IOT BASED STOLEN VEHICLE MONITORING SYSTEM

JASKEERAT SINGH
RA1611003011170
AKSHIT SINGH
RA1611003011150

ABSTRACT

The current transportation system is not ready to adapt to the growing problem of stolen vehicles. This paper aims to propose a stolen vehicle monitoring system that uses vehicle-mounted RFID tags for STOLEN VEHICLE DETECTION. This paper uses a technique to take care of the issue of stolen vehicles using a database of the last known location of the vehicle and cross reference the owner's information present in the system. Our system provides an easy platform to improve the maintenance of the database of stolen vehicles that the management system gathers. This information from various traffic light intersections is collected and problem area lanes are red lit in case of a stolen vehicle is detected using an RFID tag reader. The Arduino board is connected to so as to establish a connection to the local server where the mysql database will be hosted from. The final information of the vehicle can be sent to the owner and the concerned authorities.

INTRODUCTION

Internet of Things (IOT) states that soon all the physical devices will be interworking and be connected to each other via the internet. As the interworking of these devices with the network gets more prominent by each passing day, these interworking devices can integrate themselves with other devices to successfully carry out the tasks. The operation of the technology like self-driving cars is increasing sharply and is being talked about as the next big thing in the industry. This change in the industry requires a method to keep account of all the cars which are working autonomously on the streets.

The figure below gives the idea of the proposed implementation in the real world. A traffic system typically consists of four lanes. This vehicle monitoring system can be found in private vehicles as a vehicle monitoring and updating system. Police officials can follow the information and updates given by the monitoring system to easily locate the vicinity in which the stolen vehicle was last seen.Generally, this system is meant to locate customer-owned vehicles which makes it easier for the police officials to roughly track the area in which the vehicle is present.
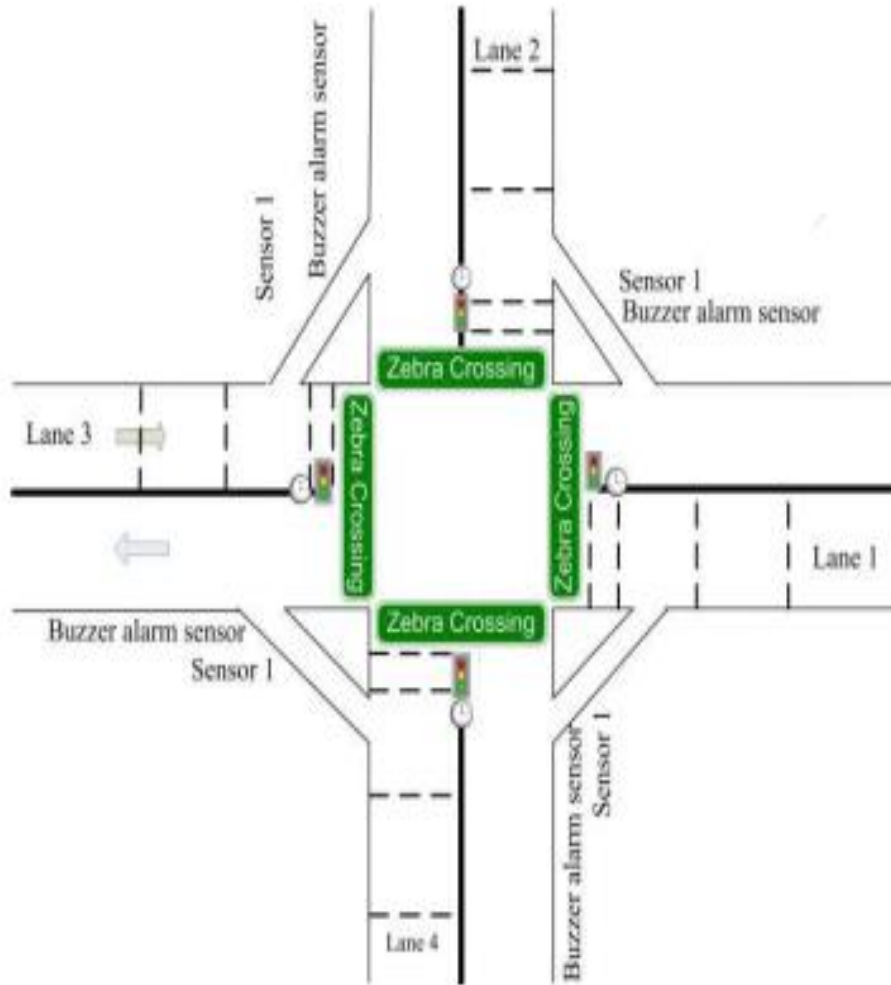
Vehicle monitoring systems are popular in privately owned vehicles as loss prevention, management, and retrieval device. The authorities will first check if any gps is available or not. If the gps is available, then we will check the gps reading. If the gps is not available, the authority will look at the rfid database. Police can simply follow the regular updates given by the database system and locate the area in which the stolen vehicle was last seen. This will certainly reduce the area of search in which the vehicle is present.

There are several components such as RFID tag and scanner, Arduino, local Database through various applications like phpMyAdmin served through a xampp server

LITERATURE SURVEY

This section will contain information regarding the projects which has attempted to tackle the problem previously or is using technology through which inspiration is gained and some part is implemented in this project.

GPS and GSM Implementation

Kunal Maurya, Mandeep Singh, and Neelu Jain made a device which can installed at a secure location in the vehicle such that it will help the owner in keeping track of the vehicle's location. It uses both GPS and GSM modules to locate the location and transfer the information. The major drawback of this system is the ease with which the GPS can be disabled by removing the power source to the gps or removing the whole panel.

Signal monitoring using vehicle count

Senthil Kumar and Kumar Narayanan proposed a model that helps maintain the timing interval between the traffic signal at an intersection. This system depends on the amount of vehicles present on the road. The proposed device will be able to decide the timing when the the systems signal will be used which is the count of the number of vehicles. The major drawback of this system is the unknown long wait time for the other users waiting on the different intersection even if an emergency vehicle is waiting on that intersection.

System for emergency vehicles

Aditi Avadhani proposed a framework that has been intended to remove the weakness in the movement of the traffic system by doing system analysis. The framework gives data about road/street blockage and also gives the ability to control the stream of traffic and help maintain a system for emergency vehicles to practice crisis exit. This system gives solution based on the premise of analysing the traffic and giving the best suggestion of a route which can be followed in the future. But this does not give any real time help to the user.

Data analysis to provide future predictions

Sabeen Javaid, Ali Sufian proposed a system that takes various different input parameters from cameras/sensors and then calculate the traffic density which will be used to manage the traffic lights. A.I. will be used to make prediction about the traffic pattern for the future to minimize traffic jams. RFIDs are also used to give more priority to the vehicles such as ambulances and fire brigade at the time of traffic congestion. It does not give any real-time advantage and rather is made to provide predictions to streamline future congestion.

System based upon road density

Mehal Zaman Talukder and Sheikh Shadab Towqir proposed a device where inputs and sensors are implemented with the Raspberry Pi. This is done so as to change the lanes of an intersection based on count of vehicles on the road with real-time action ability. The decision to greenlight a particular intersection depends upon the density of vehicles on the road. The major drawback of this system is the long wait time for the other users on the intersection.

Location Update Accuracy using Zigbee modules

To improve the accuracy of location tracking, in this paper the mechanism of Zigbee is used in addition to GPS. The Markov chain algorithm is used to increase the accuracy. They first noted the Normal Human steps and then noted the Blind human walking steps. They incorporated these with the help of Markov chain algorithm. This was used to provide stepwise location updates. There was a need for an increase in the accuracy so as to provide the blind users a device for finding a path without any obstacles. Here the GPS works as a source of location data which can help by preventing accidents.

Improving GPS Accuracy For Land Vehicle Navigation System

The paper talks about how the different Terrain, high rise buildings, and dense forest cover can block the penetration of GPS signals to the antenna receiver. While some advances have been made in improving the sensitivity of GPS receivers or developing techniques such as assisted GPS that gives permission to a GPS receiver to use attenuated signals but it does not forgo of the issue that the antenna of a conventional GPS receiver must have a direct line of sight with the satellites revolving around the earth. In urban regions, it might not be possible to maintain a line of sight with the satellites and hence will not be able to get a possible position fix. This problem can also persist when the vehicle is moving through tunnels or parking garages as no line of sight will be maintained between the satellite and the gps antenna. To maintain the accuracy of navigation a novel particle filter (PF) for sensor fusion is proposed.

Sensor Based Dead Rockening for land vehicle navigation system

The paper states that The Extended Kalman filter (EKF) is used for sensor fusion in the land vehicle navigation system. In place of EKF, a novel particle filter for sensor fusion is proposed and the sampling of the particle filter shows better performances when compared to EKF. the different Terrain, high rise buildings, and dense forest cover can block the penetration of GPS signals to the antenna receiver. In urban regions, it might not be possible to maintain a line of sight with the satellites and hence will not be able to get a possible position fix. In the absence of the GPS, the historical GPS data can be combined with sensors to provide continuous navigation in even the most challenging environments, with the possibility of the modified particle filter algorithm to avoid dead reckoning for land vehicle navigation system.

INFERENCE FROM LITERATURE SURVEY

1. The GPS devices which are installed in the vehicle can simply be removed by disconnecting the wires to the power source.

2. Another major problem is that the GPS cannot work if there is a dense cover or foliage. The gps signals wont be able to reach the antenna as there wont be direct line of sight between the antenna and the satellite.

3. If the implemented system is done based on the vehicle count, then the wait time depends upon the number of vehicles on the road. If there are a large of vehicles on the road, then the wait time for the vehicles on other roads will increase exponentially even if these vehicles are emergency vehicle.

4. The analysis of the data does not provide any immediate solution but helps provide a solution for the future by monitoring the problem areas in the current state. These analysis will look at the problem areas and will take these into consideration while making a decision for the future.

5. AI will monitor and make models for the future to prevent theft and streamline the traffic but does not provide any real time updates. These will look at the past traffic pattern to determine and predictions about the future.

6. The road density system is based on the number of vehicles on the road. Even if there are emergency vehicles on the other road, their wait time will still increase exponentially and they will have to wait till their time comes in the pattern based on the density of the road.

7. Use of physical devices like tablets or any mount devices can simply be removed from the vehicle.

8. The GPS will not work as it is difficult to work under high foliage or with high rise buildings. This is because the signals will not reach the gps antenna as there is not a straight line of sight between the satellite and the gps antenna and hence a more accurate location cannot be obtained.

DISCUSSION

The vehicle theft monitoring system concentrates on different interconnected systems present on the vehicle and helps monitor the last known position of the vehicle. These types of technologies need to be revised to take precaution against the new security threats. A Radio Frequency Identification based vehicle theft detection system is implemented in the vehicle. An RFID tag will be attached to the vehicle. Two network-connected devices communicate with each other one attached to the vehicle and the other is with the authorities nearest to the current intersection and the database hosted on a maintained phpMyAdmin database. The database will contain information regarding the registry of the vehicle against the ownership details of the vehicle. A stolen checker module is maintained where each vehicle is checked against its stolen status in the database. Here the sensor will read the unique RFID tag of each car. Once a car is identified as the one which is stolen then the local authorities nearest to the intersection will be notified via some form of communication about the last location of the junction where the car is located. The database will store the last known junction address in a column against a car that was reported stolen by the owner. whenever these vehicles with a unique RFID tag are read then that junction address will be stored against in a coloumn, and the notification will be sent to the authorities. But if the vehicle is not found then the message to the local police to check the CCTV cameras is sent.

PROBLEM DEFINITION

The problem statement of the proposed project is that if the vehicle has been stolen, the owner will not be able to track their vehicle using the traditional methods as they are not efficient and do not produce results. They will have no idea where to look for the vehicle and the chance of getting back their vehicle will be very minuscule. In 2015, the country reported 211 million registered motor vehicles with a major portion of these vehicles registered in the metropolitan area. It makes the tracking of the vehicle very hard when no evidence is available to track the vehicle. So, this system will help track and give regular updates about the movement of the vehicles to the authority. The proposed system works on the principle that once the vehicle has been reported stolen and a FIR has been lodged, the RFID tag number will be stored in a database with the owner's current contact information on which the messages will be sent in case the vehicle's tag number is read. This database where the information about the stolen vehicle is stored is hosted on the local server. When the RFID tag is read for a stolen vehicle then the information is first checked with the database. If there is a match with one of the entries in the database, then a notification of the address of the junction is forwarded to the owner and the concerned authorities and the LED or lights of the junction are changed to red and the nearest local police will be notified.

Theft of Motor Vehicle Rate - India
2006
Value: 7.8 Rate per 100,000 population

Registered cases of vehicle thefts across states between 2011 and 2013

- 🔴 2013
- 🔵 2012
- ⬛ 2011

New Delhi: 14,916 / 14,391 / 14,668
UP: 24,948 / 22,773 / 21,363
Maharashtra: 18,394 / 17,855 / 19,270

Total cases in India (in lakh)

Year	Cases
2011	1.51
2012	1.54
2013	1.65
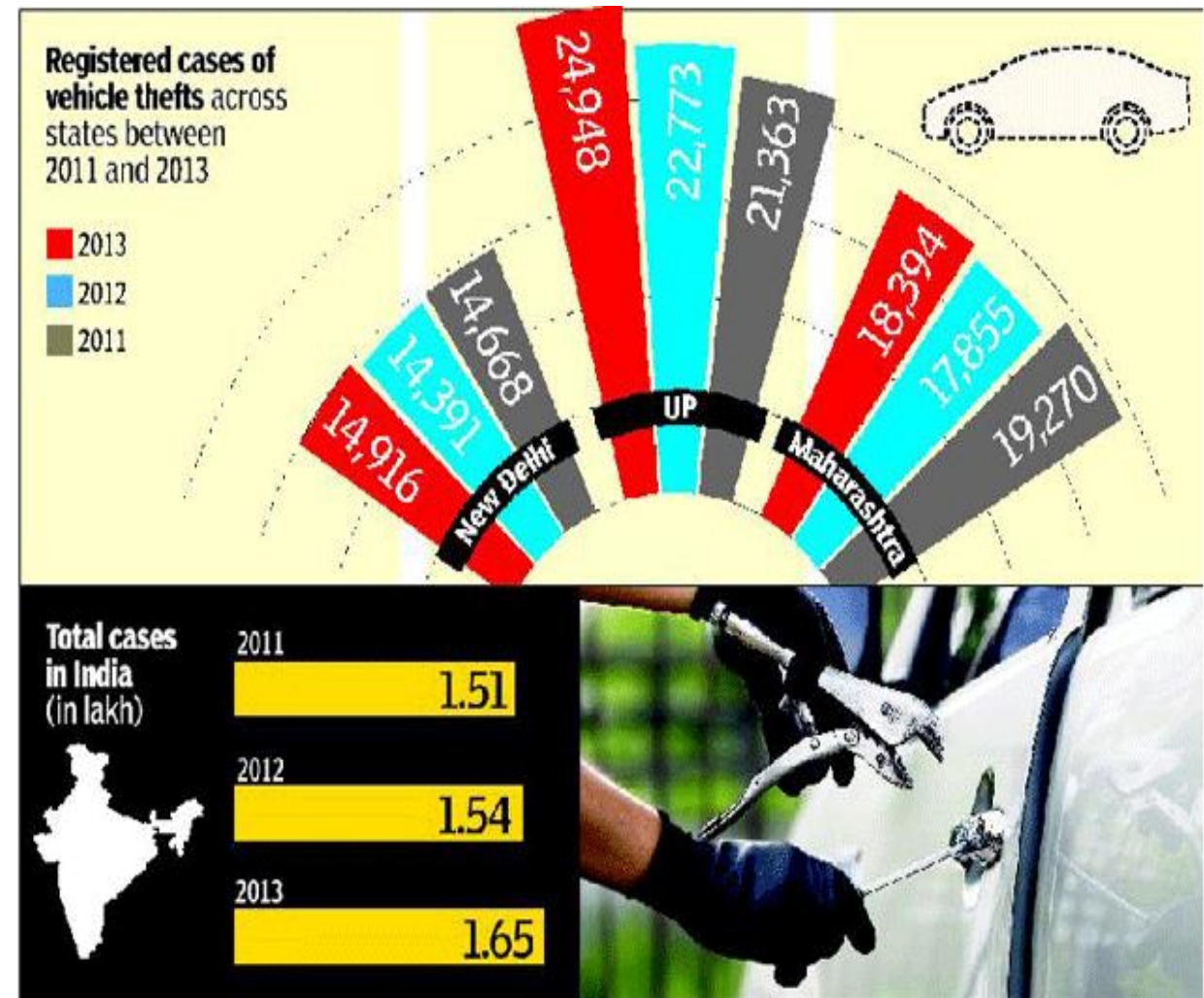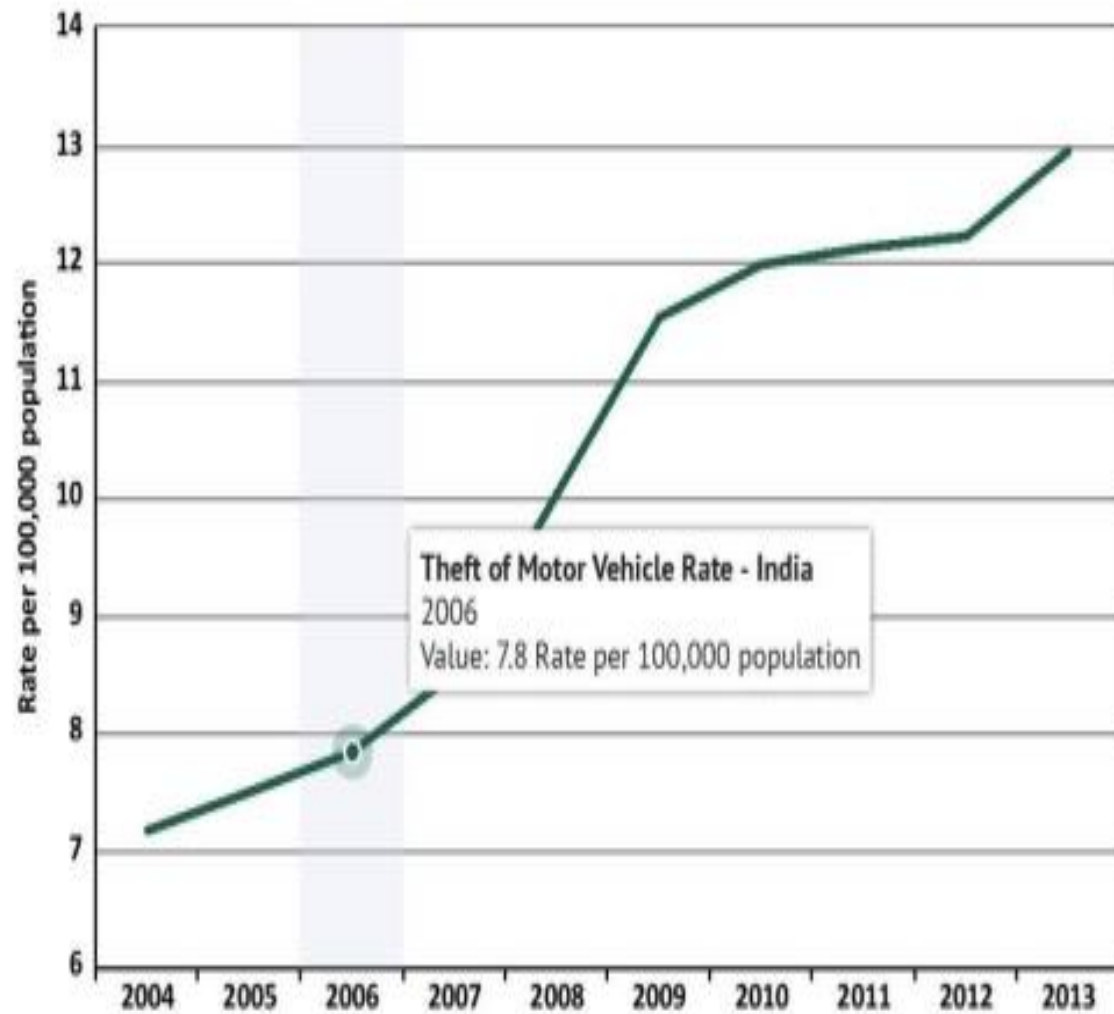
OBJECTIVES

1. To improve the communication of stolen vehicles to the concerned authorities.

2. Improving the planning techniques to reduce the overall delay which helps us in providing robust and resilient database of information.

3. To improve the methodology of providing real-time information to traffic controllers.

4. Devising new plans to use the database information much more effectively.

5. It can also be used by goods dispatchers for functions such as tracking of goods, changes in routes, dispatching of items, information regarding the delay, and security.

6. Authorities can follow the regular updates given by the database system and help triangulate the area in which the stolen vehicle is present.

7. Insurance companies need to track the movement of vehicles for reimbursement of insurance.

8. It helps different companies plot and use the location to closely monitor operation status.

CURRENT IMPLEMENTED SYSTEM

The current system for the stolen vehicle system depends upon the owner of the vehicle to go and make a FIR. After the complaint had been lodged, the police start looking at all the possible CCTV cameras to see all the possible places where the vehicle could be seen and placed. Then it is up to the police to make queries and work with the local population to start making rounds of the workshops. If the vehicle is not recovered the vehicle is then added to the NCRB or the National Crime Records Bureau and the owner, as well as the insurance company, is intimated. Once the information is added then it is a matter of time, once the authorities track down the VIN of the vehicle registered to the owner. Once the vehicle is confiscated then after checking the insurance information the vehicle is returned to the owner.

The another implemented system consist of a gps system in which a physical module which might be in the form of a chip powered by cell or a module which becomes on when the vehicle powers on. This module will try to make a line of sight with the satellite. If the satellite comes into the sight a link will be established. The last known location will be updated into the database. If there is a breakage in the line of sight the packages of data will not be received. This breakage of sight can occur due to high rise building or due to dense foliage. If the sight is not maintained then the gps will not remain hot. To again start the service, the line of sight needs to be maintained. This will require some time as the gps again needs to get hot. This time can be anything ranging from 30 sec to 30 min. Every information regarding the gps will be sent. It will depend upon the manufacturer to show a particular data to the user. The data will be shared in the form of NMEA format. The data required will be in the form of GPGGA which can be converted before sending it to the users display.

PROPOSED SYSTEM

The proposed system works on the principle that once the vehicle has been reported stolen and a FIR has been lodged, first the GPS module is checked. If nothing is found then the RFID tag number will be stored in a database. This database where the information about the stolen vehicle is stored is hosted on the local server. When the RFID tag is read for a stolen vehicle then the information is first checked with the database. If there is a match with one of the entries in the database then a notification of the address of the junction is forwarded to the owner and the concerned authorities and the lights of the junction are changed to red. Otherwise, nothing happens and the traffic cars are allowed to move through the junction and the signal of the junction remains green. Finally, a notification to the local police will be forwarded if the vehicle is not spotted in the region for more than 24 hours. In the end, the last known location of the junction where the vehicle's RFID tag was read will be stored in the database which can be used and brought into consideration into the investigation later.

SYSTEM ARCHITECTURE
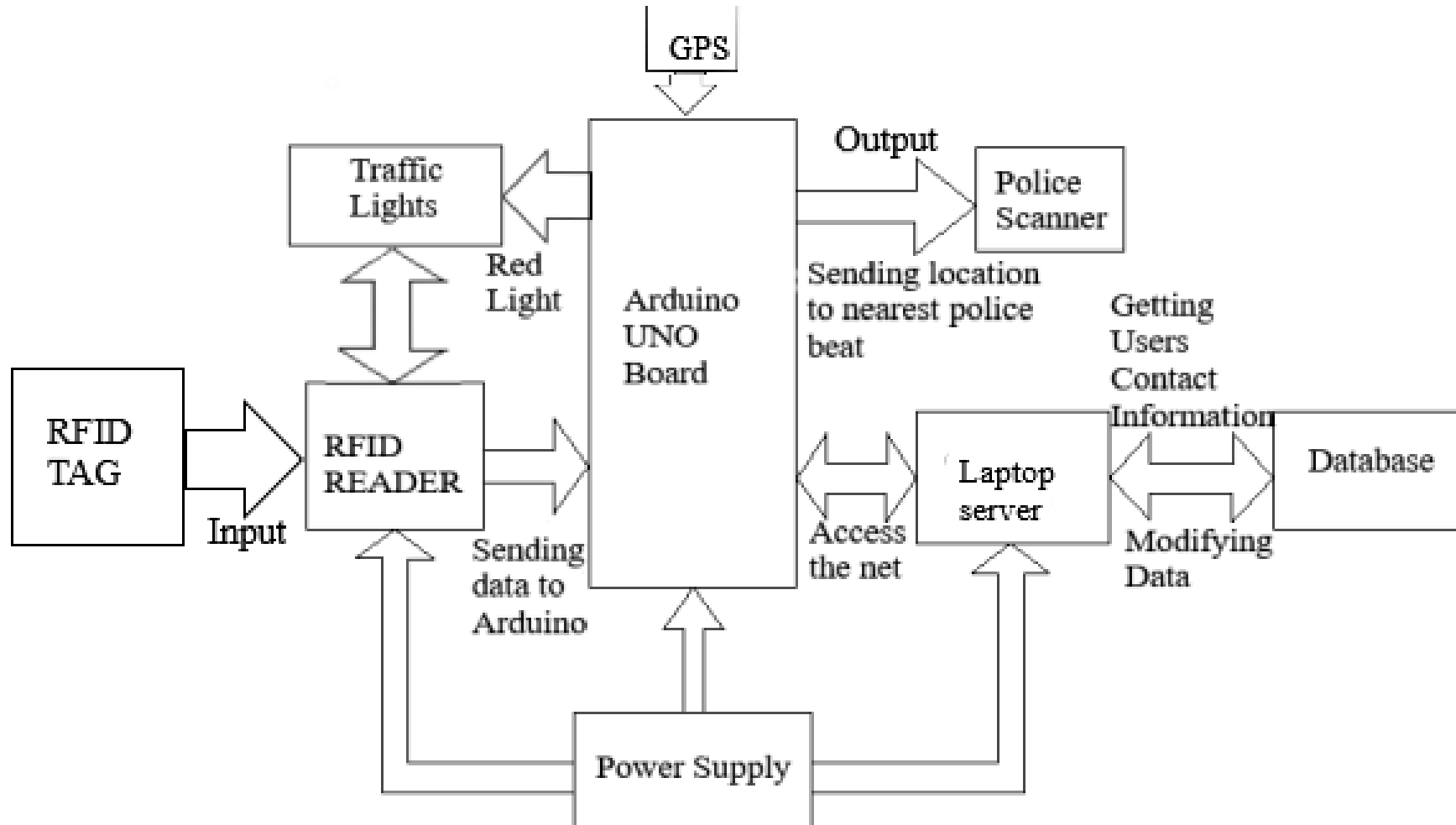
EXPLANATION

1. The main system consists of the Arduino uno board. This will serve as the brain of the project.

2. To this arduino board one RFID reader will be connected to a 3.3V.

3. This reader will read the input from the RFID tag and the information read will be passed to the arduino board.

4. The data read will be stored in the database using a python script which will connect the serial monitor output to the MySQL database.

5. The database will save this information in the XAMPP server hosting the mysql server.

6. In contrast to this a gsm module to show the comparison will be running. For this a clear line of sight needs to be maintained between the antenna and the satellite.

7. The gsm module will show the real life location of the vehicle.

8. All the modules can be powered with a single source like a laptop with a USB giving a constant supply.

9. Based on the input of the RFID, the action of the lights and buzzer can be manipulated based on the readings of the sensor.

10. The output will be stored in the MySQL database and different query's can be used to get particular output.

11. The output saved in the table can be sent to the authorities

FLOW OF THE PROJECT

1. At the start the user will make an update to the authorities of the theft.
2. The authorities will log the owners information in the database.
3. First it will be checked if the gps is available.
4. If yes then we can use the it to trace the location.
5. If no then we can use the RFID database to track the last known location of the car.
6. If we are not able to use the RFID then send the notification to the nearest police patrol car.
7. If yes then send the last junctions location to the owner and to the authorities.
8. If the vehicle is detected then red lit the road.
9. After this the process will stop.
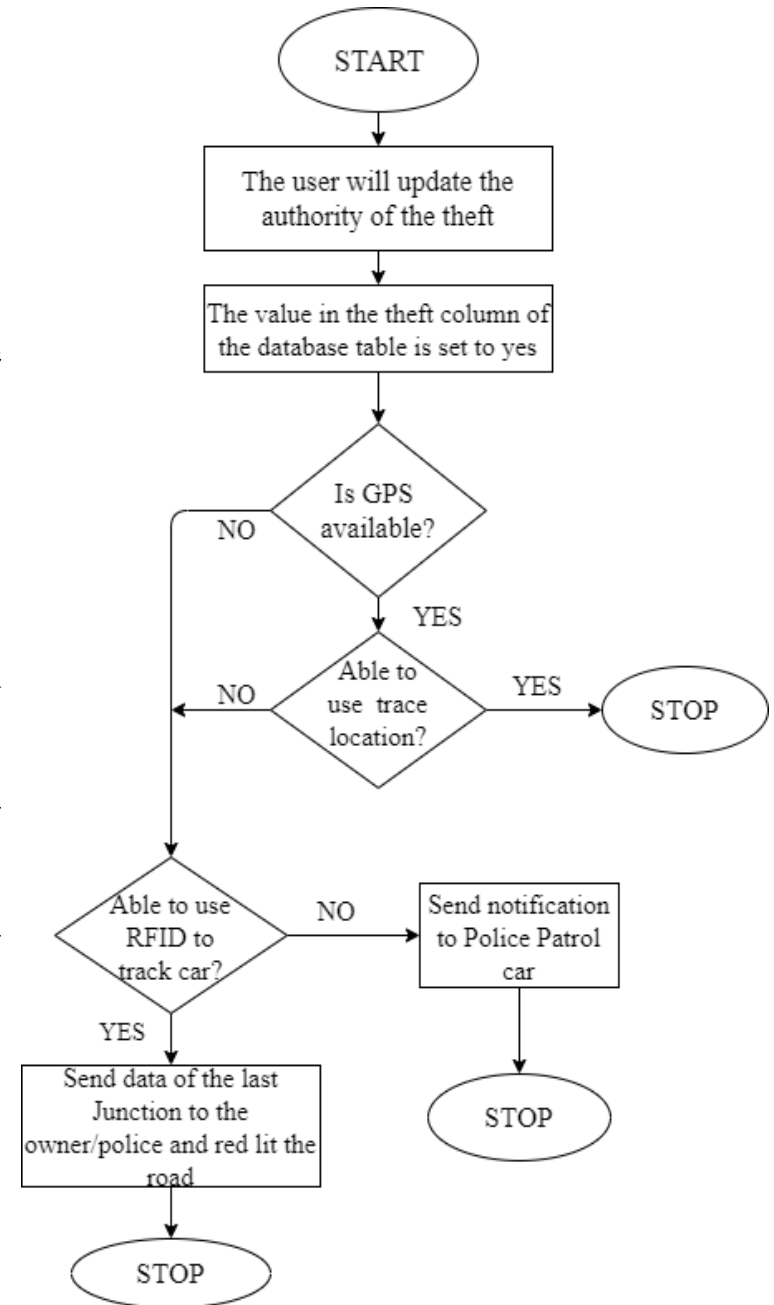
MODULE DESCRIPTION

The proposed system consists of two major components: An RFID tag that is mounted on the vehicle and scanners at the various intersections to read the uid of the tag. These RFID scanners transfer data to various data farms that read the data of the RFID tags which are mounted on the vehicles and transmit the signals of each vehicle using RFID reader to a database using a xampp server. The administrators can interact with the system using the server module connected to the Arduino and alert can simply be notified to the concerned authorities.

Database

The database is systematic logging and collection of data. It help us in easily manipulating the data. It makes the job of the operand easy. It is a collection of programs and functions which enables its operand to use the database, change the data, represent the data in a tabular format for easy manipulation. It helps to reduce the errors which occur during updating of data and increases the consistency and atomicity of the data. It helps maintain greater data integrity and independence from the different application programs which depend upon the database.

For this setup we are using:

1. Start the XAMPP control panel
2. Start the APACHE module
3. Start the MYSQL module
4. Open the browser and log into the localhost
5. Create the new Database
6. Create tables in the Database

RFID - An RFID system consists of two main components- an RFID tag that is attached to an object whose information needs to be scanned, and an RFID scanner that will share the information which is connected to a database. The RFID tag will generate an electromagnetic field in its omnipresent direction hoping for the reader to catch it which will read the signal and use it to connect to the tag and hence is known as the UART or universal asynchronous receiver transmitter.

Arduino - Arduino is an electronic platform that is used to develop physical projects which the user can themselves program and run. Arduino is made up of a programmable circuit board and an IDE that runs on a computer and will be used to run the code and load the code directly into the physical board. Arduino will be used to interact with different physical objects starting from but not limited to buttons, Wi-Fi, GPS, screens, motors, speakers, ethernet shield, cameras, with a simplified form of C++ and python which are used to upload the code and control the physical board
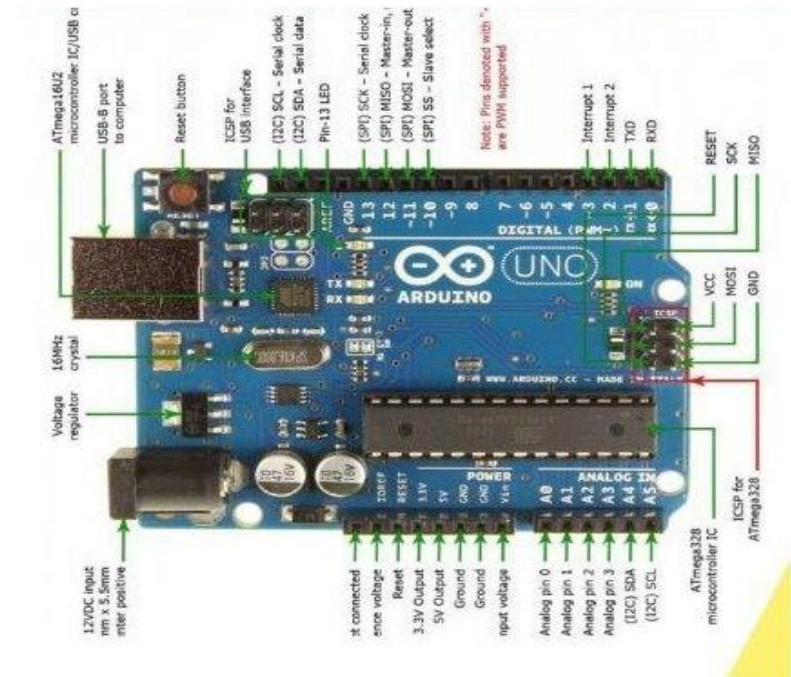
GPS - GPS or a global positioning system is a system of about 30 satellites all of which are orbiting the earth. Atleast 4 satellites are visible at any given point. It provides the geolocation and other information to any receiver. It is free to use the gps but requires a straight line of sight with the satallite.

PYTHON - Python is a very popular coding language. It easily supports C/C++ integration. We have chosen Python for our project because of the simplicity of the syntax and its tight integration with arduino. Here Python will be used to integrate the output of the serial monitor with the Database such that the output will be stored in the table. Here the output of the arduino ide will be transfered to a new window in the python ide. This will be required to interact with the user for input/output.
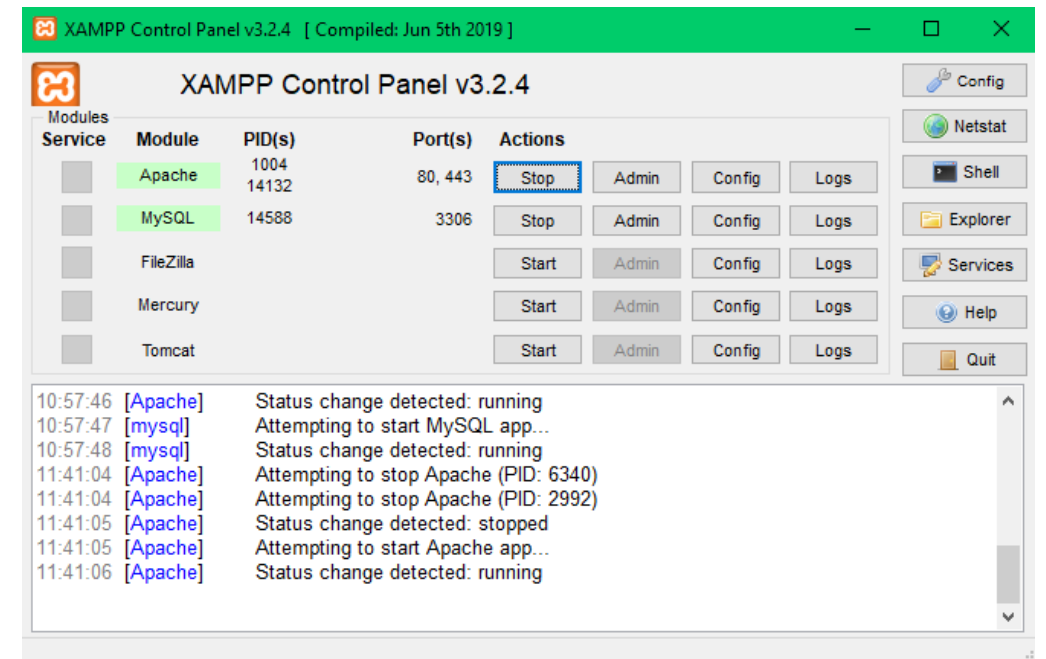
NOVELTY IN METHODOLOGY

- Here the Database will store the data so that it can be reviewed.

- The RFID will give the data which will make it easier to get the basic location.

- Does not require a power source as the RFID tag constantly passes the information.

- It is very inexpensive in comparison to other alternatives

- Easy to implement with the hardware already available

- It is not as easy to remove

- Using this system the last known location will be easy to track down

Comparison between RFID and GPS

S no.	Global Positioning System(GPS)	Radio frequency identification(RFID)
1	Uses signal from low-power satellite signals	Uses RF Signals
2	Signal processors are power hungry	Works with low power as well
3	A lot of power is used during Data transmission	Transmission of data requires less power
4	Requires use of battery	Low use of battery
5	Expensive even when bought in large numbers	Inexpensive when bought in large numbers
6	Long range	Short range
7	Medium to Large in size	Size depends upon application
8	Large amount of latency	Very low Latency
9	Accuracy increases with price	Moderate accuracy
10	Satellite and mobile GPS	Active and Passive RFID
11	Need data connection	Does not need data connection
12	Can be encrypted and secure	Always encrypted and secure
13	Can provide alerts at regular intervals	Alerts depend upon scanner
14	Real Time Tracking	No Real Time Tracking
15	Two way communication	Only one way communication

PIN CONNECTION DIAGRAM

VCC RX TX GND

GND RX TX
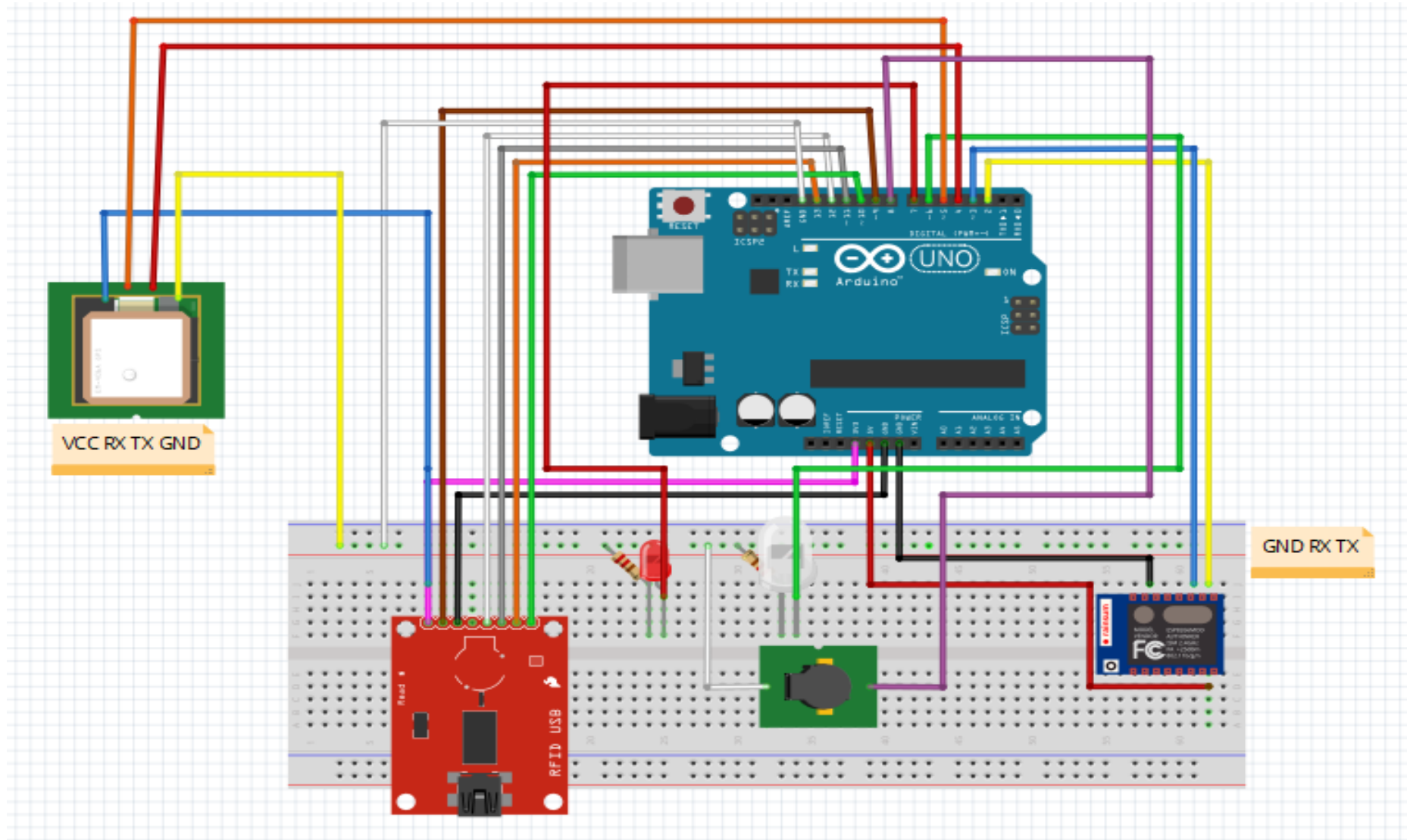
Pin connection: Arduino and RFID

Arduino	RFID
3.3V	3.3V
9	RST
GND	GND
10	SDA
13	SCK
11	MOSI
12	MISO

Pin Connection: GPS and Arduino

GPS	Arduino
VCC	5V
RX	4
TX	3
GND	GND

Pin Connection: Light and Arduino

Light	Arduino
+ve RED	7
-ve RED	GND
+ve BLUE	6
-ve BLUE	GND
+ve Buzzer	8
-ve Buzzer	GND
negative side rail	GND

RESULTS AND DISCUSSION

PHPmyADMIN Database

Open the XAMPP Control Panel

Start the Apahe Module

Start the MySQL Module

Check the Ports
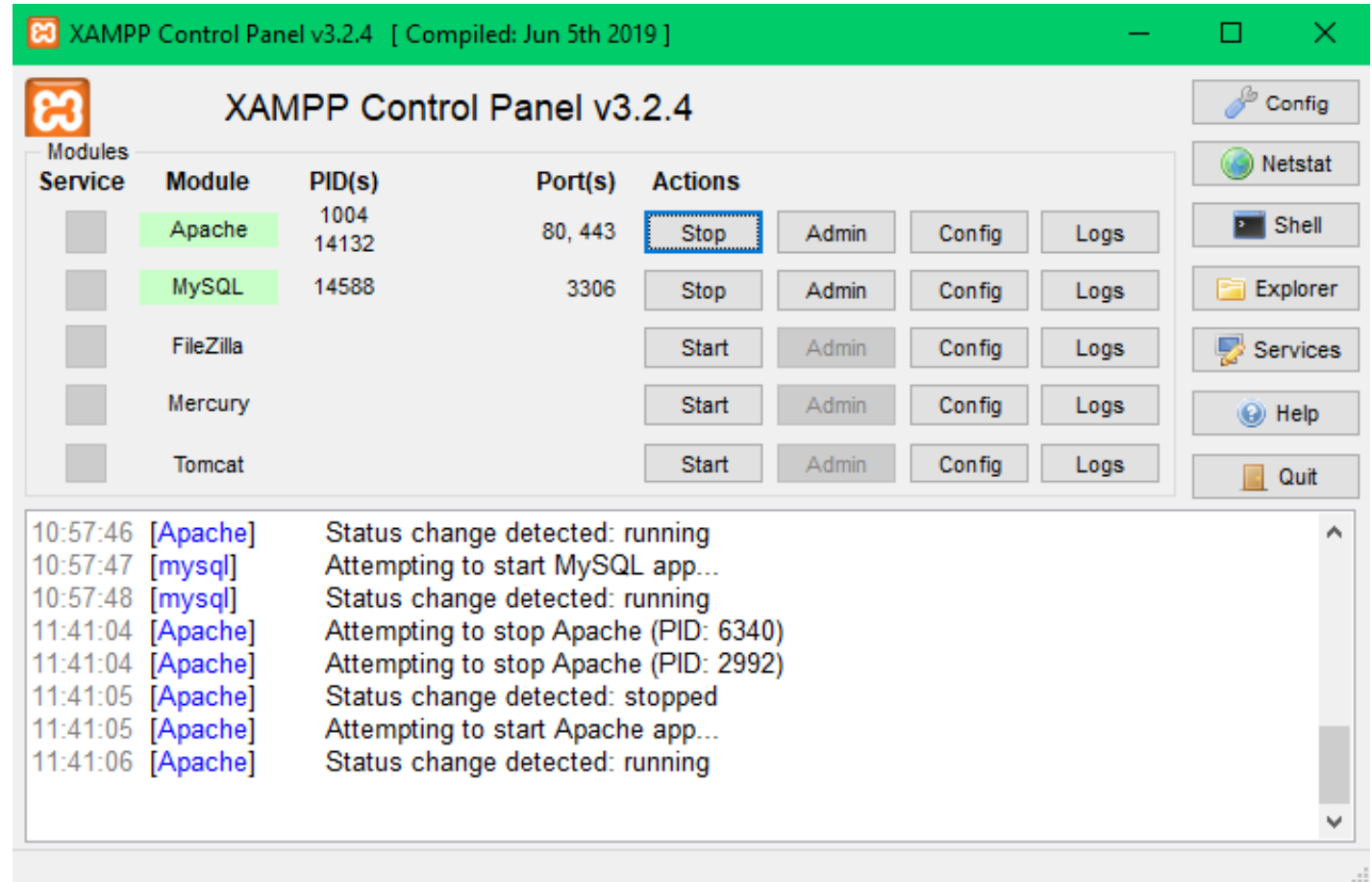
Create the database – **rfiddatabase**

Create the table - **intersection1**

Create different fields like:

1. ID

2. INTERSECTIONADDRE

3. RFIDNUMBER

4. STATUS

5. NEARESTPOLICE

6. TIME

Create the table - **stolenvehicleinfo**

Create different fields like:

1. OWNERNAME
2. CONTACTINFO
3. RFIDNUMBER
4. VEHICLENUMBER
5. STATUS

The result window gives the output of different RFID numbers of all the vehicles crossing the intersection. We need to click on 'Refresh' if the tags are used and the changes are not updated in the database. We can use any query to get a particular desired output.

GPS OUTPUT

At first, The gps will take some time to get a connection between gps antenna and the satellite. This time can be anywhere between 30 sec to 30 min. This will be known as the time for the gps to get hot.

```
C020
Time: 6:2:31
----------------------------------
Current Location:
INVALID
Date: 8/3/2020
Time: 6:2:37
----------------------------------
```

Now the GPS will give the location to the user every 10 sec. This location will never be exact and will be in the radius of +15m to -15m. If the line of sight is broken between the gps antenna and the satellite then the location will not be updated

```
Current Location:
Latitude: 21.092882
Longitude: 79.062484
Date: 8/3/2020
Time: 6:3:17
----------------------------------
Current Location:
Latitude: 21.092882
Longitude: 79.062484
Date: 8/3/2020
Time: 6:3:17
----------------------------------
```

PYTHON

The python will connect the output of the serial monitor to the Database.

Every user dialogue will be shown in the python shell.

It will also show whether the system is connected or not It will check the arduinos connection to the server laptop at the particular port.

First it will check if the database is responding and connected to the Python script.

At the end it will prompt the user to connect a card

Physical output

The BLUE light specifies that the vehicle is not stolen and hence no action needs to be taken. In the database the information will be upadated as the current RFID tag and NOTSTOLEN.
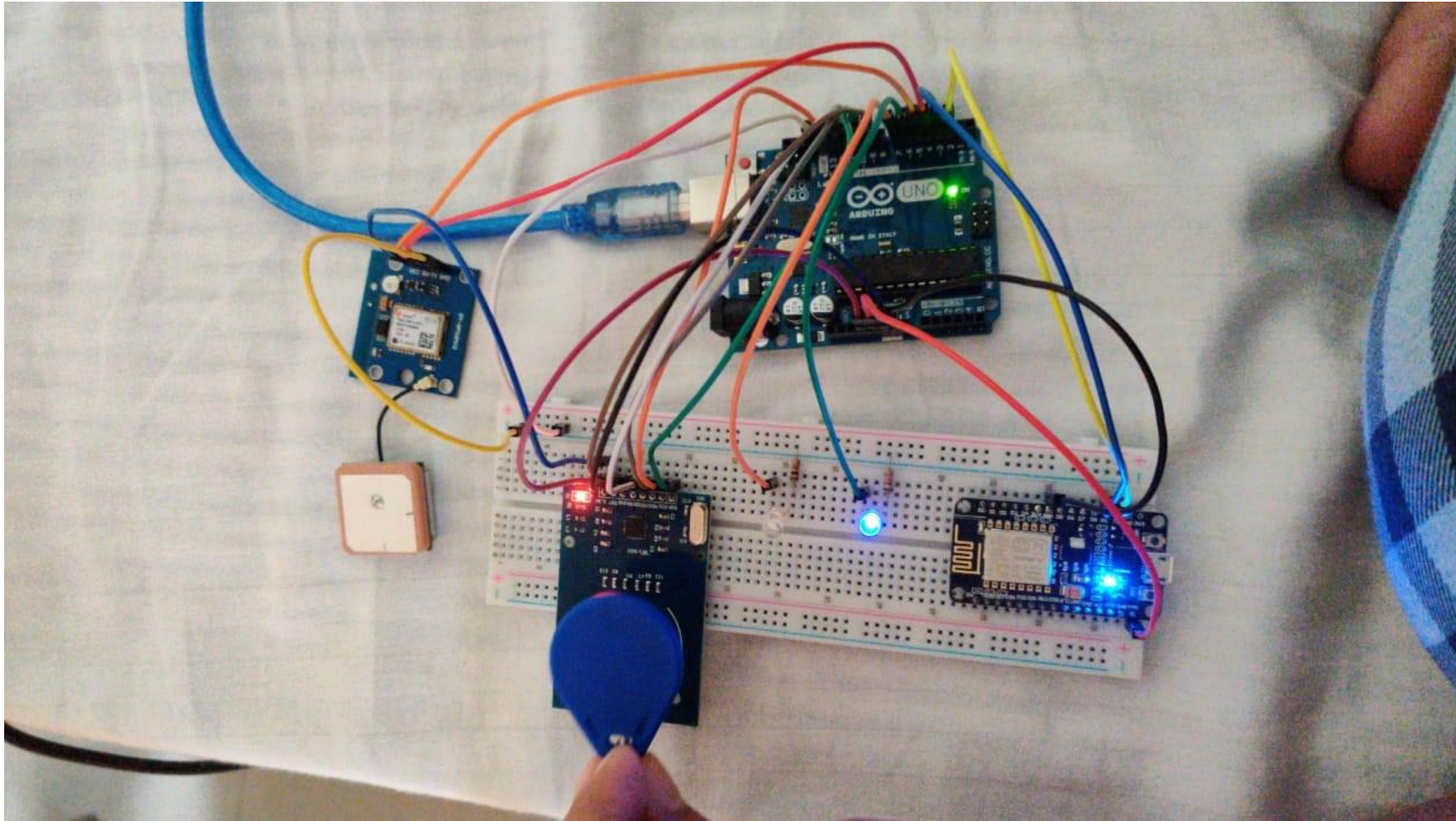
The RED light specifies that the vehicle is stolen and an action needs to be taken. In the database the information will be updated as the current RFID tag and STOLEN. The buzzer will also produce a sound which will help the authorities.
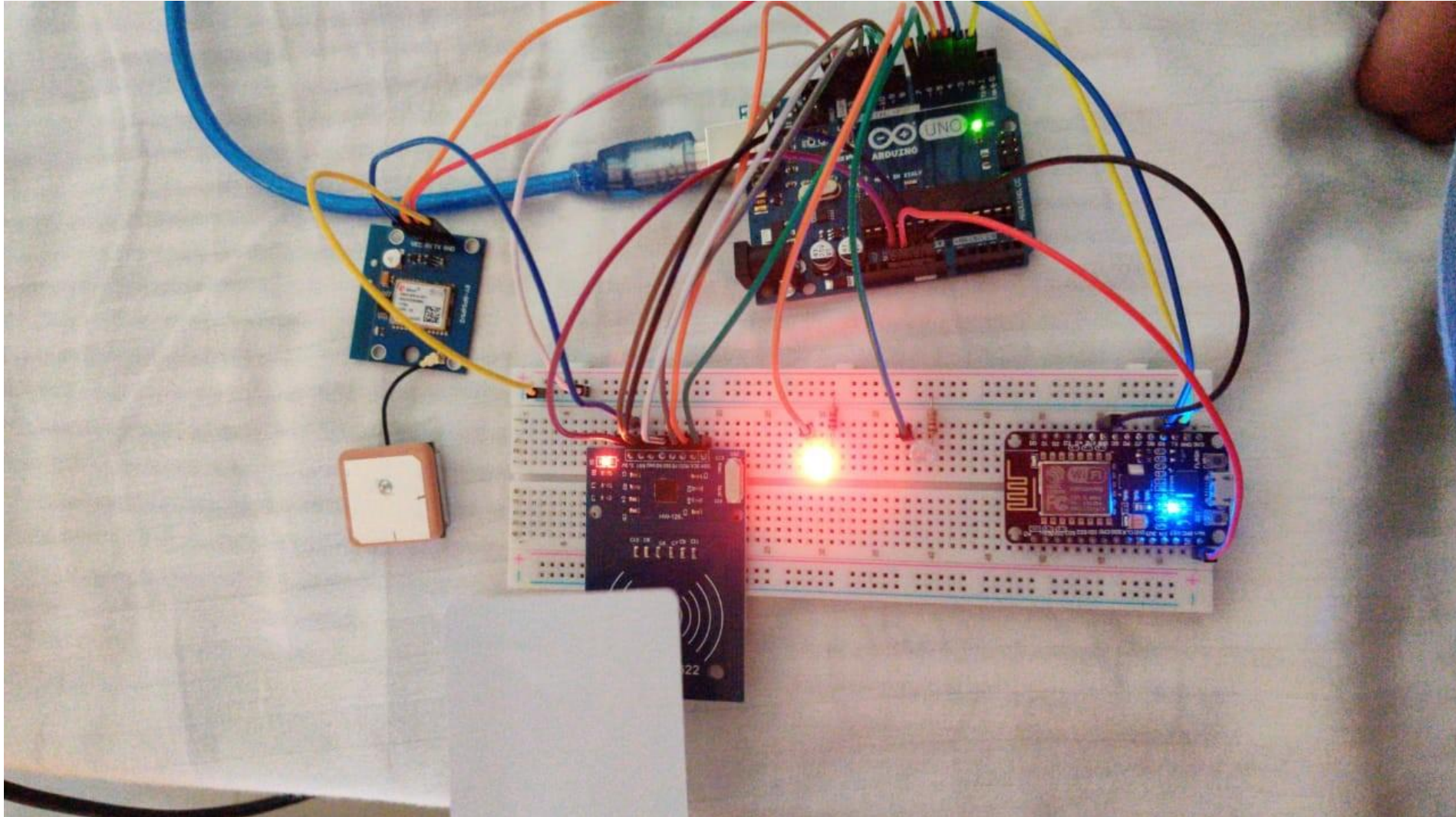
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Iot Based Stolen Vehicle Monitoring System

R.Jeya, C.Rajeshabu, Jaskeerat Singh, Akshit Singh
School of Computing, SRMIST, KTR, Tamil Nadu, India

Abstract

The current transportation system is not ready to adapt to the growing problem of stolen vehicles. This paper aims to propose a stolen vehicle monitoring system that uses vehicle-mounted RFID tags for STOLEN VEHICLE DETECTION. This paper uses a technique to take care of the issue of stolen vehicles using a database of the last known location of the vehicle and cross-reference the owner's information present in the system. Our system provides an easy platform to improve the maintenance of the database of stolen vehicles that the management system gathers. This information from various traffic light intersections is collected and problem area lanes are red-lit in case of a stolen vehicle is detected using an RFID tag reader. The Arduino board is connected to a GSM module which will be used to establish a connection to the local server where the database will be hosted from. The final information of the vehicle will be sent to the owner and the concerned authorities.

Keywords: *RFID, GPS, GSM*

Introduction

Internet of Things (IoT) is the technology that states that soon all the physical devices will be interworking and be connected via the internet. As the interworking of physical devices with the Internet gets more prominent day by day, these interworking devices can integrate themselves with other devices to successfully carry out the operation. The operation of self-driving cars is rising sharply and is being talked about as the next big thing in the transport industry. This change in the transport ecosystem requires a method to keep account of all the cars which are working autonomously on the streets.

A traffic system typically consists of four lanes. This vehicle monitoring system can be found in private vehicles as a vehicle monitoring and updating system. Police officials can follow the information and updates given by the tracking system to locate the vicinity in which the stolen vehicle was last seen. Generally, this system is meant to locate customer-owned vehicles which makes it easier for the police officials to roughly track the area in which the vehicle is present.

Vehicle monitoring systems are popular in privately owned vehicles as loss prevention, management, and retrieval device. Police can simply follow the regular updates given by the system and locate the area in which the stolen vehicle was last seen.

There are several components such as Wi-Fi mmodule, RFID tag and scanner, Arduino, local Database through various applications like phpMyAdmin served through a xampp server.

Figure 1. Proposed Implementation
Problem Definition

The problem statement of the proposed project is that if the vehicle has been stolen, the owner will not be able to track their vehicle using the traditional methods as they are not efficient and do not produce