle's different functions such as engine control, powertrain control, transmission control, brake control, body control, suspension control and further on which can be integrated with their respected device, further these be used to prevent theft or mishap the owners shall later on also be provided with SOS options to immediately report the crime to the nearest police station.



Fig2.2 NeoM8 Module

One such being Hyundai Blue link implemented widely across different model ranges made by the vehicle manufacturer. This has been done with the help of Verizon enterprise solutions and open text business network platform, this particular format also supports other vehicle manufacturers including likes of Landrover/Jaguar, Daimler and General Motors.

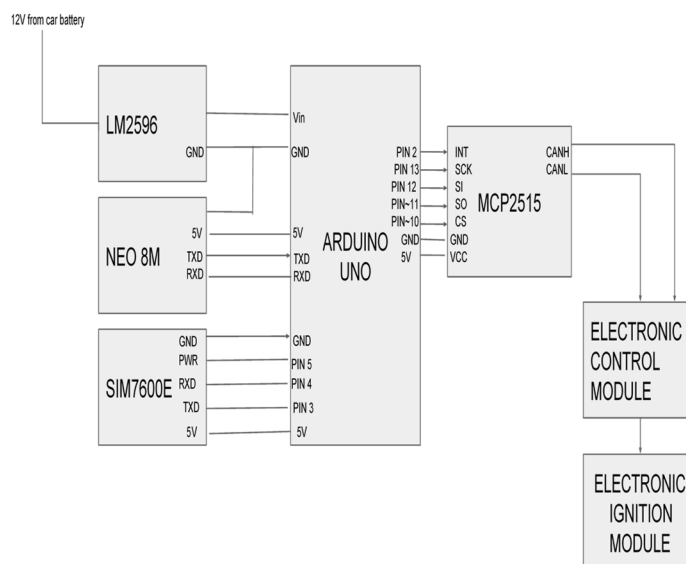
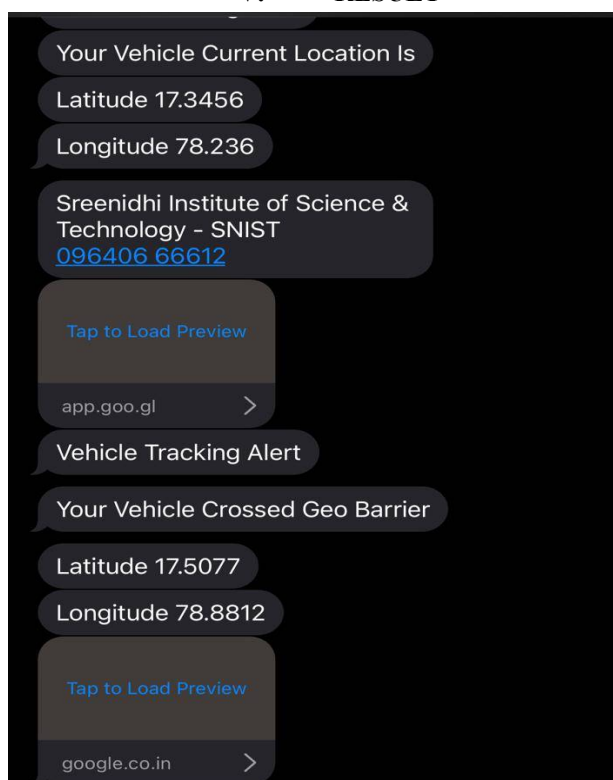
Smart phones are provided with various diagnostics provide vehicle owners navigational status and electronic control module status. The only drawback being it doesn't allow the individual to override ECM and also isn't available in older vehicle models and hence forth our proposed system comes into play it can be used if whoever wishes to enhance their vehicle protection with this system. The module will be compatible with BSIV to BSVI variants and future generations also.

IV. ALGORITHM

This contains step by step implementation to get desired output

- A. Start update
- B. Neo M8 module gets the coordinates of the vehicle
- C. SiM7000E connects to 000webhost
- D. Calculate Geographical location
- E. Estimate the vehicle motion
- F. Plot coordinates with Google Maps API
- G. If inside Geo-Barrier Grid send SMS "latitude & longitude"
- H. If outside Geo-Barrier send SMS "Alert" latitude & longitude"
- I. Arduino module communicates with vehicle ECU using MCP2515.
- J. Electronic Ignition Module seizes the combustion of the engine. Vehicle is brought to stand still within 2 mins
- K. The Arduino shift power supply from alternator to battery. Start over again from point A.

V. RESULT



VI. CONCLUSION

Fleet tracking not a new concept it has been used in many commercial enterprises from many contractors installing free tracking systems on trucks, tractors and cranes to large container ships for monitoring their current status. This is also been used by Petrochemical multinational entities as all refineries want the tanker fleets to be available whenever the plant has finished processing installing tracking devices on their oil tankers fleet ensures safety of the fleet and robust supply chain so that there isn't any backlog or scarcity in supply to the respected oil stations. New York City department has also installed these systems onto public vehicles so that all possible passengers have an idea how far the buses are, this helps in reducing waiting time.

VII. FUTURE ENHANCEMENTS

Further on various secondary operation of the vehicle inside Electronic Control Module including switching on and off the engine, turning on the AC, turning on various other peripherals likes of wiper, headlights, defrosting the windshield have been and are being implemented on new gen-models at this instance. Manufacturers are working to incorporate different other technologies such as remote-controlled locomotion of the vehicle which has been partially done by BMW motors. To remove the vehicle from jam-packed space without the need for the driver to enter the vehicle. The manufacturers are also working on technologies that helps the vehicle in wireless parking the vehicle can also be connected to other IOT features such as automatic collision avoiding, driver sleep detection.

Some of the conceptualizations being automatic SOS sent to nearest mechanic on vehicle breakdown. Fleet tracking is not just limited to location of the desired vehicles this can also be installed in cold storages so that the temperature of each and every individual installation can be detailed and sent to the one liable for their maintenance. For instance, let's say a message is sent in case the cold storage begins to heat or assuming undesirable temperature or anomaly is being detected with the comfort of this technology that particular individual does not to make it to each and every installation to monitor its current status rather he can approach the one diagnosed with anomaly. Many national parks are installing the systems on wild animals in the form of collars and many more wild animals are being administered with trackers this assists in monitoring and unfortunate encounters

VIII. ACKNOWLEDGEMENT

We would like to thank our project guide Dr. T Ramaswamy, Associate professor and coordinator Dr. Shruti Bhargava Choubey, Associate professor giving us their constant guidance, support and motivation throughout the period this course work was carried out. We express our sincere gratitude to Dr. S.P.V Subba Rao, Head of the Department, and ECE for helping us in carrying out this project giving support throughout the period of our study in SNIST. We are also thanking to our Principal Dr. T. Ch. Siva Reddy giving us his guidance and support, motivation throughout the period of our B. Tech course work was carried out. We convey our special thanks to Honorable Executive director P. N. Reddy for his continuous support.

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