PROJECT REPORT

on

VEHICLE TRACKING SYSTEM VIA GOOGLE MAP AND ARDUINO

Submitted in partial fulfillment of requirements for the award of

Integrated Master of Science(Int. MSc.)

In the department of

Information Technology

Submitted by:

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CERTIFICATE

This is to certify that the project report entitled ***"VEHICLE TRACKING SYSTEM VIA GOOGLE MAP AND ARDUINO"***,submitted to the School of Computing Sciences (SCS), **THE ASSAM KAZIRANGA UNIVERSITY, JORHAT, ASSAM,** in partial fulfillment for the completion of **Semester – X** of the degree of **Master's of Science** in the department of **Information Technology**, is a record of bona fide work carried out by **Kalpajyoti Gogoi(CS15MI0399)**,**Kishur Dutta**(**CS15MI0393)**, under my supervision and guidance.

All the help received by us from various sources have been duly acknowledged. No part of this report has been submitted elsewhere for award of any other degree.

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Dean, SCS, KU

Faculty Supervisor

Prof. Ratan Kumar Saha

Professor

Kaziranga University,Jorhat

ACKNOWLEDGEMENT

It is a great pleasure to present this report on the project named, “Vehicle tracking system via google map and arduino” undertaken by us as a part of our Int. MSc. (IT) curriculum.

A project without proper guidance is like ship without a navigator. A successful story is incomplete without paying tribute to those who inspired it. We would like to express our gratitude towards all those people who guided is for preparing this project which was a great learning process for us.

We are heartily indebted to Prof. Ratan Kumar Saha who guided us throughout the project and gave up valuable suggestions and encouragement.

We show our gratitude to our Prof. Sajal Saha, Dr. Manoj Kumar Muchahari and our project coordinator Dr. Purnendu Bikash Acharjee for providing the facilities and environment to bring out our innovation, talent and spirit of inquiry through this project.

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Declaration

We declare that all the materials embodied in the project report entitled Vehicle tracking system via google map and arduino submitted to the School of Computing Science (SCS), The Assam Kaziranga University, Jorhat, Assam,by us as a X semester project in the partial fulfillment of the Master's of Science in the department of Information Technology(IT) is original and no part of the report submitted to any other institution or organization for the award of any degree or diploma. I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact from any other sources in my project report. For any violation of the above facts I shall remain solely responsible.

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ABSTRACT

The vehicle tracking system is designed and implemented for tracking the movement of any equipped vehicle from any location at any time. The proposed system to be made good use of a popular technology that combines a Smartphone application with a microcontroller. This will be easy to make and inexpensive compared to others.

The designed in-vehicle device works using Global Positioning System (GPS) and Global System for Mobile (GSM) communication technology that is one of the most common ways for vehicle tracking. The device is embedded inside a vehicle whose position is to be determined and tracked in real-time. A microcontroller is used to control the GPS and GSM. The vehicle tracking system uses the GPS module to get geographic coordinates at regular time intervals. The GSM/GPS module is used to transmit and update the vehicle location to a database.

A Smartphone application is also developed for continuously monitoring the vehicle location with respect to data available in database. One more implementation will be doing along with tracking the vehicle is alarming system through SMS to the server from the mobile. This alarm will indicate that the database is not receiving the position of the vehicle not in regular interval or stop sending the geographic location of the vehicle.

The Google Maps API to be used to display the vehicle on the map in the Smartphone application. Thus, users will be able to continuously monitor a moving vehicle on demand using the Smartphone application and determine the estimated distance and time for the vehicle to arrive at a given destination. In order to show the feasibility and effectiveness of the system, this project presents experimental results of the vehicle tracking system and some experiences on practical implementations.

Chapter 1

Introduction

Vehicle Tracking System (VTS) is the technology used to determine thelocation of a vehicle .Main aim of the VTS is to provide security and safety to vehicles to keep an eye on the moving objects and using surveillance. This improved security system for vehicleswhen vehicles were lost/stolen, the owner often found it problematic to keep track of what was happening. Also to track moving vehicle carrying school children, patients, VIP's, high value material or Bank/ATM Money transportation. There is a requirement of some type of system to determine where each object was at any given time and for how long it travelled .

The latest technology like GPS, GSM are highly useful now a days, this system enables the owner to observe and track his vehicle and find out vehicle movement and its past activities of vehicle. This system will offer effective, real-time vehicle location, and report the location of the vehicle.This new technology popularly called Vehicle Tracking System which created many wonders in the security and safety of the vehicle. Mostly this tracking system will work with internet and data server as a primary requirement.

The implementation of this system is fitted on to the vehicle in such a manner that it is not visible to anyone who is inside or outside of the vehicle. Thus it is used as a system which continuously sends the location data to the monitoring unit. When the vehicle is stolen, the location data from tracking system can be used to find the location and can be informed to police and owner for further action. Some Vehicle tracking System can even detect unauthorized movements of the vehicle and then alert the owner.

1.1 Vehicle Tracking System's features

It is mainly benefit for the companies which are based on transport system. Since it can show the position of all vehicles in real time, so that they can create the expected data accordingly. These tracking system can store the whole data where the vehicle had gone, where did it stop, how much time it take at every stop and can create whole data analysis. It is also used in buses and trains, to estimate how far are they, how much time it takes for them to come to a particular stop. These systems are used to data capture, data storage, data analysis and finally data transfer. By adding additional sensors such as temperature sensor and infrared sensors the system can be enabled to detect fire , theft and obstacles.

Chapter 2

Literature Review

2.1 Literature Review #1

Title :A Review on GSM and GPS Based Vehicle Tracking System

Author :Dinesh Suresh Bhadane, PritamB.Bharati, SanjeevA.Shukla, MonaliD.Wani, KishorK.Ambekar

Publication :International Journal of Engineering Research and General Science Volume 3, Issue 2, March-April, 2015

Objective

In this paper a survey is done on various vehicle method of tracking techniques using GSM & GPS. Vehiclenavigation is one of the most important factors in the context of navigation which is mostly used by many drivers. A vehicle trackingsystem combines the installation of an electronic device which is mounted in a vehicle, or inside of vehicles, with purposedesignedcomputer software to allow the owner or a user to track the vehicle's location, collecting data in the process. Todayvehicle tracking systems commonly use Global Positioning System (GPS) technology for locating the vehicle, but other types ofautomatic vehicle location technology can also be used. Vehicle information can be viewed and located on the electronic google mapsvia the Internet or specialized software.

Vehicle navigation is one of the most important applications in the field of navigation which is mostly used by drivers. The mapsgiven to the driver in the system plays most important role in this field. When large object or vehicles were spread out over ground,the owner corporations often found it difficult to keep track of what was happening. They required some type of system todetermine where each object was at any given time and for how long it travelled. Also the need of tracking in consumer’s vehicle useto prevent any kind of theft because police can use tracking reports to locate stolen vehicle. GSM and GPS based tracking system willprovide effective, real time vehicle location, and reporting. A GPS- GSM based tracking system will inform where your vehicle isand where it has been, how long it has been.

The system fetches the geographic location and time information from the Global Positioning Satellites. During vehicle motion, its real-time parameters such as location are reported by SMS message. The syste mtakes advantage of wireless technology in providing powerful management transportation engine.

2.2 Literature Review #2

Title :Vehicle tracking system using GPStechnology

Author :KismatPradhan, YogeshLimboo, AnuRai, Avinash Sharma

Publication :International Journal of AdvancedResearch,Ideas and Innovations in Technology.

Objective

Vehicle tracking is one of the most important techniques mostly used in today's world. A vehicle tracking system works with the installation of a tracking device which is kept inside vehicles, so it allows the user or an owner to track the vehicle's location.

Now a day's vehicle tracking systems are normally work on Global Positioning System (GPS) technology for tracing the vehicle,but other forms of vehicle tracing technology can also be used. In this paper, a survey is done on various vehicle tracking methodusing GPS. Vehicle information can be viewed and located on the maps via the Internet or specialized software. In this paper,study is done on a real-time vehicle tracking system that works using GPS and GSM technology, which would be the easiest andinexpensive source of vehicle tracing.

2.3 Literature Review #3

Title :Survey on Vehicle Tracking Services

Author :Ankush Das, NisargGandhewar, Devendra Singh Nehra, MayankBaraskar, ShubhamGurjar and Mubbshir Khan

Publication :Journal ofInformation Technology & Software Engineering

Objective

If a person moves to a new place or a new city and there is some problem to vehicle then it is difficult to find amechanic nearby. This application provides service of mechanic to the user. This application helps to search nearestmechanic available to the user's location. This application allows to trace the mechanic and provide different servicesto the user and it also provide video tutorial to help the user. Our application tracks the mechanic and user location withthe help of google maps. Also, we have studied some papers and application related to the tracking of the vehicle usingsome hardware devices, we are planning to use google map and GPS tracking available in mobile to track a vehicle.

Chapter 3

Project Details

3.1 Overview

The project consists of GPS receiver and GSM modem with a micro controller.. The vehicle tracking system uses the GPS module to get geographic coordinates at regular time intervals. The GSM/GPS module is used to transmit and update the vehicle location. A Smartphone application is also developed for continuously monitoring the vehicle location . One more implementation will be doing along with tracking the vehicle is alarming system through SMS to the server from the mobile. This alarm will indicate that the database is not receiving the position of the vehicle not in regular interval or stop sending the geographic location of the vehicle. The Google Maps API to be used to display the vehicle on the map in the Smartphone application. Thus, users will be able to continuously monitor a moving vehicle on demand using the Smartphone application and determine the estimated distance and time for the vehicle to arrive at a given destination. In order to show the feasibility and effectiveness of the system, this project presents experimental results of the vehicle tracking system and some experiences on practical implementations.The whole system is attached to the vehicle.GPS system will send the longitudinal and altitude values corresponding to the position of vehicle to GSM Modem. Imagine the bus has left Bangalore at 6 o clock in the morning. If the officer in charge for that vehicle wants to know where the vehicle is, he will just send a SMS ‘Track’ to the vehicle’s GSM phone number then the GSM will sent back a reply along with a URL.After clicking on that URL it will be directly redirected to google map and in google map the officer can see the position of the bus.

3.2 Block diagram

The block diagram of the vehicle tracking system is shown below. The block diagram shows the overall view of the system. The blocks that are connected here are GPS,Microcontroller, display, GSM .

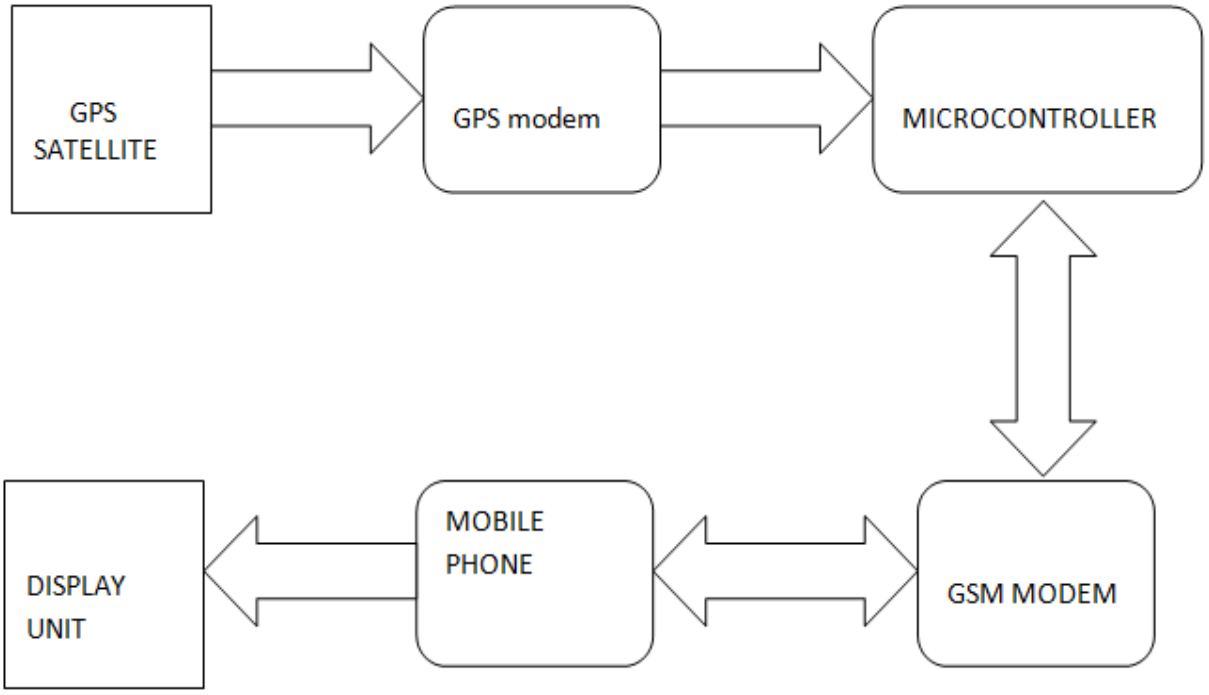

Fig 3.1 Block fiagram

3.3 Software/hardware requirements

- Arduino UNO
- GPS Neo 6m
- GSM 900A
- 16/2 display
- Jumper cable
- Arduino IDE
- C,C++

3.3.1 Arduino UNO

Fig 3.2 Arduino

Arduino UNO is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worring too much about doing something wrong, worst case

scenario you can replace the chip for a few dollars and start over again."Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

3.3.1.1 Programming

The Arduino Uno can be programmed with the Arduino Software (IDE) as per the following steps:

Step1: Select "Arduino/Genuino Uno from the Tools > Board menu (as for the microcontroller on board).

Step2: Upload new code from ATmega328 on the Arduino UNO using bootloader. It communicates using the original STK500 protocol .

Or

We can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) .

Step3: The ATmega16U2/8U2 is loaded with a DFU bootloader, which can be activated by:

On Rev1 boards: connecting the solder jumper on the back of the board and then reseing the 8U2.

On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

3.3.1.2 Warning

The Arduino Uno has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

3.3.1.3 Five ways to power up the Arduino

- Using USB cable

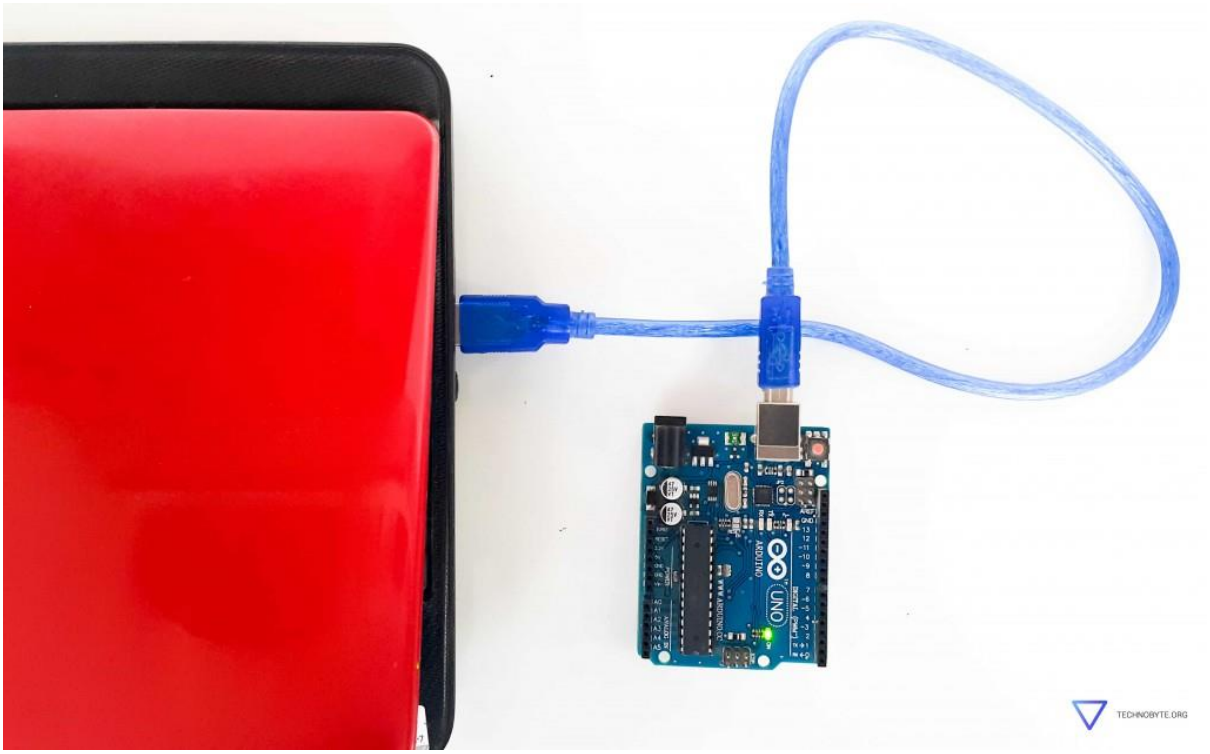

Fig 3.3 Arduno USB port

The USB port of the Arduino Uno can be connected to a desktop/laptop. If the connection is enumerated, i.e. the computer recognizes the device, the current

supplied to the board is 500mA at 5V. If the connection is not enumerated, 100mA is supplied at 5V.

- Using an AC to DC adapter plugged into the barrel connector

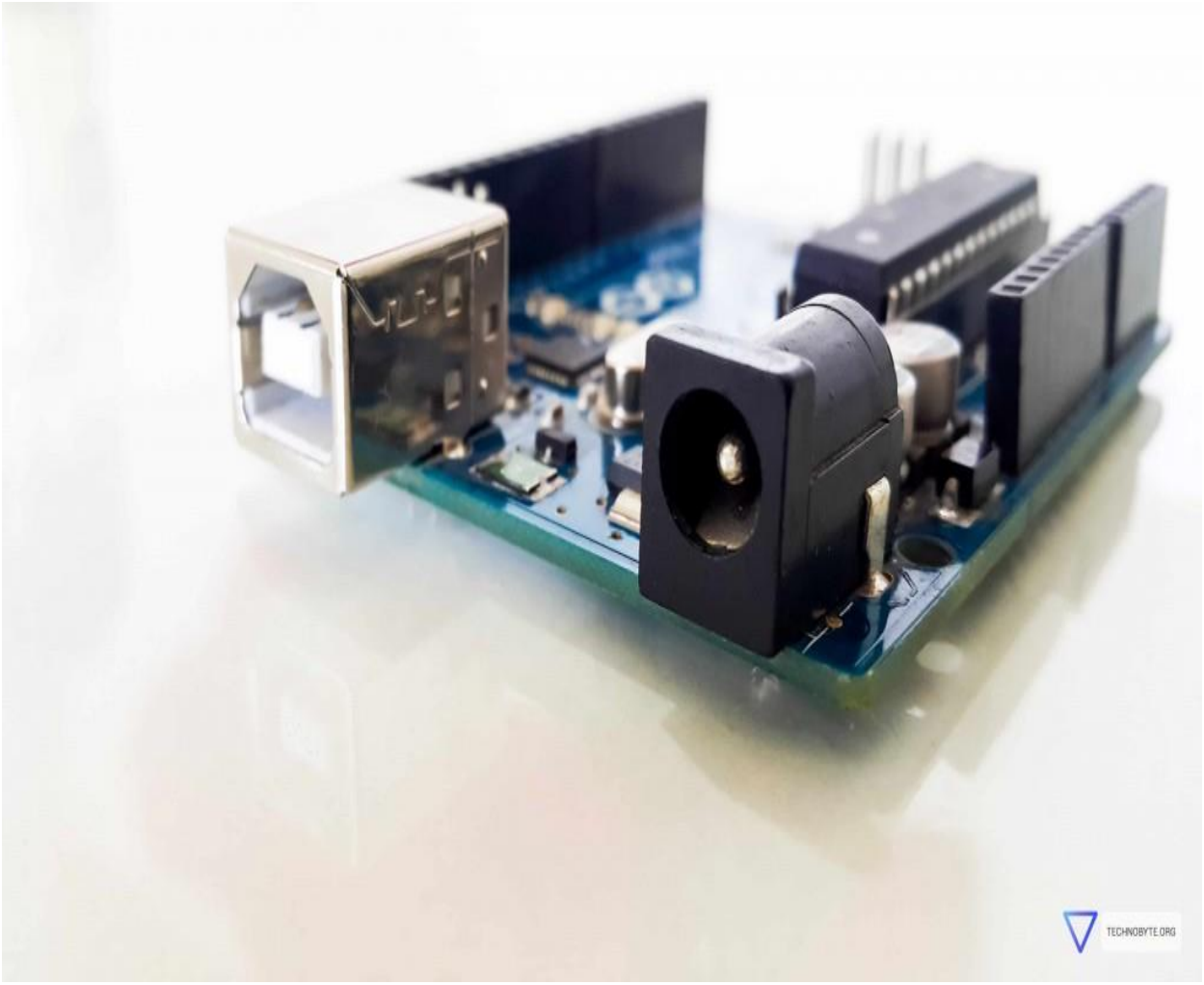

Fig 3.4 AC to DC adapter

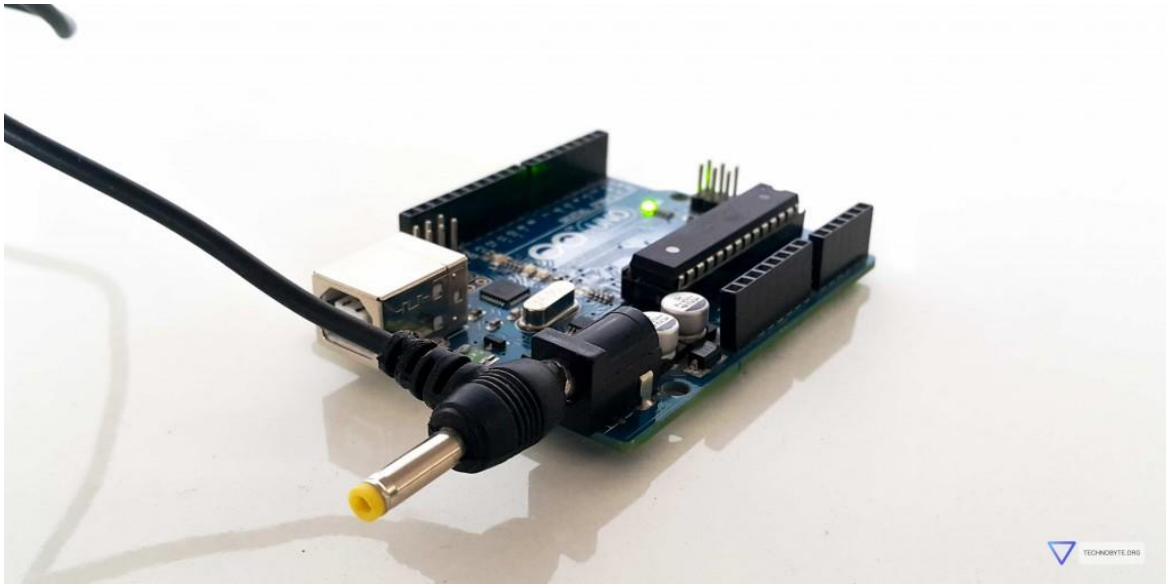

Fig 3.5 Barrel connector

The barrel connector can be supplied with an input of 7-12V. This is regulated to 5V by the onboard voltage regulator, and the board is powered on.

- Using 5V input

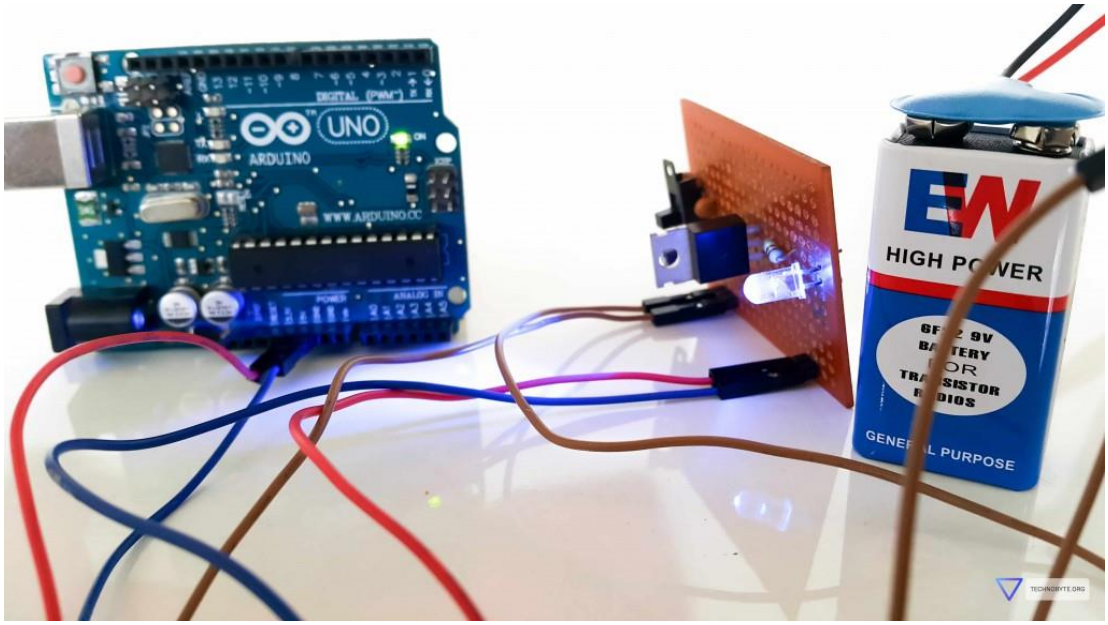

Fig 3.6 5V input

It is possible to power up the Arduino using the 5V and GND pins, provided that the input given is steady and regulated 5V. The 5V pin bypasses the voltage regulator and all the safety measures present on the Arduino Uno, so if the input exceeds 5V (5.5 is the maximum upper limit), the board can be damaged. It is generally advised to avoid powering up the Arduino Uno using this method.

- Batteries (9v) with a battery connector

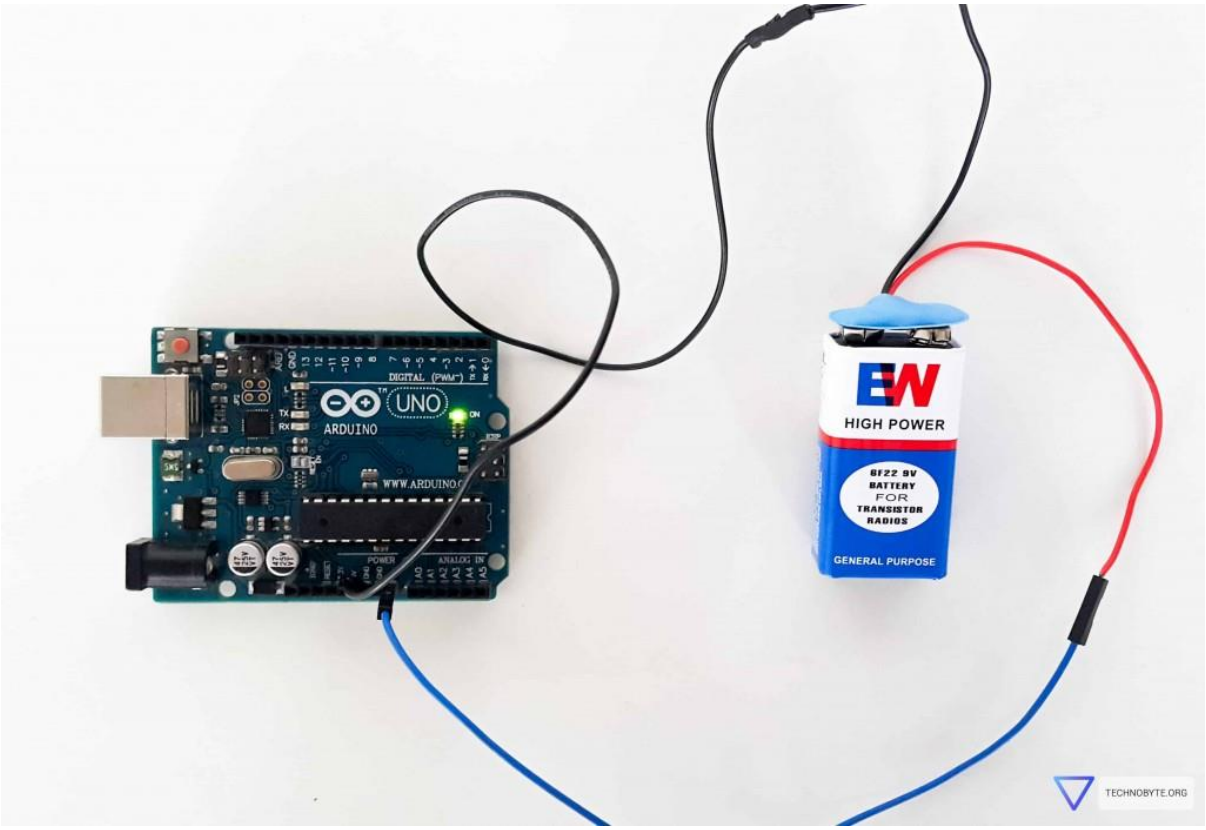

Fig 3.7 Battery

Connect a 9V battery with the positive terminal connected to the Vin pin and the negative terminal connected to the GND pin. The Vin port allows an input between 7 and 12 Volts, but we recommend to use a 9V battery. Depending on your application you can input 12V too but make sure the current values stay around 500mA.

3.3.2 GPS Neo 6m

This article demonstrates how to play with the u-blox NEO-6M global positioning system (GPS) module, a very popular, cost-effective, high-performance GPS module with a ceramic patch antenna, an on-board memory chip, and a backup battery that can be conveniently integrated with a broad range of microcontrollers.

Fig 3.8 GPS

The u-blox NEO-6M GPS engine on these modules is quite a good one, and it also has high sensitivity for indoor applications. Furthermore, there's one MS621FE-compatible rechargeable battery for backup and EEPROM for storing configuration settings. The module works well with a DC input in the 3.3- to 5-V range (thanks to its built-in voltage regulator). The NEO-6M module includes one configurable UART interface for serial communication, but the default UART (TTL) baud rate here is 9,600. Because the GPS signal is right-hand circular-polarized (RHCP), the style of the GPS antenna will be different from the common whip antennas used for linear polarized signals. The most popular antenna type is the patch antenna. Patch antennas are flat, generally have a ceramic and metal body, and are mounted on a metal base plate.

They are often cast in a housing.Remember, the position of the antenna mounting is very crucial for optimal performance of the GPS receiver. When using the patch antenna, it should be oriented parallel to the geographic horizon. The antenna must have full view of the sky, ensuring a direct line of sight with as many visible satellites as possible.

3.3.3 GSM 900A

This is an ultra compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications.Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mmx24mmx3mm, SIM900A can fit in almost all the space requirements in user applications, especially for slim and compact demand of design

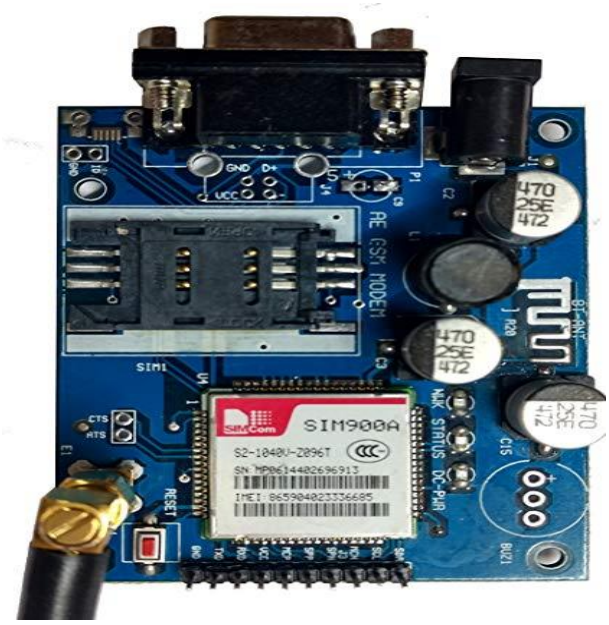

Fig 3.9 GSM

3.3.3.1 Features

- Dual-Band 900/ 1800 MHz
- GPRS multi-slot class 10/8GPRS mobile station class B
- Compliant to GSM phase 2/2+Class 4 (2 W @850/ 900 MHz)
- Class 1 (1 W @ 1800/1900MHz)
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- Low power consumption: 1.5mA(sleep mode)'
- Operation temperature: -40°C to +85 °C
- Status indicator (D5): It will flashes continuouslywhenever the call arrives otherwise it is left ON.

3.3.4 16/2 display

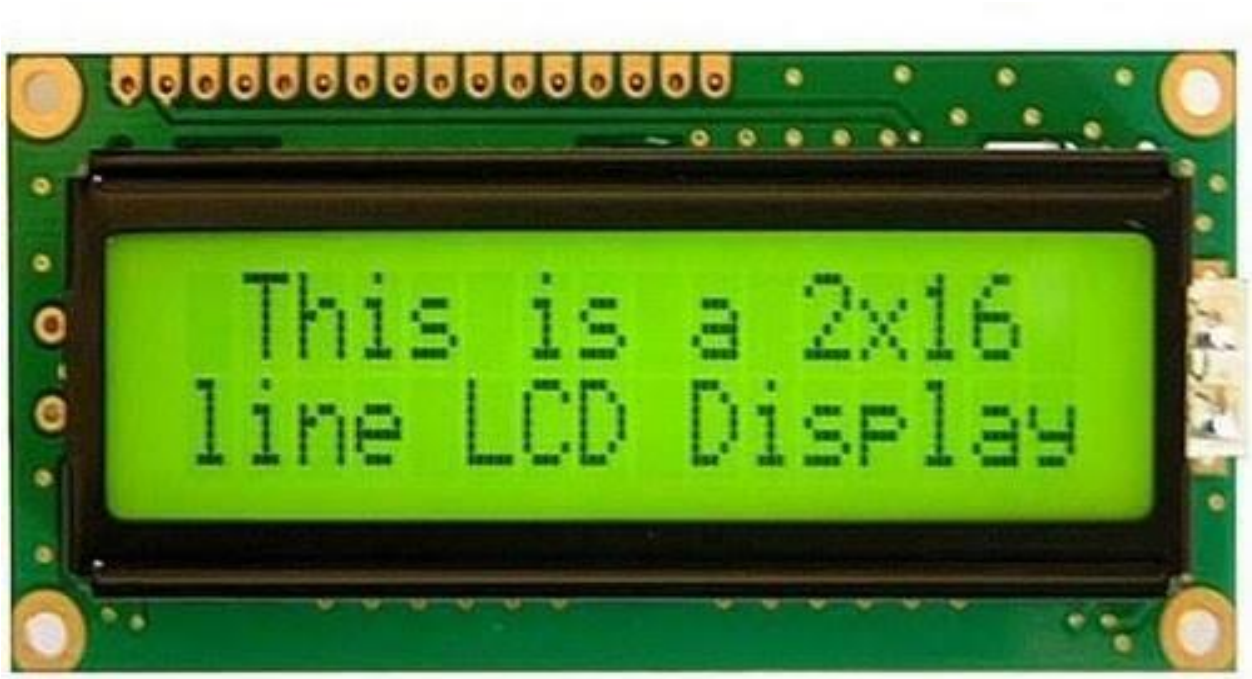

Fig 3.10 16*2 LCD display

The part 16×2 means that the LCD has 2 lines, and can display 16 characters per line. Therefore, a 16×2 LCD screen can display up to 32 characters at once. It is possible to display more than 32 characters with scrolling though.

3.3.5 Jumper cable

A jump wire (also known as jumper wire, or jumper) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into.

Fig 3.11 Male to male jumper cable

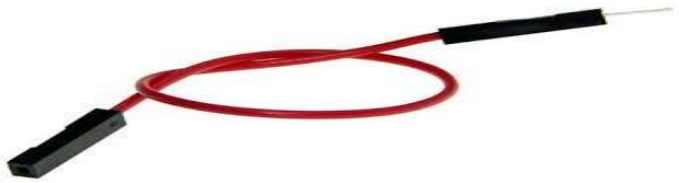

Fig 3.12 Male to female jumper cable

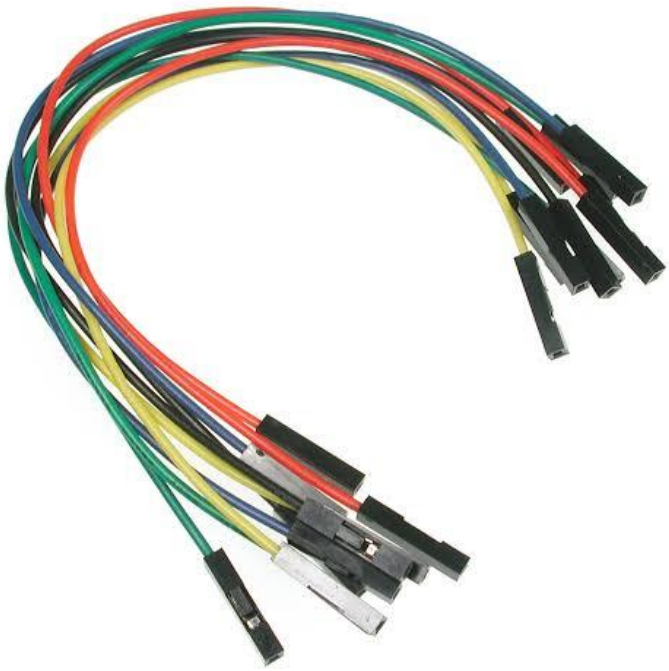

Fig 3.13 Female to male jumper cable

3.3.6 Arduino IDE

The open-source Arduino Software (IDE) on Windows to write the code and upload it into the microcontroller board. This environment is written in Java and based on Processing and other open-source software.This software can be used with any Arduino board.

3.3.7 C,C++

- Both the languages have a similar syntax.
- Code structure of both the languages are same.
- The compilation of both the languages is similar.
- They share the same basic syntax. Nearly all of C's operators and keywords are also present in C++ and do the same thing.
- C++ has a slightly extended grammar than C, but the basic grammer is the same.
- Basic memory model of both is very close to the hardware.
- Same notions of stack, heap, file-scope and static variables are present in both the languages.

Chapter 4

Methods and approaches

The project consists of GPS receiver and GSM modem with a micro controller. The whole system is attached to the vehicle. In the other end (main vehicle station) one GSM mobile phone is attached to the computer with VB application. So the GPS system will send the longitudinal and altitude values corresponding to the position of vehicle to GSM Modem.

Imagine the bus has left Bangalore at 6 o clock in the morning. If the officer in charge for that vehicle wants to know where the vehicle is, he will come to the computer and click on the vehicle number on the VB program .The VB program will send an SMS to the vehicle number.

The SMS sent would come through the GSM service provider and then reach the vehicle, which is traveling, because the vehicle has a GSM device with sim card. This GSM modem will receive the SMS and send to the microcontroller in the vehicle. The microcontroller will receive this SMS and compare the password and the command. If everything matches then it will perform the request required by the office.

A place name is assigned for each longitude & latitude. The GSM receiver in the vehicle office receives these data & gives to the PC through serial port. The VB program in the PC checks this data with its database & displays the details of the vehicle on the screen. The device is password controlled i.e. person who knows the device password only able to operate. In case of any mishaps such as fire , theft or obstacle ,the device will automatically will send an alert to the registered number i.e, the number that is feeded into the memory of microcontroller.

Chapter 5

Result and Discussion

The whole circuit without power connection :

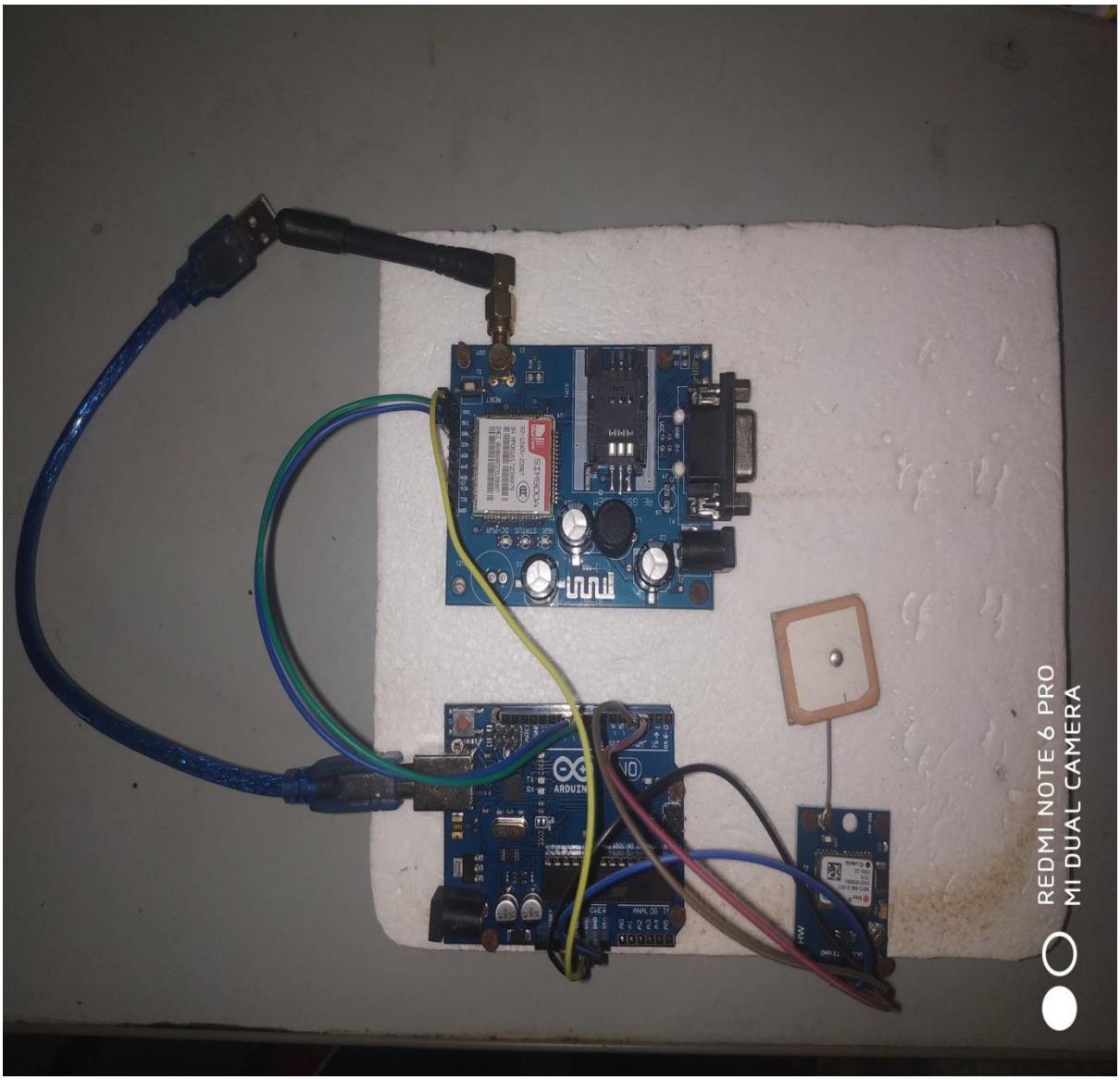

Fig 5.1 The whole circuit without power connection

Circuit after getting power supply through USB cable :

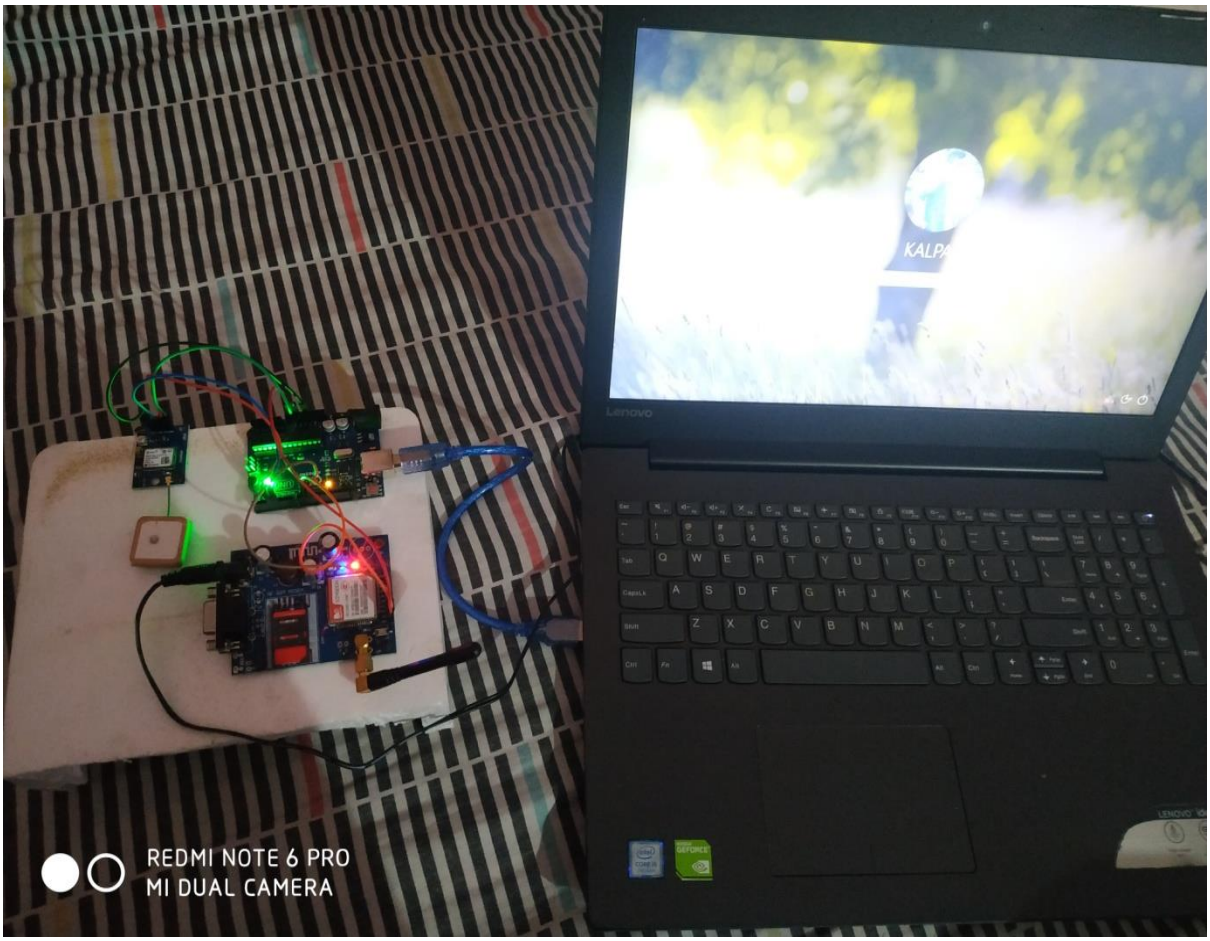

Fig 5.2 Circuit after getting power supply through USB cable

Circuit after getting power supply through USB cable :

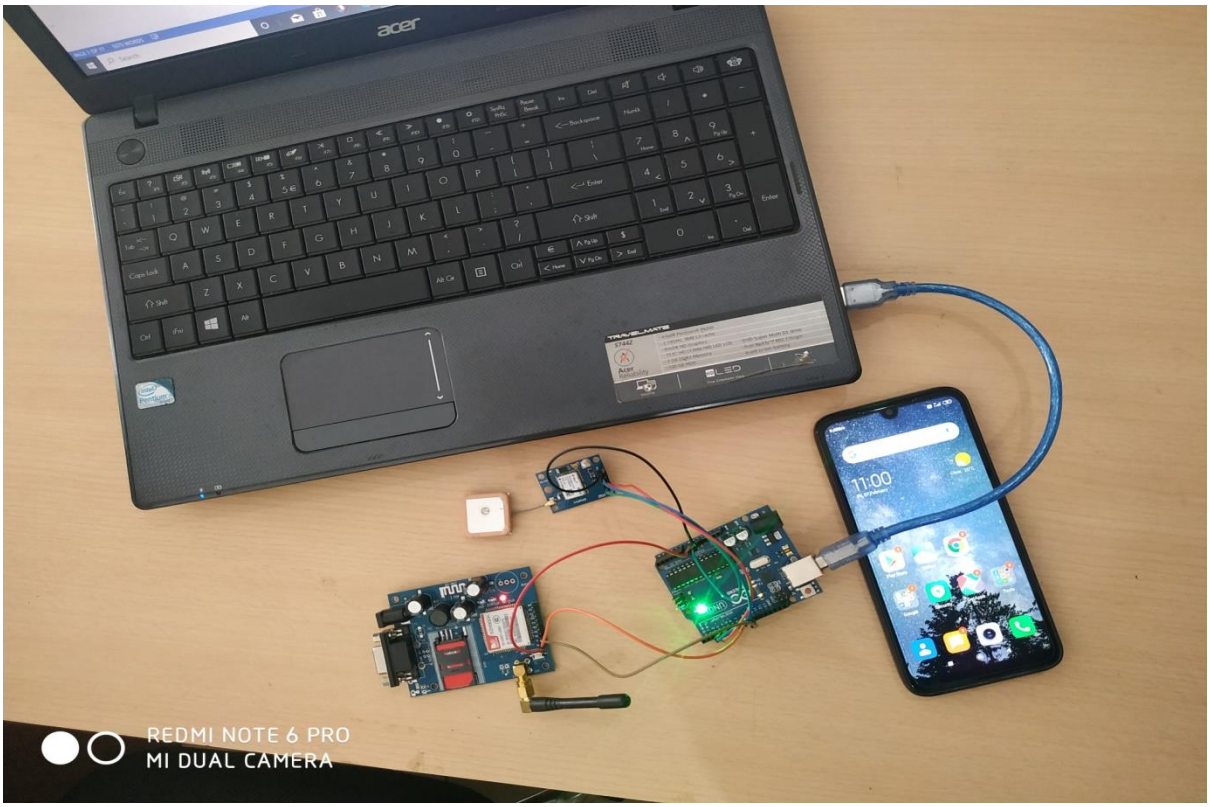

Fig 5.3 Circuit after getting power supply through USB cable

Output display on handset :

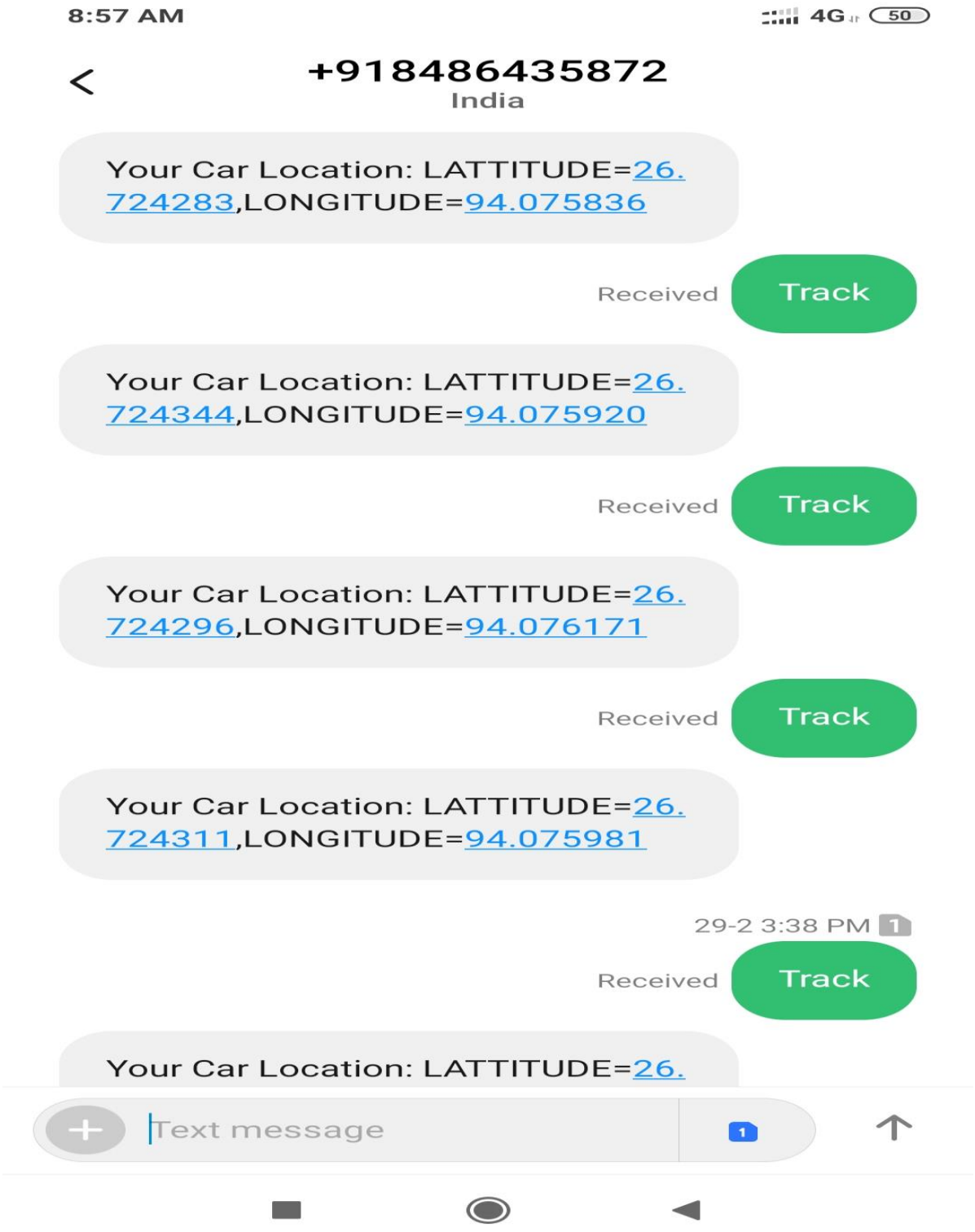

Fig 5.4 Output display on handset

Display of the map on handset to indicate the location :

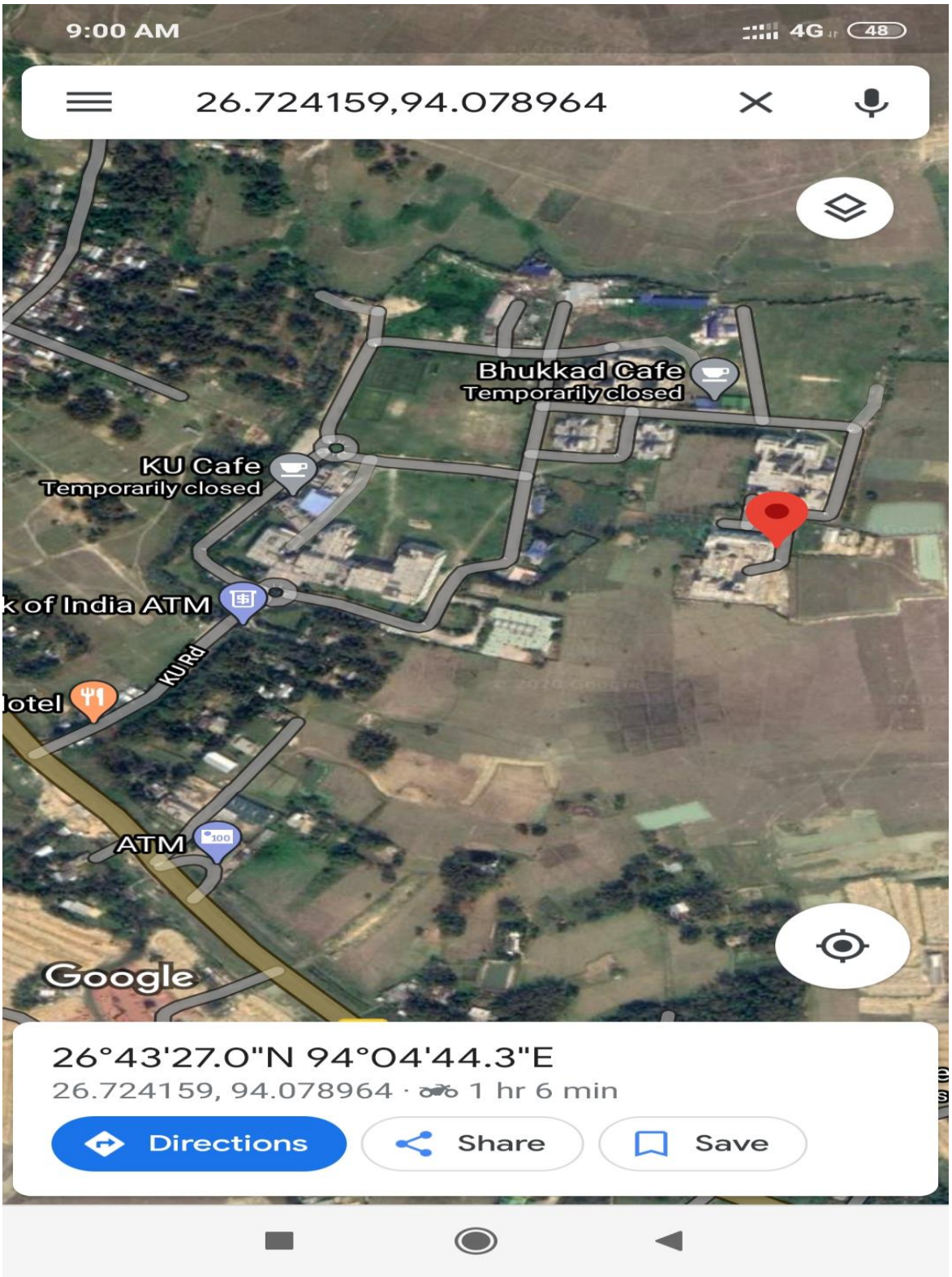

Fig 5.5 Display of the map on handset to indicate the location

There are two option : a)Share b)Save

a)Share :We can share the map to any other authorize person.

b)Save : Google map will be saved in a folder as per configured by the handset user.

Chapter 6

Conclusion

Vehicle tracking system makes reduce the risk of theft of vehicles, better fleet management, better control of traffic, and which in turn brings large profits. Better scheduling or route planning can enable to handle large no. of jobs loads within a particular time. Vehicle tracking can be used by individual as well as organization to improve safety and security, communication medium, performance monitoring and increases productivity. So in the coming year, it is going to play a major role in our day-to-day living.

Chapter 7

Future Work

The following two features will be design and developed as a future wok :

a)An alarm system to be implemented inside the vehicle along with existing Vehicle Tracking System (VTS).This alarm will be activated if someone try to destroy VTS of the vehicle and alarm will send a notification to the owner. So that the owner can take some immediate action.

b)We will try to convert the latitude and longtitude value into an URL link.

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