Final Year Design Project
Final Report
[EEE 400C or ECE 402C]

Project Title: **Design of a smart anti-theft system for motorbike**

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Chapter 1: Introduction

1.1 Introduction

The Smart anti-theft system for Motorcycles including fingerprint sensor is our final year project. This project is inspired from the smartphone fingerprint sensor that is widely used in many smartphones in this world. We cannot unlock our phone if the sensor cannot recognize the fingerprint and this way is safer than using the old way which is pin lock or pattern lock. Nobody can use your phone unless you open it with your own fingerprint. Because of this, we would like to apply this application for motorcycles due to the increased number of stolen motorcycle cases lately. This case is getting worse and it does not only happen to the moped bike, this case only happens at the superbike. But for the superbike, it is not so famous because stealing a superbike is not that easy like stealing a moped bike. Moreover, to make our system smart we are using some other security features like GSM transmission, solenoid valve, buzzer etc beside fingerprint.

This problem should not be neglected by the manufacturer of the bikes because it is about the customer's money. They probably should be aware of what is wrong with their safety features and try to fix it immediately. So, we are going with our idea which is making a fingerprint sensor based security system for motorcycles. This fingerprint sensor will ignite your motorcycle and you will no longer use your key to start your motorcycle. This way is more convenient and modern like the technology that is already applied for the cars which is ‘keyless entry’. If someone tries to break the sensor, an alarm sound will be produced to tell the nearby people that the bike is in danger. Hence, this way is better than the current safety features. Other than that, an alarm will be triggered which can make the thief feel afraid and panic so your bike will be in safe hands.

1.1.1 Problem Statement

In Bangladesh, motorcycle users are increasing every day. People are using motorcycles for their work purpose, because of their passion or as a pastime vehicle. As the motorcycle numbers are increasing, alongside them, their robbery is also rising all over the country. Nowadays motorcycles are robbed from shopping malls, parking lots, beside the roads, even from residences. So, To prevent motorcycle stealing rider’s use different locks and methods but sometimes they can not stop the motorcycle being stolen. Matter of fact is that if the motorcycle users want to prevent motorcycle theft then using a typical locking system is not a good option nowadays, because thieves have gotten so skilled that conventional locking systems are piece and paper to them [1]. In addition to this, crimes are also increasing using these stolen motorbikes. gangs are snatching, kidnapping, robbery, even committing killing by using the stolen motorbikes. And for this reason it's also getting hard for the police to trace them after their crime.

Moreover, the rapid growth of our economy and people's purchasing power has seen a rise in demand for personal transport. People are buying more motorcycles than ever before. For example, according to the daily star, in the year of 2010 the total two wheeler sale was below 10 thousands units per year where in it came up to half a million units per year in the recent years. But the safety and security system for this large number of vehicles hasn't developed that much yet. For example, in the Dhaka metropolitan area there are not enough parking areas to park. Which results in parking in insecure places and it is eventually leading to the increase of stolen cases. In addition, thief gangs are also increasing day by day which is becoming a big headache for us. So we need to solve this problem and our project is going to be the better solution for this.

1.1.2 Background study

In order to design a low cost, affordable and user friendly anti theft system, we needed to know what the consumers want. So we did some personal surveys among bikers to see what types of features they wanted to be integrated in an optimal security system. What we found was that most of the bikers wanted a multi layered protection system at a low price which made our work more difficult. For that, we had to go through many works previously published in this field. There have been works involving biometric, GSM based, IoT based, cloud based systems.

For our designing, we had to build a design that would have a biometric, Cloud and an alarm based multi layered system. And to integrate it, we had to find a simulation platform that would satisfy our requirements. And for that, we chose proteus as it is easy to design and implement. Although we couldn't obtain a component for our biometric part of the system, we were able to complete our designs. And to do that, we had to learn to use Proteus and C language. Plus we had to research the components used for our designs. Therefore, we had to cover lots of papers, articles about security system designs. By using the knowledge, we tried to demonstrate our design in Proteus. After doing some background research, we found out some issues based on our country's vehicle security system.

Shortage of Parking area: In Dhaka city there is not enough parking area for vehicles to park. As a result with so many other vehicles, motorcycle riders also park their motorbike into the unsafe zone more often[1]. For this unsafe parking thief gangs are taking advantage and stealing the motorcycles easily. Even though most motorbike users use various locking systems in their vehicle, that can not prevent stealing. We cannot expand the parking area that much in the city like Dhaka but we can make our security harder so that bike users can prevent their bikes being stolen [12]. By observing our security system we can say that this problem will be eliminated by using our device.

Two-wheeler related crimes: In Bangladesh, motorcycle users are increasing every day. People are using motorcycles for their work purpose, because of their passion or as a

pastime vehicle[11]. As the motorcycle numbers are increasing, alongside them, their robbery is also rising all over the country. Nowadays motorcycles are robbed from shopping malls, parking lots, beside the roads, even from residences. In addition to this, crimes are also increasing using these stolen motorbikes. Gangs are snatching, kidnapping, doing robbery, even committing killing by using the stolen motorbikes. And for this reason it's also getting harder for the police to trace them after their crime. So, a good security system is essential for stopping this whole criminal activity.

1.1.3 Literature Gap

There has been quite vigorous research on this field previously. Some technologies include RFID (Radio Frequency Identification), GPRS(General Packet Radio Service), GSM (Global System for Mobile communications), Facial and voice recognition.
Other systems include a component specifically in-vehicle engine immobilizer. The component will not enable the functions of the appliances if it finds itself is illegally moved to another car [4]. The negative aspect of this system is that it requires a secure processor and smart card chips to store in the Group Identification Number.
The highly developed system uses the Global Positioning System (GPS) to track the position of the vehicle and its existing location. GPS uses global navigation satellite system. The position in sequence provided by GPS system can be visualized using Google earth. The main complication of using GPS is that the signal can become degraded and receiver system will not provide location if view of the sky is severely limited. It is also inclined by other factors like rainfall, fog and snowfall [5].
Radio frequency Identification (RFID) is used in Intelligent Computerized anti-theft system [ICAT].RFID cards are used to provide secured access. The restriction here is that keyless RFID cards can be easily stolen. In addition, key may malfunction on contact with metallic object [6].

1.1.4 Relevance to current and future Industry

Our project proposes a security system for bikes that will ensure that no matter what circumstance, the bike will be almost impossible to steal. Thus, we have implemented many layers of security in our device. During our market research for our project, we have seen that there are many types of security systems available in the market. Some are expensive, some are cheap but have low integrity but overall, we observed that the more layers of security, the more out of hand the price of it and very few security systems are available in the market that have biometric systems in them. Moreover, the ones that do tend to be higher priced that most people wouldn't be able to afford. This is why we saw an opportunity to grab the market where we can introduce a low cost high-end security system. Currently, there aren't many devices in

the market that are offering as many security layers as we are offering, that too at almost half the price of existing anti theft systems available in the market.

1.2 Objectives, Requirements, Specification and constant

1.2.1 Objective of this project is stated below:

- Design of a smart anti-theft system for motorbikes.
- To improve the safety and security mechanism to avoid stealing.
- To develop a user friendly and universal anti-theft system.
- To prevent motorcycle related crimes.
- To create social impact by reducing stealing of motorcycles.

In our project we have scope to design a smart anti theft system. Also we can implement an IOT-based anti theft system. We will try to make a double layer security system and improve it as well. Moreover, our design will be suitable for every user and compatible with every bike. By all these, we can implement our different layer engineering knowledge in this project design.

1.2.2 Functional and Nonfunctional Requirements

Requirements are qualities or qualifications that one must possess to be able to do something or be fit for something. As we are building up an industrial load control and risk management project the core requirements are those defined to reduce risk and control load as required. Like any other requirement, it can initially be defined at a high level, such as simply the need to mitigate a given risk.

Functional Requirements

1. **Sensing element for primary security:** For identifying the fingerprint of the user by scanning it and matching the given fingerprint with the saved fingerprint we will need a biometric system like **Fingerprint System**.
2. **Secondary smart security system:** A cloud-based security system which will be able to send the location message code in the user's smart device as a SMS in every one hour and it will be able to send SMS or make direct voice calls as an alarm with the help of the internet from any part of the world. For this a cloud-based security system like **Tracking System** will be required.
3. **Third security system:** A valve that controls the fuel flow to the engine of the motorbike. For flowing engine fuel, for example, if the output data matches it will open the valve gate or if it doesn't match it will remain closed for preventing any kind

of unethical activities the valve will be able to control by the user's smart device. That kind of system will be a **Fuel Control System**.

4. **Fourth security system:** An alarming device that will be responsible for creating noise if anything happens to the user's motorbike and that will be able to be controlled by a smart device of the user like for turning it off if the user doesn't feel any threat. For this purpose, an **Alarming System** will be required.
5. **Operating system:** A **microcontroller** that will read input or output data from the sensor accordingly. Takes all the input data output data from the sensors and connects them with each other and makes them work.
6. **Power supply:** Supply voltage to the microcontroller and all the sensors work a **supply voltage** will be needed.

Non-functional Requirements:

1. **Operational switch:** A **relay module** that will connect all the sensing elements with the operating system which will work as an operational switch.
2. **Backup cloud system:** For tracking the live location of the motorbike another backup cloud system will be needed.
3. **Smart system:** An android/smart device will be required, by which the user will be able to control the sensing elements through the operating system. This will work as a remote-control system.
4. **Backup Power Supply:** A backup power supply will be required if anything happens to the main power supply for example if the main power supply goes down or if the thief disconnects the main power supply.
5. **Backup Security System:** Another backup security system will full fill the users requirement if the biometric security system fails.

1.2.3 Specifications

According to the required system the sub systems, components and their specification are given below [Chosen elements are written in bold and marked as (*)]:

System	Sub- system	Components	Specifications	Comments
Biometric security system	● **Fingerprint Scanning ***	Fingerprint Scanner- ● **R305***	**Features**: o Power DC: 3.6V-6.0V o Interface: UART	Commonly used module all over the

	• Facial Recognition • Voice Recognition • Iris Recognition • Heart-Rate Monitor	• ZKTeco SLK20R • Eikon Touch 510 • ZKTeco ZK-4500 • Eikon Touch 510	(TTL logical level)/ USB 1.1 ○ Working current: 100mA ○ Baud rate (9600*N) bps, N=1-12 (default N=6 57600bps) ○ Character file size: 256 bytes ○ Template size: 512 bytes ○ Storage capacity: 256 ○ Security level: 5 (1, 2, 3, 4, 5(highest))	world and its less costly than ZKTeco SLK20R, Eikon Touch 510, ZKTeco ZK-4500
Cloud based tracking system	• **GSM*** • GPS	GSM Module- • NEO-6M GPS Module with EPROM • **SIM 800 GSM + GPRS Modem with SMA Antenna***	○ Input Supply voltage (V): 3.4 ~ 12 ○ GSM: 850,900,1800 and 1900MHz ○ Flash Memory (MB): 24 ○ RAM Memory (MB): 32 ○ Operating Temperature (°C): -40 ~ +85	Updated version of SIM 800 and also cheaper than SIM 900, SIM 900A etc.
Fuel control system	**Sinusoidal Valve**	○ **2P050***	○ Valve Type: 2 Way, Normally Closed (NC) ○ Orifice: 5.0mm ○ Operating Pressure: Vacuum to 50 PSI ○ Port Size (Tube OD): Options: 3/8" OD Tube : 3/8" Push-In Fitting	

			; 3/8" Female NPT o Voltage: Options: 12, 24 VDC; 24, 110/120 (50/60Hz), 220/240 VAC (50/60Hz) o Coil Power: 20W	
Alarming system	**Buzzer***	● **Large Piezo Alarm - 3kHz*** ●	● -3V to 18V input ● -3KHz output ● -25.1mm diameter, 22.2mm height ● 100 dB(A) at 18V at 61cm ● -78 db(A) at 3V at 61cm	
Operating system	**Arduino UNO**	o Arduino UNO R3 o Arduino - UNO R3 SMD o **MEGA 2560 R3*** o MINI MEGA PRO 2560	o Microcontroller: ATmega328P o Operating Voltage: 5V o Input Voltage (recommended): 7-12V o Input Voltage (limit): 6-20V o Digital I/O Pins: 14 (of which 6 provide PWM output) o PWM Digital I/O Pins: 6 o Analog Input Pins: 6 o DC Current per I/O Pin: 20 mA o DC current for 3.3V Pin: 50 mA o Flash Memory: 32 KB (ATmega328P) of which 0.5 KB used by bootloader o Clock Speed: 16 MHz	It is cheaper than Arduino-UNO R3 SMD, MEGA 2560 R3, MEGA CH340, MINI MEGA PRO 2560 etc.

Power supply	**DC voltage**	○ **Duracell 9v Battery ***	○ Nominal voltage: 9 V ○ Impedance: 1,700 m-ohm @ 1 kHz	
Operational switch	**Relay module**	○ **4 Channel 5V Optical Isolated Relay Module ***	○ Relay Maximum output: DC 30V/10A, AC 250V/10A. ○ 4 Channel Relay Module with Opto-coupler. LOW Level Trigger expansion board, which is compatible with Arduino control boards. ○ Standard interface that can be controlled directly by microcontroller (8051, AVR, *PIC, DSP, ARM, ARM, MSP430, TTL logic).	Connect Multiple Sensors.
Backup cloud tracking system	● **GPS*** ● GSM	GPS Module- ○ **Ublox NEO-6M***	○ -Input Supply Voltage (VDC): 2.7 ~ 6 ○ -Main Chip: NEO-6 ○ -Sensitivity (dBm): -160 156 ○ -Cold Start (without aiding): -147 dBm ○ -Tracking & Navigation: -161 dBm. ○ -Navigation Update Rate: 5Hz. ○ -Position Accuracy (Meter): 2	
Backup power supply	**Power Supply**	● **Solar panel***	-ROHS approved Mini Solar panel - Polycrystalline silicon	If DC power supply

			-Max work voltage:5V -Max work current: 200ma -Dimension: 90mm×90mmx3mm	fails for any reason this will keep the power supply uninterrupted
Backup of biometric security system	**Analog Keyboard System**	● **4x4 Keypad - 16 Key - Matrix Membrane Type (RBD-986)***	-4 x 4 Matrix Membrane Keypad -Size: 7cm X 7.5cm -8 pin connector -Adhesive mounting -Maximum Circuit Rating: 35VDC, 100mA	If the biometric system fails, the analog pin system will ensure that the rider doesn't get locked out

1.2.4 Technical and Non-technical consideration and constraint in design process

Technical consideration & constraints

• Constant power supply is needed for Arduino mega to get an uninterrupted power to run the whole system.
• Testing system functionality, constant checking whether all sensors are properly working or not.
• In this project we are not using our own website for checking sensors parameter value and real-time updates, so we need to rely on a third-party monitoring site to get constant updates.
• If the GSM module (secondary communication system) gets a low network connection, then the system may not give a proper response to the user when internet disconnection happens.

Non-Technical consideration & constraints

• This system needs to have continuous checking so proper monitoring is a must to avoid system failure.

• Due to digitization and automation in the manual locking industry some employees may lose their job.
• As our system consists of electrical components so it may get damaged which can interrupt the connection of transferring and receiving data from sensors and actuators to the control unit
• This project has no interoperability or intelligent network system to work itself on when Industrial appliances need to be controlled in a risky situation so they need to operate by the user end.

1.2.5. Applicable standards codes

Our proposed system follows ISO/IEC TR 30166:2020 (E) standards which describe the following:

Sensors: ISO/IEC TR 30148:2019 std code describes the structure of wireless gas sensing network and the application protocol of the wireless gas network system. We are following this std code implementing gas sensors for our project.

Control board: We are using the Arduino MEGA development board as our main control board. which follows Std 1855 standard and codes to operate functionality. IEEE Std 1855 enables the design of the project in fully interoperable fashion.

Communication network: GSM 900 mainly operates in 2G network system. GSM operates on the mobile communication bands between 900 MHz and 1800 MHz in most parts of the world. The GSM module includes the ability to transmit audio data in real-time, which is done at a rate of 13 kbps. Apart from This involves sending and receiving short text messages over the mobile network itself, without the need of being connected to the internet. GSM networks follow IEEE 802.11 std and codes protocol.

1.3 **Summary of the proposed project**

This proposed project comprises integrating multiple sensors and microcontroller to control industrial parameters and load control of industrial appliances. Arduino mega which is the slave controller of our project which will take analog input from the sensors and analyze those input before giving the final output. In addition, our project includes another input beside the fingerprint sensor for security purposes which is the keypad. We have also implemented GPS, GSM module, servo motor for solenoid valve, buzzer for alarm in our design board and all the components are working successfully.

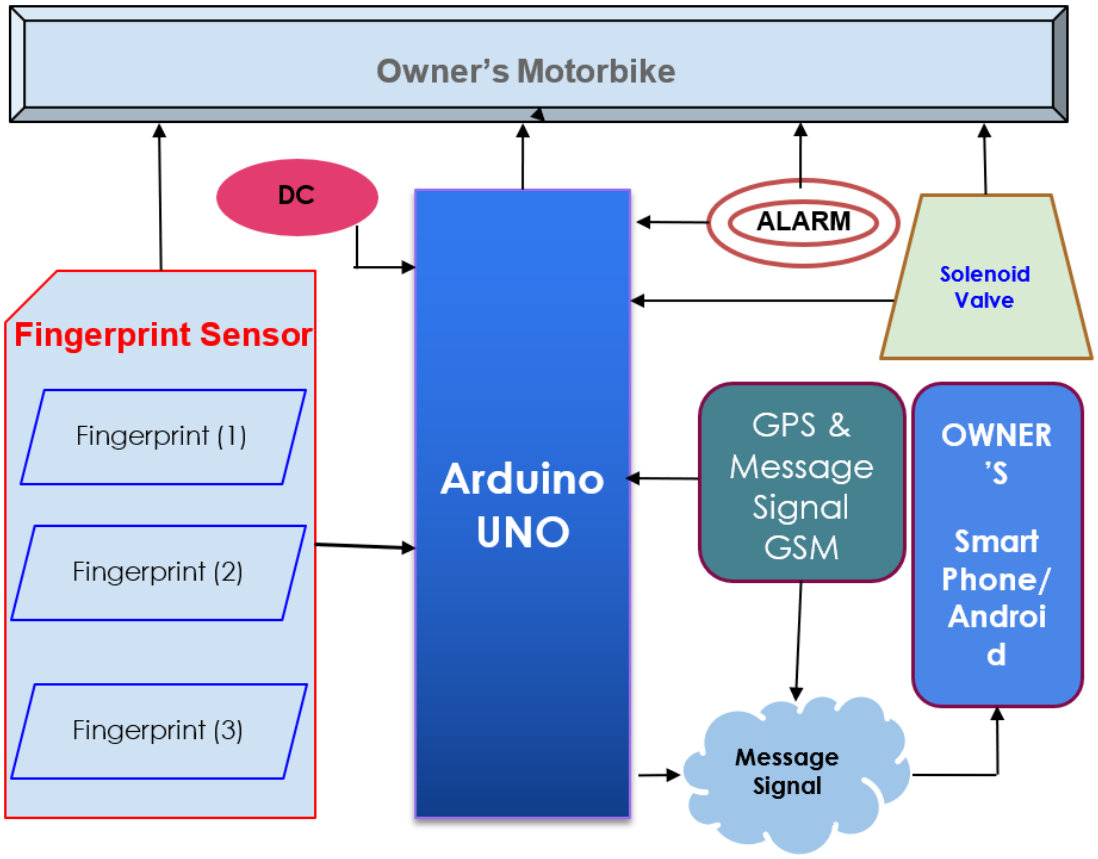


fig: Systematic Overview

Chapter 2: Project Design Approach [CO5, CO6]

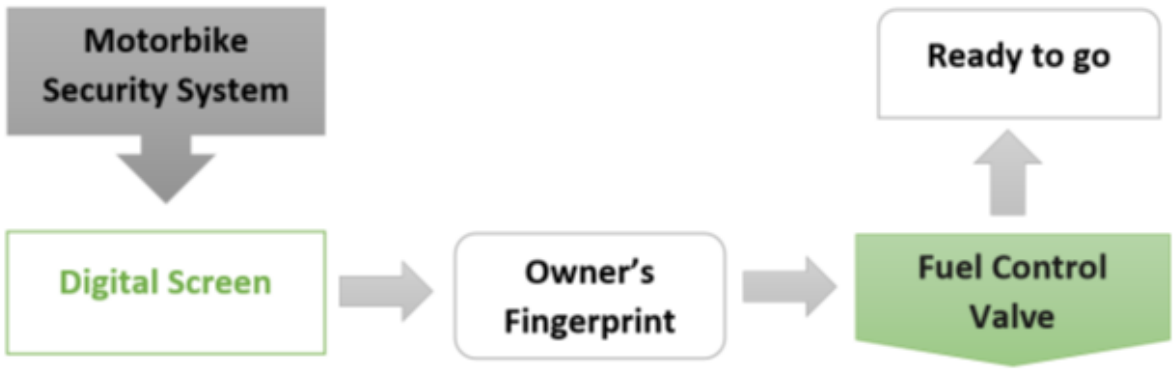
2.1 Introduction

To find out our optimal design solution for our project, we had to experiment with different types of designs for different types of situations. As we needed to choose a design that would be suitable for the majority of the consumers. We then categorized them into 3 different types.

2.2 Identify & Describe multiple design approach

Biometric based

It is a biometric security system, where they have used a digital screen for indication, a biometric Fingerprint security system for security purposes and a Fuel control system which will let the engine fuel flow if the fingerprint matches or it will not. [8]

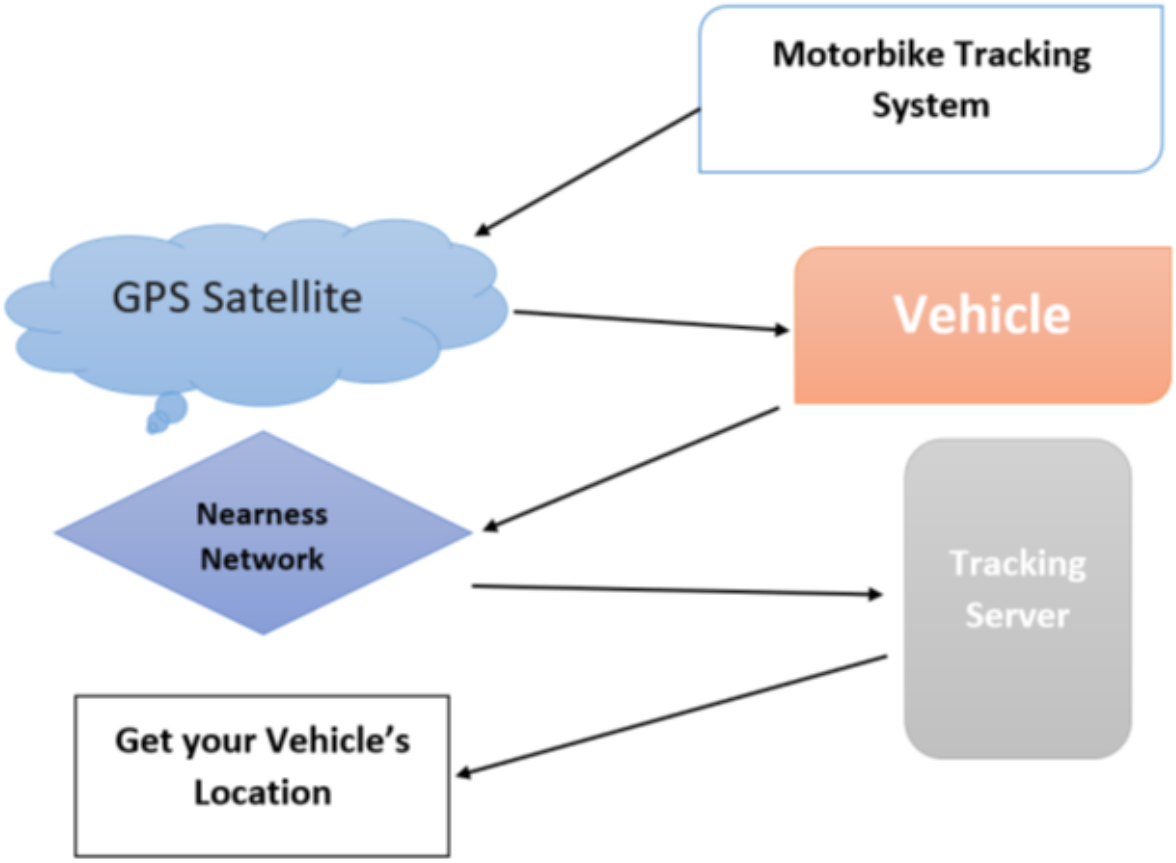


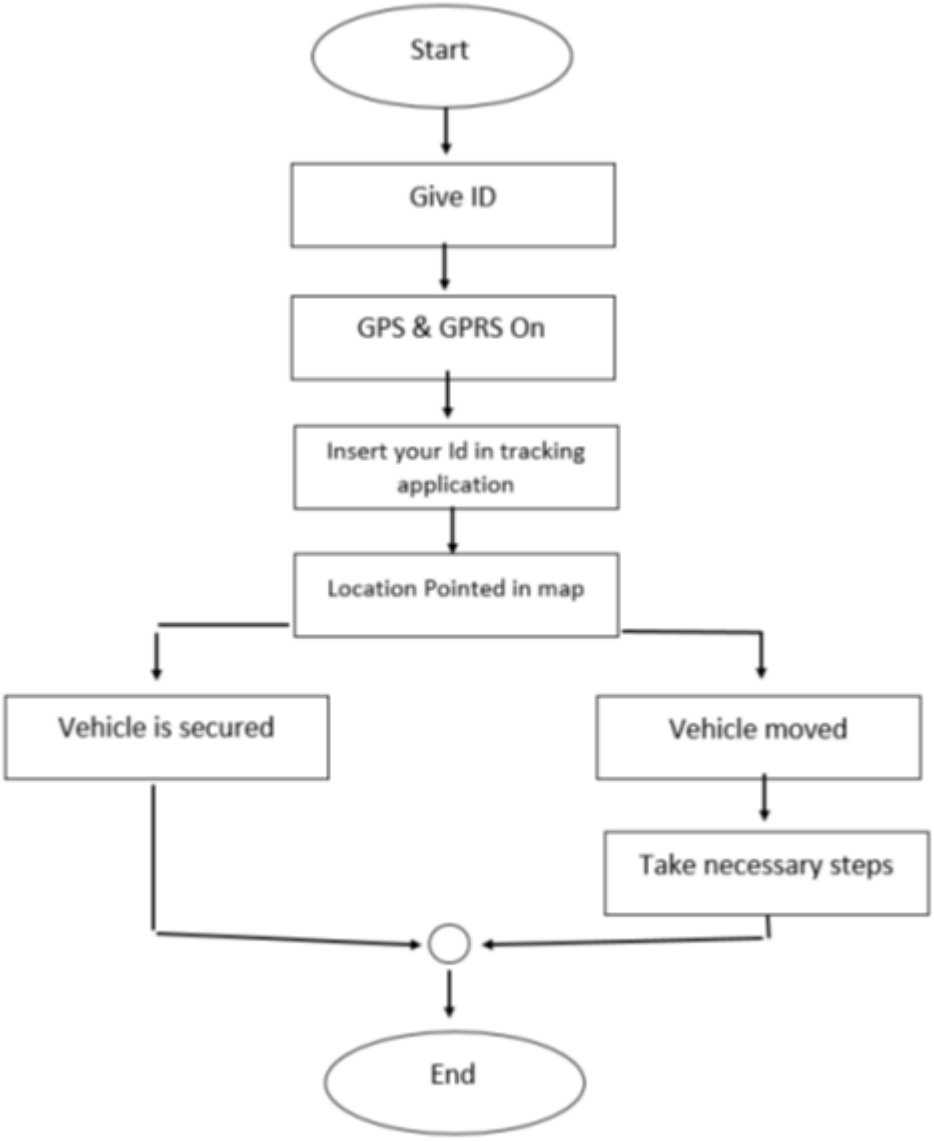
This design meets our specific project objectives as it is a smart biometric protection system that will be able to prevent thefts and crimes. Although it can give two layers of protection, it doesn't have some other features such as cloud based components such as GPS/GSM modules. Thus the owner cannot know the location of his bike. Moreover, if somehow the access to the solenoid valve is compromised, then it might fail to protect the bike.

However, in the proposed design, we wanted to use a biometric fingerprint sensor. But as there are no fingerprint sensors in the proteus software that we can intricate into our design, So we had to use a number pin lock system instead. [8]

Cloud Based Tracking System

A GPS tracking system is used to locate their vehicles if it gets stolen and they will be able to do it by using a computer or a smart device's application. The system can be controlled by using a Smart Device or Computer. [9]


Motorbike Tracking System
GPS Satellite
Vehicle
Nearness Network
Tracking Server
Get your Vehicle's Location



The main constraints of this design is that it cannot really give any protection against theft. It can only detect the location of the vehicle. Moreover, if somehow the device is removed from the vehicle, there is no other mode of protection left. So this design approach does not fulfil all our proposed objectives

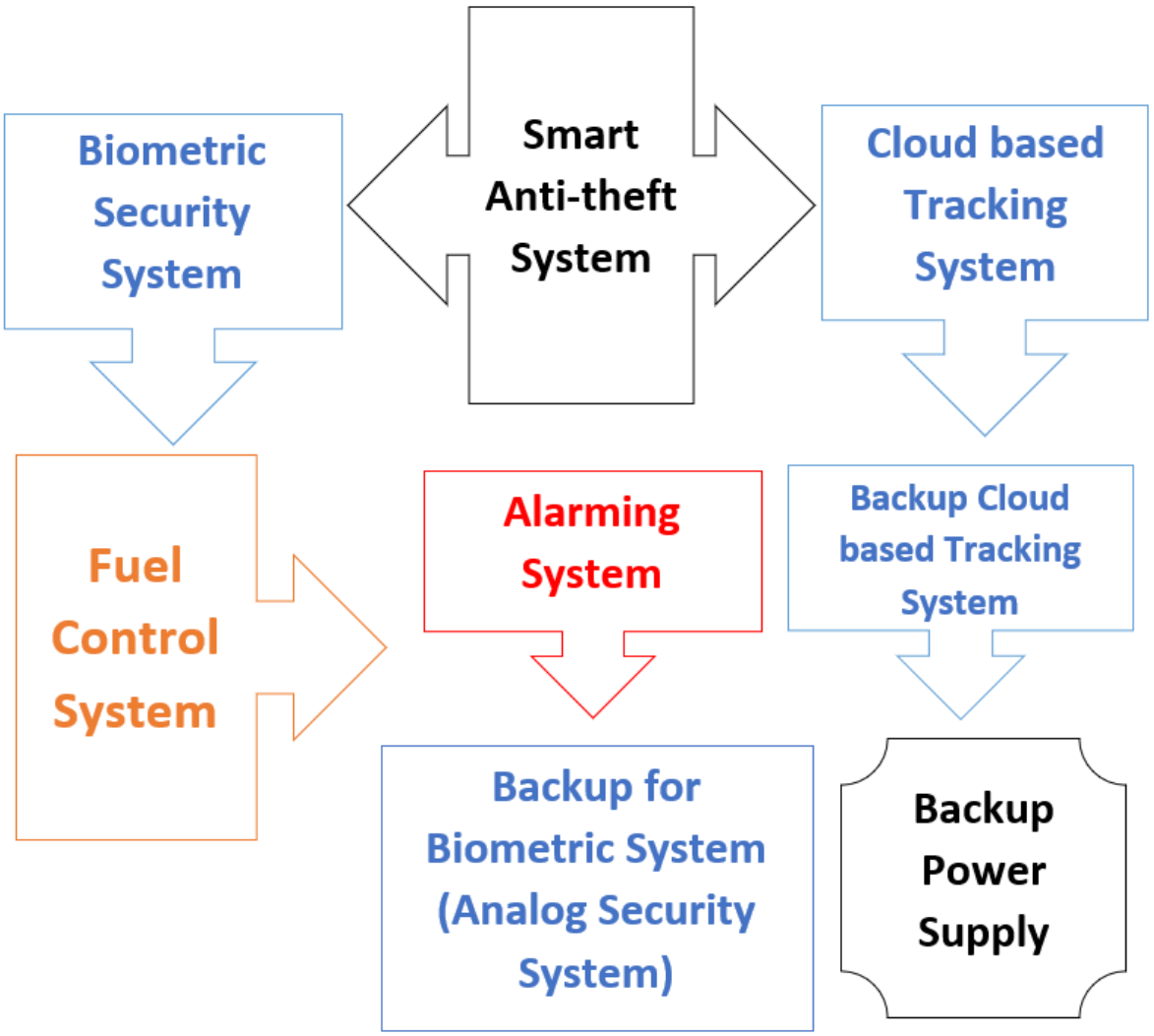
Alarm Based Security System

In this design, there is only one layer of protection. That whenever the bike detects an incorrect pin it will alarm a siren which will alert the owner. What happens here is when the correct pin is given, the microcontroller will send a signal and unlock the bike. But when it receives an incorrect pin, it will send another signal to the Arduino and it will sound the alarm. Only the correct pin can disable the alarm again.

However, the constraint is that the owner has to be nearby to hear the alarm. There is no GSM system which can alert the owner using a mobile alert text. [10]

Smart anti-theft system for motorbikes:

The system that we are going to implement will be a Smart Anti-theft System where we will use four levels of security system which are; Biometric security system, Cloud based Security system, Fuel Control System and Alarming Security System. Where all the systems will be able to be controlled by smart devices directly. We are also considering some backup systems for avoiding unwanted situations. Which are: backup for biometric security (an analogue security system) , a backup power supply and a backup for cloud based security systems.



Flowchart: Smart Anti-theft System

2.3 Analysis of multiple design approach

Biometric Based System	Cloud Based System	Alarm Based System	Smart Security System (Optimal)
2 layer security	1 layer security	1 layer security	4 layer security
Smart Security system	-	-	Smart security system
Doesn't have backup power supply	Doesn't have	Doesn't have	Has backup power supply & backup security
Doesn't have component failure backup	Doesn't have component failure backup	Doesn't have component failure backup	Has component failure backup
High efficiency protection	Low efficiency as it can only provide location	Low efficiency as it only sounds alarm and signal	High efficiency protection as it covers all 3 types protection
Less Sustainable	Low sustainable	Low sustainable	Highly sustainable

2.4 Conclusion

Here we have discussed the multiple designs we are going to implement for our smart anti theft security system. We have discussed with our ATC panel and approved the approaches for our project.

Chapter 3: Use of Modern Engineering and IT Tool. [CO9]

3.1 Introduction

To perform complicated engineering projects, various engineering and IT technologies are available. One of the most important tasks is to find the right tools and medium for the job. First, we sorted out the tools and platforms for our project, narrowing them down to a few by debating them amongst ourselves. Finally, present them to the ATC panel and have the tools and platforms approved.

3.2 Select appropriate engineering and IT tools:

We have used a number of IT tools in our project. Those are given below with the validation.

Arduino Uno: Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board (on the Microchip ATmega328P microcontroller) that can be integrated into a variety of electronic projects. In our project we are using it as our main control unit and will integrate with the motorcycle ECU.

Solar Power supply: A solar power system is an electric power system designed to supply usable solar power by means of photovoltaics. It consists of an arrangement of several components, including solar panels to absorb and convert sunlight into electricity. For getting backup power in case of emergency we will use solar power supply in our security system.

Solenoid valve: A solenoid valve is an electromechanically operated valve. Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. For an extra security layer we are using this tool to electronically control the motorcycle's fuel to the carburetor or the engine.

Proteus Software: Proteus is a simulation software, which can simulate analog circuits, digital circuits, microcomputer circuits and embedded systems. For designing our whole project and for analyzing it before implementation we need to use proteus software for simulation purposes.

Fingerprint Sensor: This sensor is actually a biometric security system. Fingerprint sensor will be connected and programed with the Arduino uno. This is our first security layer in the whole design.

GPS & GSM module: **GPS** is a satellite navigation device and it is capable of receiving information from GNSS satellites and then calculating the device's geographical position. If

anyone input the wrong fingerprint to our security system or more precisely steal the motorcycle then this GPS module will share its current location through the GSM module. Where the GSM module will be working for network-connectivity for the system. Eventually, GPS and GSM module will be directly connected to the Arduino Uno.

Digital Screen: We are going to use a digital screen to visualize the system's activity and signals to make it more user friendly for the users.

Siren: It's a loud noise-making device for alerting the motorcycle user. If anything wrong happens in the security system or if anyone tries to steal the motorcycles by touching, braking or inputting the wrong fingerprint then this siren will make loud noises to alert it's owner.

3.3 Conclusion

Designing and performing a difficult Engineering project for FYDP provides us with the opportunity to experiment with modern IT and engineering techniques. This is an excellent opportunity to learn and apply a variety of new technologies in order to make the most of these current tools.

Chapter 4: Optimization of Multiple Design and Finding the Optimal Solution. [CO7]

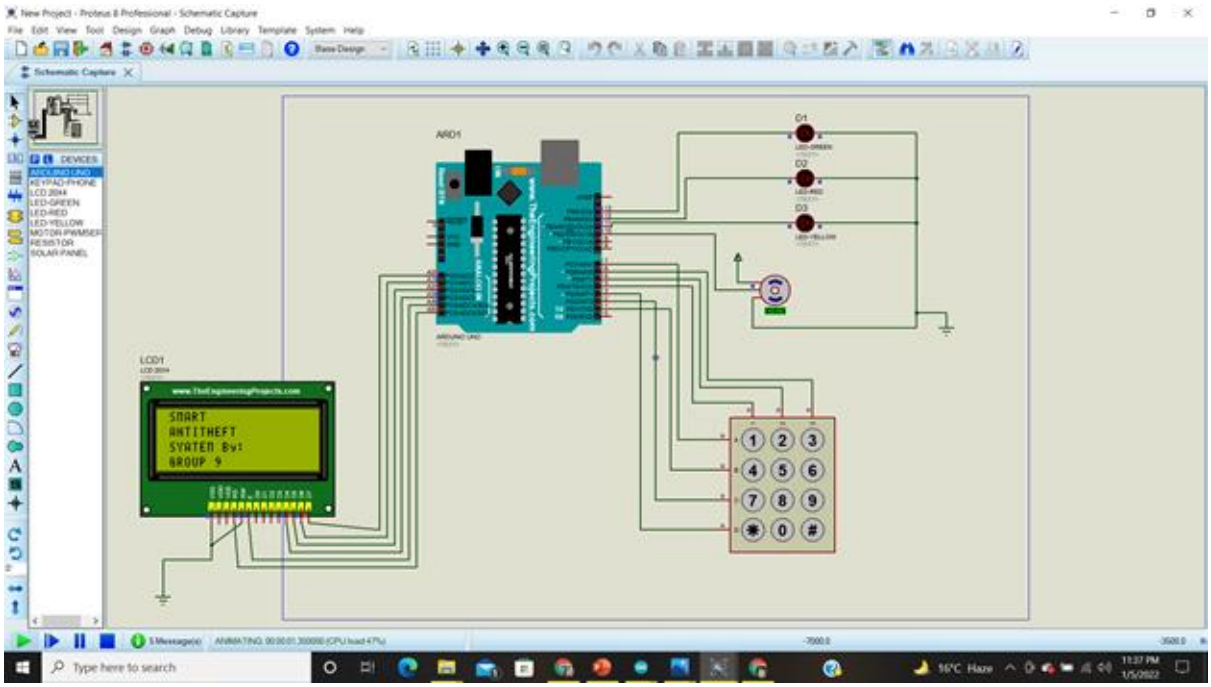
4.1 Introduction:

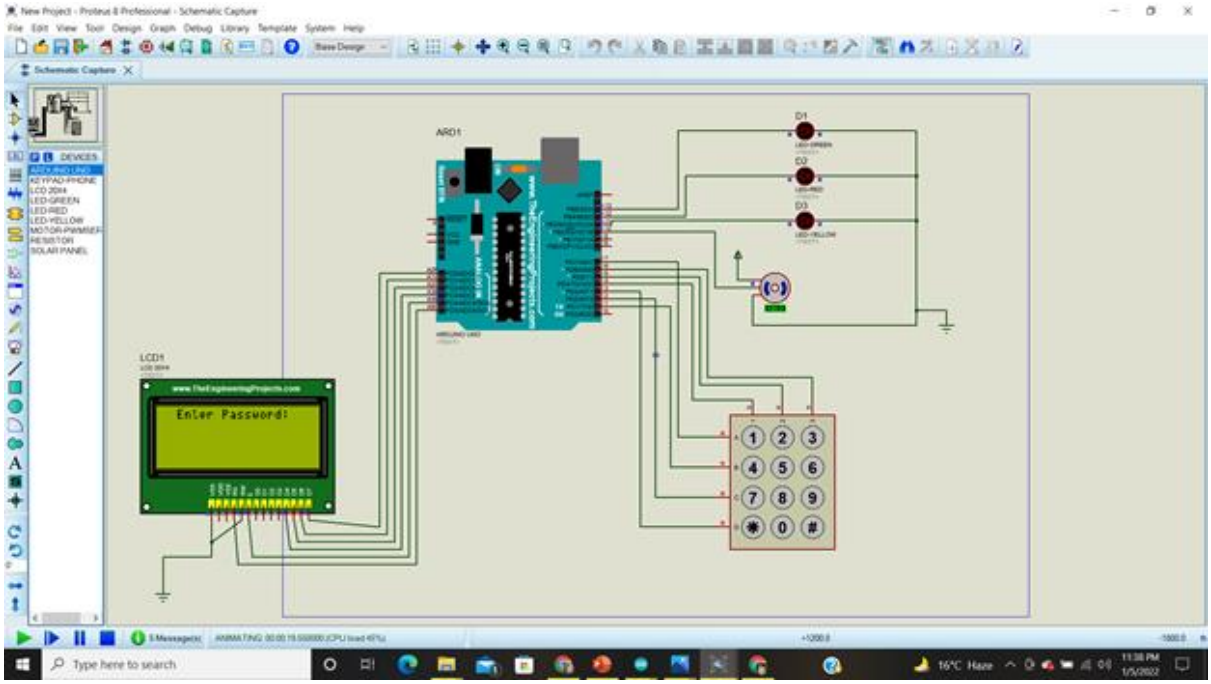
The task of optimal solution engineering design problem is considered as a decision-making requirement process of which real-life industrial problems often have to consider out of very different views. In this context, the most logical approach to achieving the best solution, in the presence of several design criteria and many design variables, is the task of performing science optimization to produce potential solutions for standard decision-making. The result is multiple criteria optimal decision approach techniques design problems, through the effective use, cost optimization, global and multi-objective optimized algorithms, yield a significant and competitive advantage with optimized design.

4.2 Optimization of multiple design approach:

Biometric Based Security System

It is a biometric security system, where they have used a digital screen for indication, a biometric Fingerprint security system for security purposes and a Fuel control system which will let the engine fuel flow if the fingerprint matches or it will not.




ARD1
LCD1
Enter Password!
1 2 3
4 5 6
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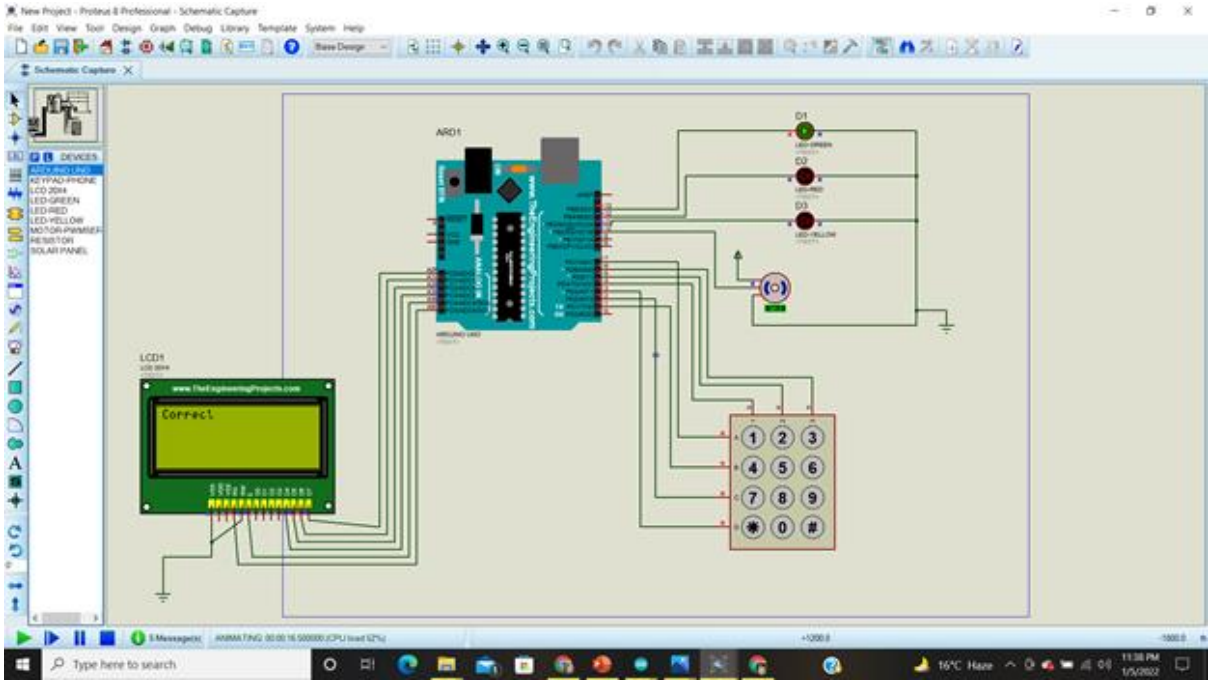
* 0 #


ARD1
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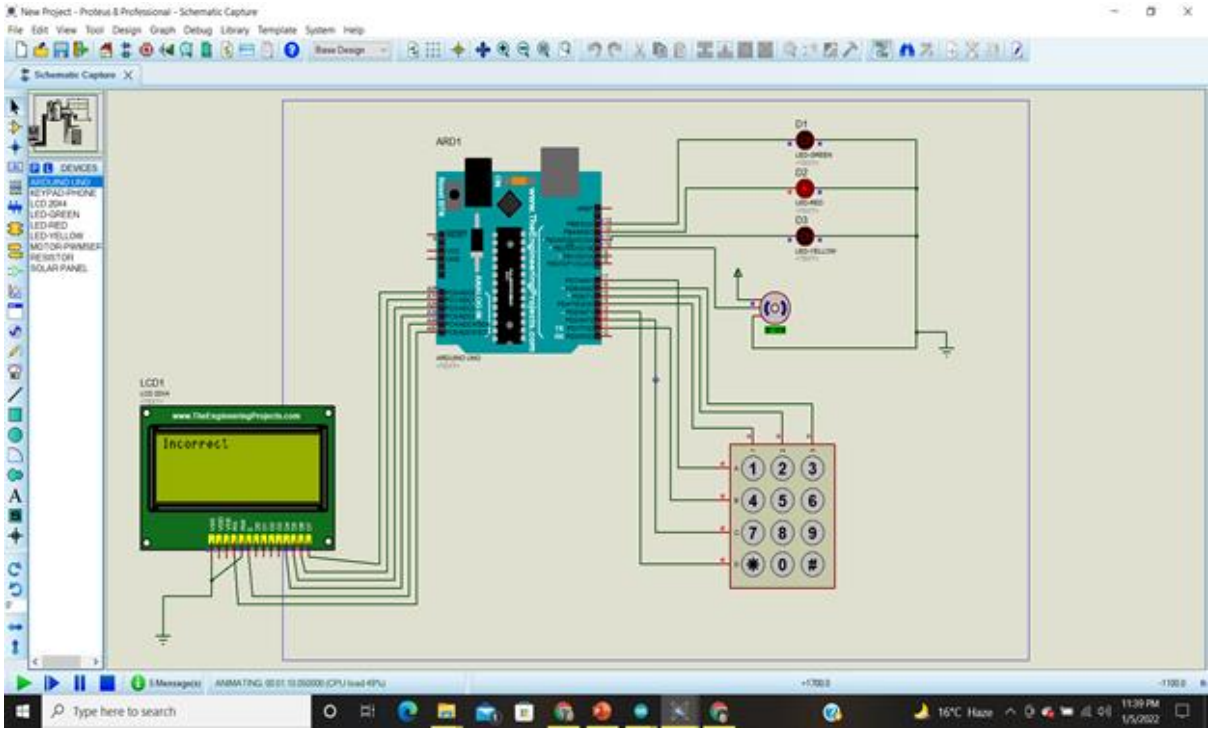
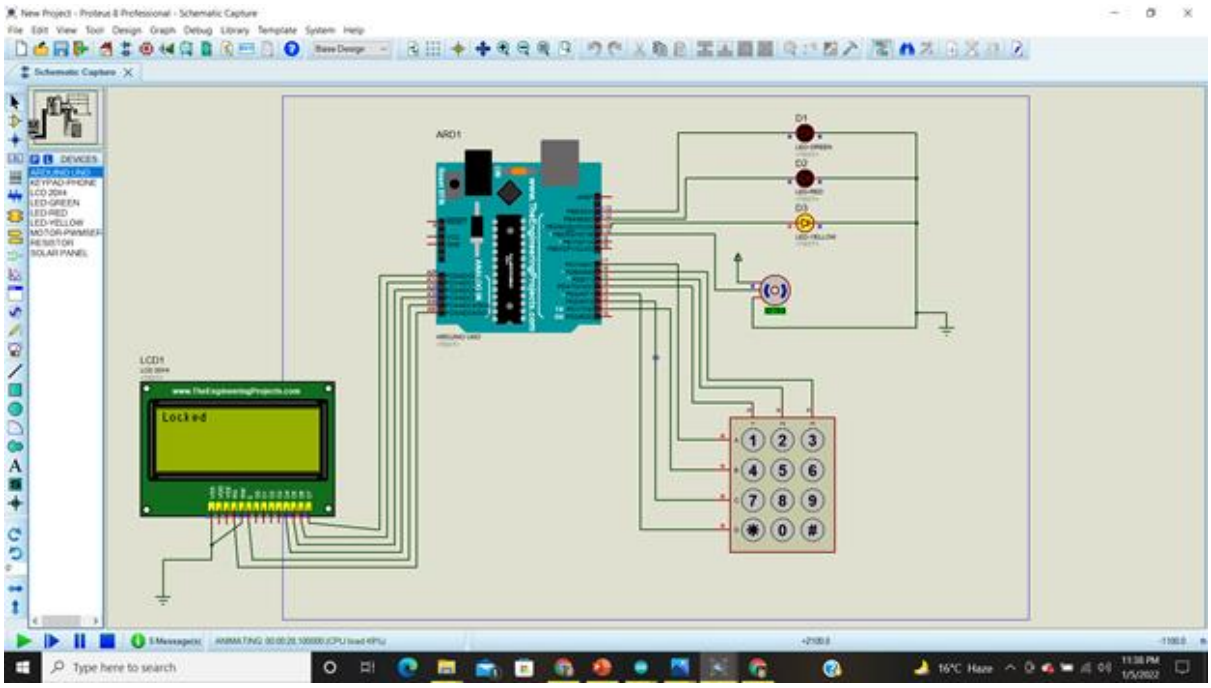
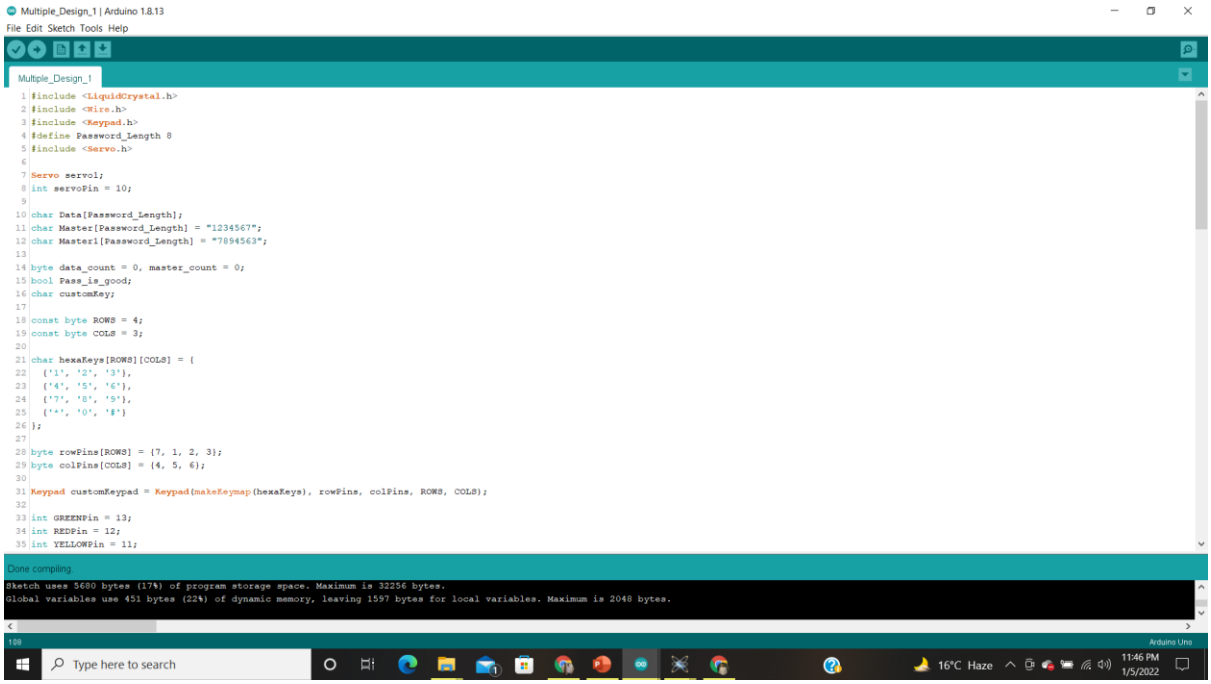




Here, an analog keyboard is used in place of the fingerprint module because of Proteus's availability. Where if the fingerprint matches with the given fingerprint, green led blinks that means the vehicle is unlocked. Then the servo motor changes its direction to indicate the fuel is flowing to the engine. So, it's ready to go. If it doesn't match then a red led will blink and the servo motor remains closed. In order to lock the vehicle, another fingerprint is needed and in this case, the servo motor will go backward which indicates fuel flow turned off and yellow led blinks to indicate the bike is locked.


Multiple_Design_1 | Arduino 1.8.13
File Edit Sketch Tools Help
Multiple_Design_1
#include <LiquidCrystal.h>
#include <Wire.h>
#include <Keypad.h>
#define Password_Length 8
#include <Servo.h>
Servo servo1;
int servoPin = 10;
char Data[Password_Length];
char Master[Password_Length] = "1234567";
char Master1[Password_Length] = "7894563";
byte data_count = 0, master_count = 0;
bool Pass_is_good;
char customKey;
const byte ROWS = 4;
const byte COLS = 3;
char hexaKeys[ROWS][COLS] = {
{'1', '2', '3'},
{'4', '5', '6'},
{'7', '8', '9'},
{'*', '0', '#'}
};
byte rowPins[ROWS] = {7, 1, 2, 3};
byte colPins[COLS] = {4, 5, 6};
Keypad customKeypad = Keypad(makeKeymap(hexaKeys), rowPins, colPins, ROWS, COLS);
int GREENPin = 13;
int REDPin = 12;
int YELLOWPin = 11;
Done compiling.
Sketch uses 5680 bytes (17%) of program storage space. Maximum is 32256 bytes.
Global variables use 451 bytes (22%) of dynamic memory, leaving 1597 bytes for local variables. Maximum is 2048 bytes.
Arduino Uno
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16°C Haze
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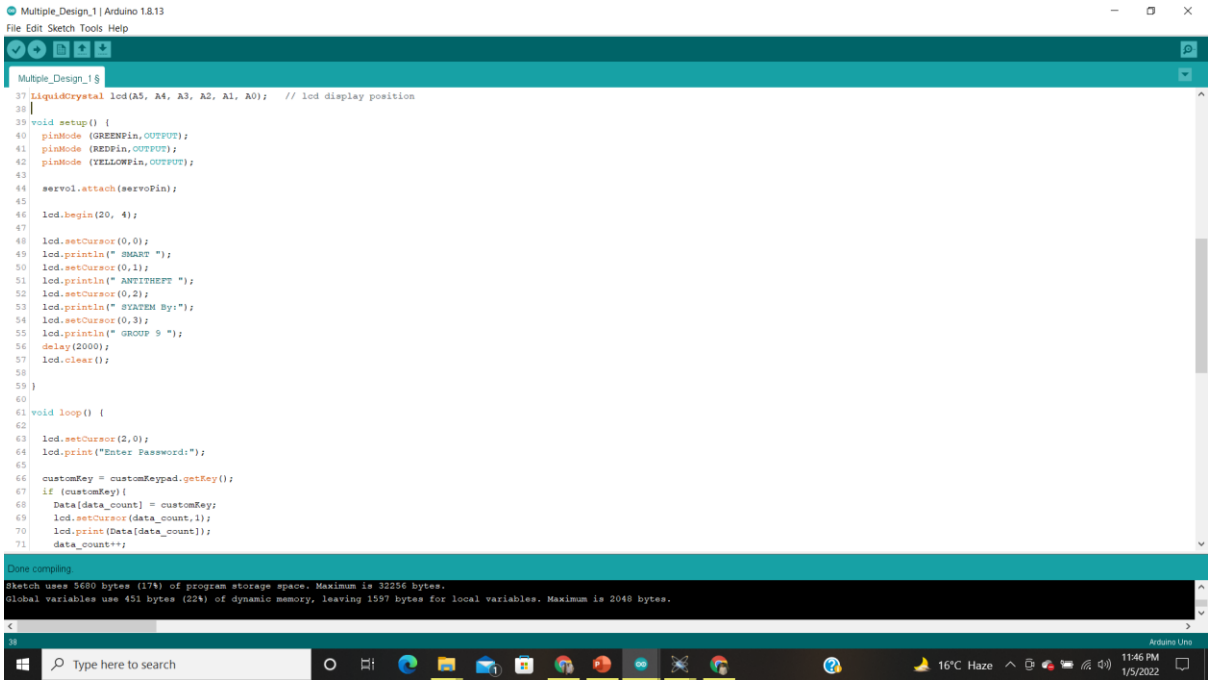
1/5/2022


Multiple_Design_1 | Arduino 1.8.13
File Edit Sketch Tools Help
Multiple_Design_1 §
LiquidCrystal lcd(A5, A4, A3, A2, A1, A0); // lcd display position
void setup() {
pinMode (GREENPin,OUTPUT);
pinMode (REDPin,OUTPUT);
pinMode (YELLOWPin,OUTPUT);
servo1.attach(servoPin);
lcd.begin(20, 4);
lcd.setCursor(0,0);
lcd.println(" SMART ");
lcd.setCursor(0,1);
lcd.println(" ANTITHEFT ");
lcd.setCursor(0,2);
lcd.println(" SYATEM By:");
lcd.setCursor(0,3);
lcd.println(" GROUP 9 ");
delay(2000);
lcd.clear();
}
void loop() {
lcd.setCursor(2,0);
lcd.print("Enter Password:");
customKey = customKeypad.getKey();
if (customKey){
Data[data_count] = customKey;
lcd.setCursor(data_count,1);
lcd.print(Data[data_count]);
data_count++;
Done compiling.
Sketch uses 5680 bytes (17%) of program storage space. Maximum is 32256 bytes.
Global variables use 451 bytes (22%) of dynamic memory, leaving 1597 bytes for local variables. Maximum is 2048 bytes.
Arduino Uno
Type here to search
16°C Haze
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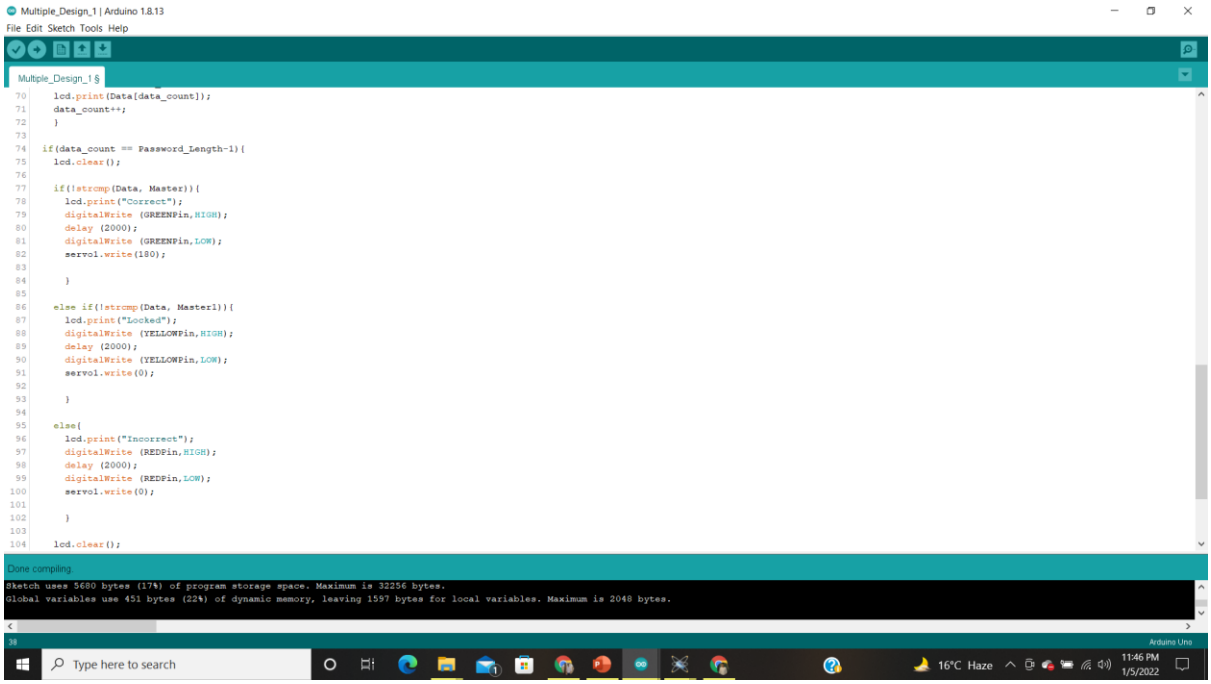
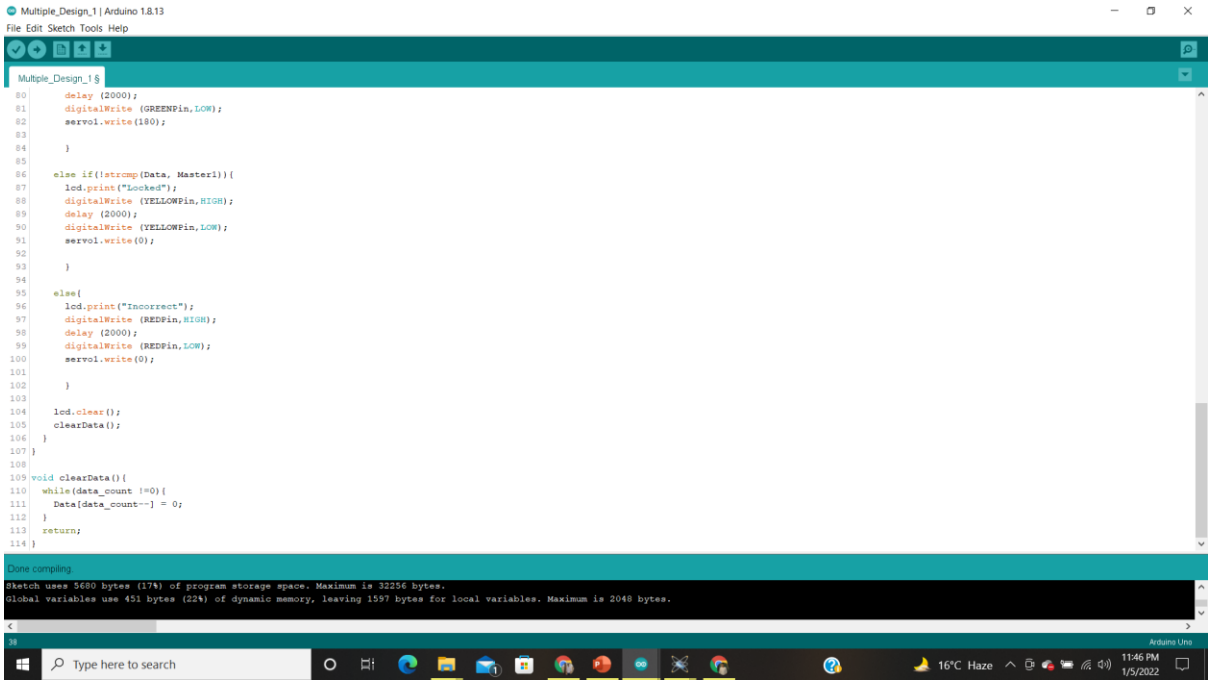
1/5/2022

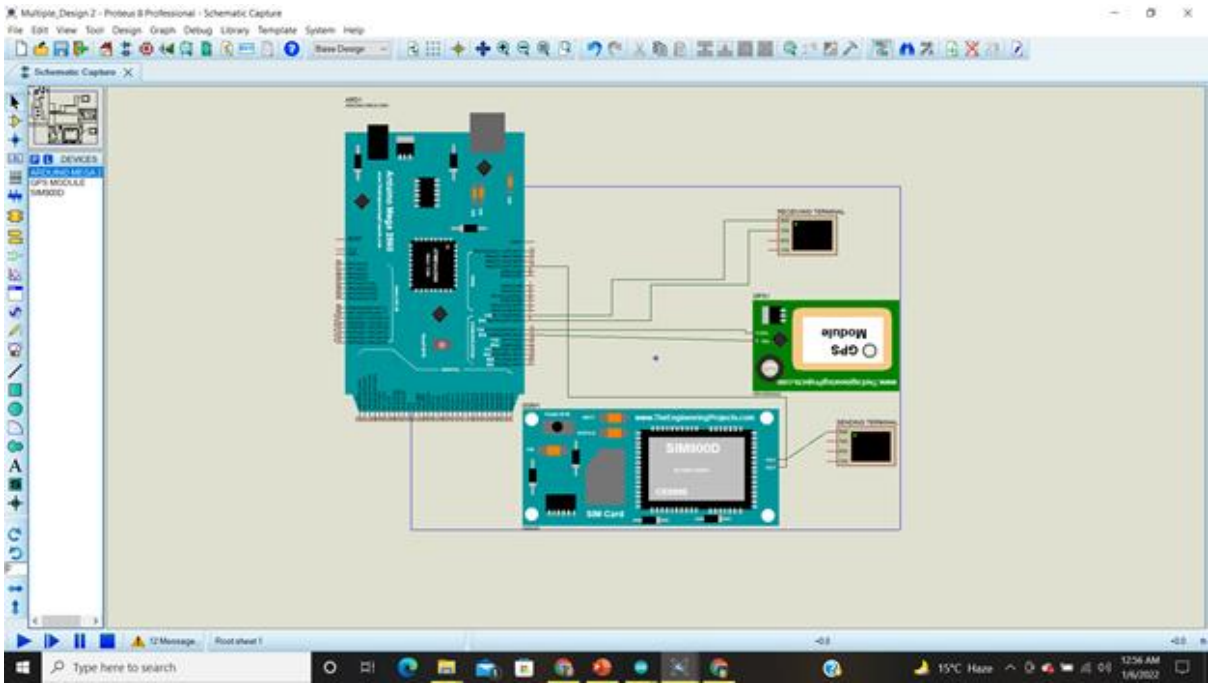


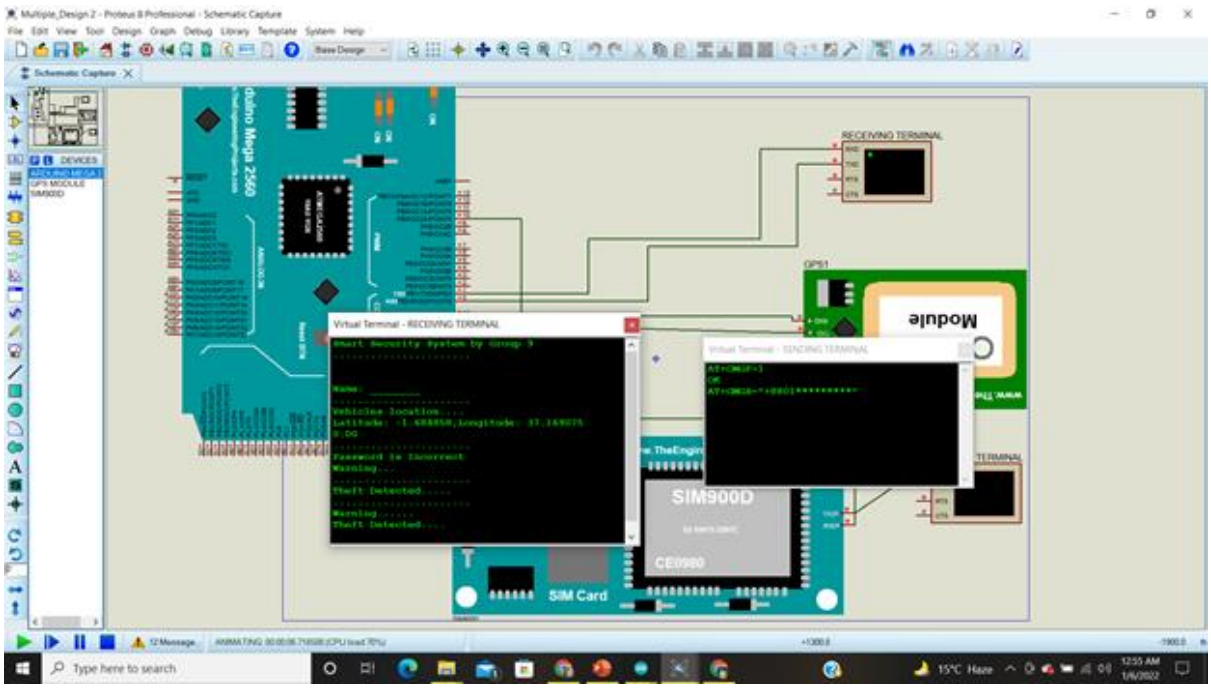


Cloud Based Tracking System

GPS tracking system is used to locate their vehicles if it gets stolen and they will be able to do it by using a computer or a smart device's application. Now in our proposed design we wanted to implement all of the features. But due to budget and requirement needs we

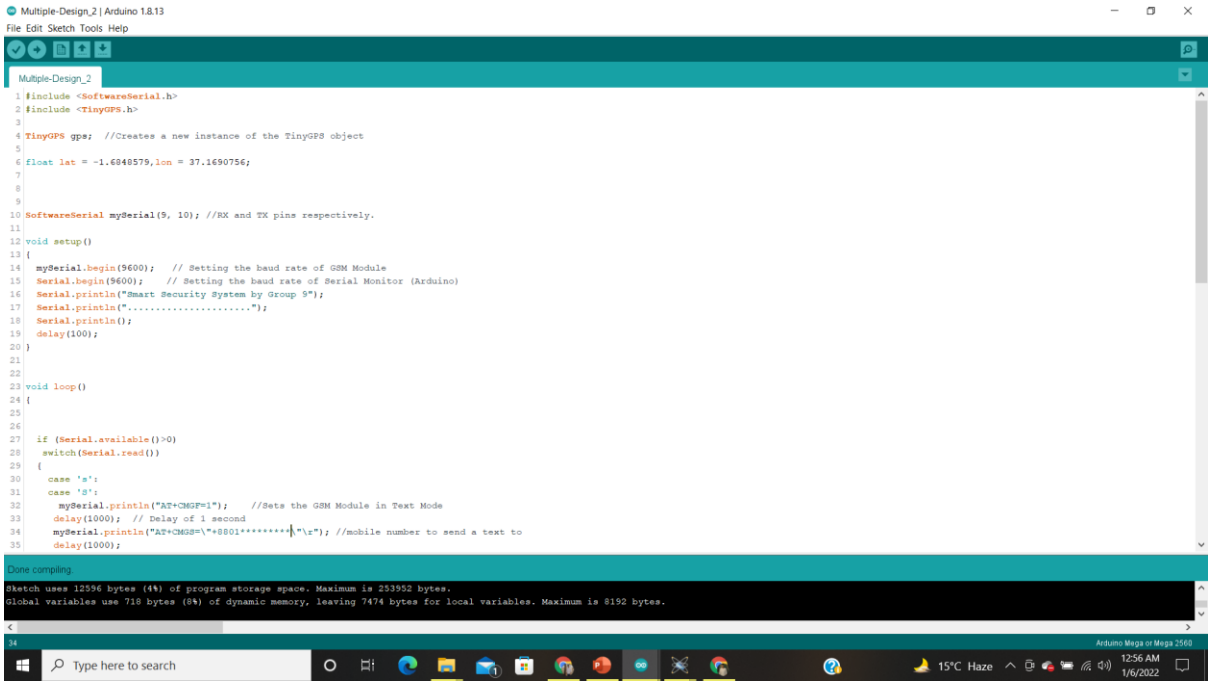
changed our approach a bit. At first, whenever the user needed to locate his bike, he'd have to send a signal code via his cell phone to the GSM module installed in the device. From there, the microcontroller(Arduino) will send a signal to the GPS module. After receiving the signal, it will send the coordinates to the microcontroller and Arduino will then send the exact location to the owner using the GSM module(SIM990D).

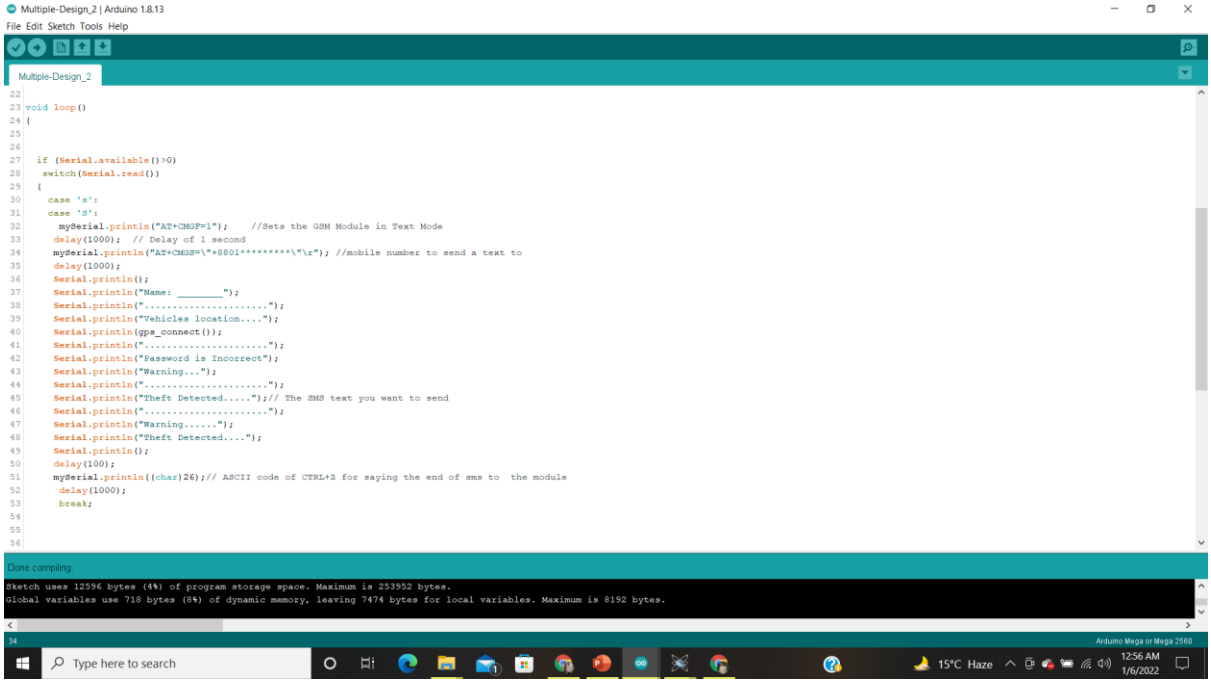


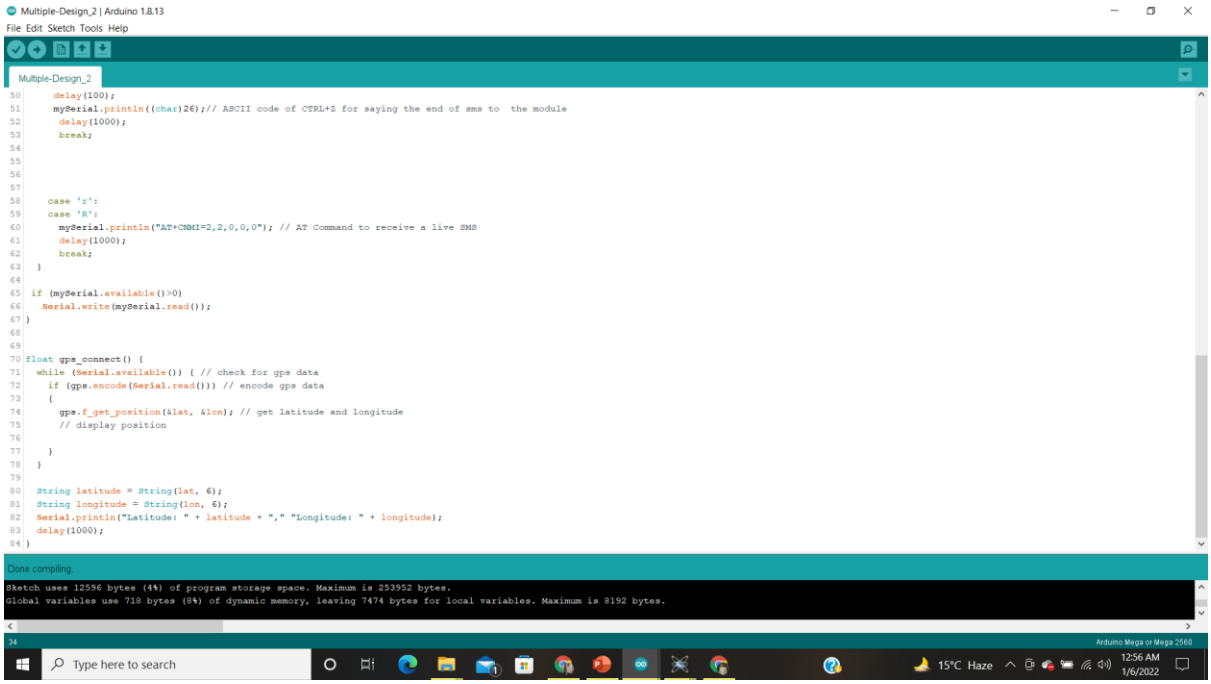


Here, for tracking the bike the owner has to send a message to the gsm module there the gps module will track its current location and send it back to the owners smart device. We

have used a virtual terminal in place of a smart device where we are able to read the location of the bike.






Multiple-Design_2 | Arduino 1.8.13
File Edit Sketch Tools Help
Multiple-Design_2
delay(100);
mySerial.println((char)26);// ASCII code of CTRL+Z for saying the end of sms to the module
delay(1000);
break;
case 'r':
case 'R':
mySerial.println("AT+CNMI=2,2,0,0,0"); // AT Command to receive a live SMS
delay(1000);
break;
if (mySerial.available()>0)
Serial.write(mySerial.read());
float gps_connect() {
while (Serial.available()) { // check for gps data
if (gps.encode(Serial.read())) // encode gps data
{
gps.f_get_position(&lat, &lon); // get latitude and longitude
// display position
String latitude = String(lat, 6);
String longitude = String(lon, 6);
Serial.println("Latitude: " + latitude + "," "Longitude: " + longitude);
delay(1000);
Done compiling.
Sketch uses 12596 bytes (4%) of program storage space. Maximum is 253952 bytes.
Global variables use 718 bytes (8%) of dynamic memory, leaving 7474 bytes for local variables. Maximum is 8192 bytes.
Arduino Mega or Mega 2560
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15°C Haze
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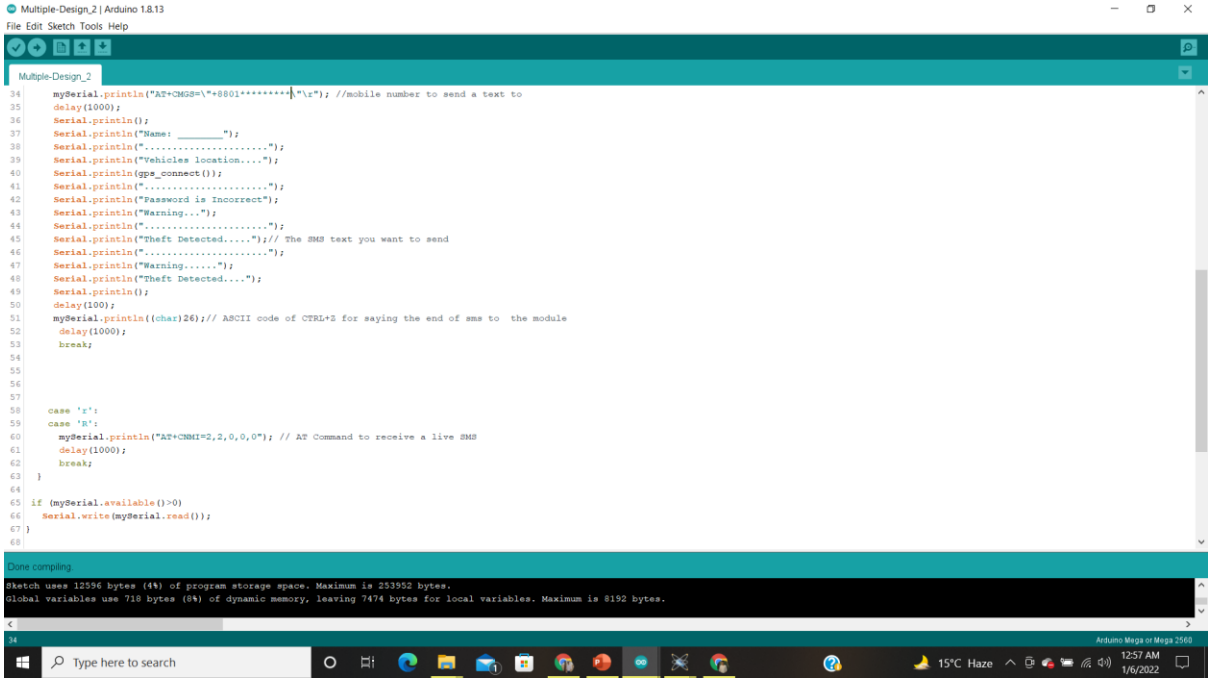
1/6/2022


Multiple-Design_2 | Arduino 1.8.13
File Edit Sketch Tools Help
Multiple-Design_2
mySerial.println("AT+CMGS=\"+8801********\"\r"); //mobile number to send a text to
delay(1000);
Serial.println();
Serial.println("Name: _______");
Serial.println("......................");
Serial.println("Vehicles location....");
Serial.println(gps_connect());
Serial.println("......................");
Serial.println("Password is Incorrect");
Serial.println("Warning...");
Serial.println("......................");
Serial.println("Theft Detected.....");// The SMS text you want to send
Serial.println("......................");
Serial.println("Warning.....");
Serial.println("Theft Detected....");
Serial.println();
delay(100);
mySerial.println((char)26);// ASCII code of CTRL+Z for saying the end of sms to the module
delay(1000);
break;
case 'r':
case 'R':
mySerial.println("AT+CNMI=2,2,0,0,0"); // AT Command to receive a live SMS
delay(1000);
break;
if (mySerial.available()>0)
Serial.write(mySerial.read());
Done compiling.
Sketch uses 12596 bytes (4%) of program storage space. Maximum is 253952 bytes.
Global variables use 718 bytes (8%) of dynamic memory, leaving 7474 bytes for local variables. Maximum is 8192 bytes.
Arduino Mega or Mega 2560
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15°C Haze
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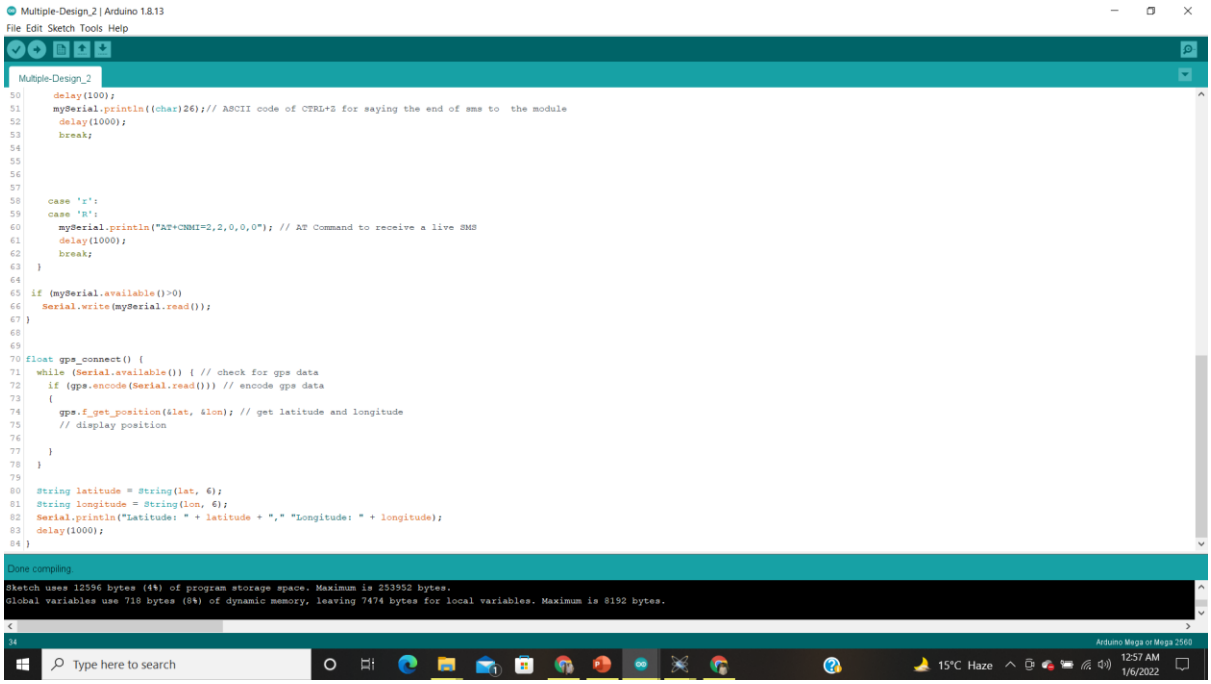
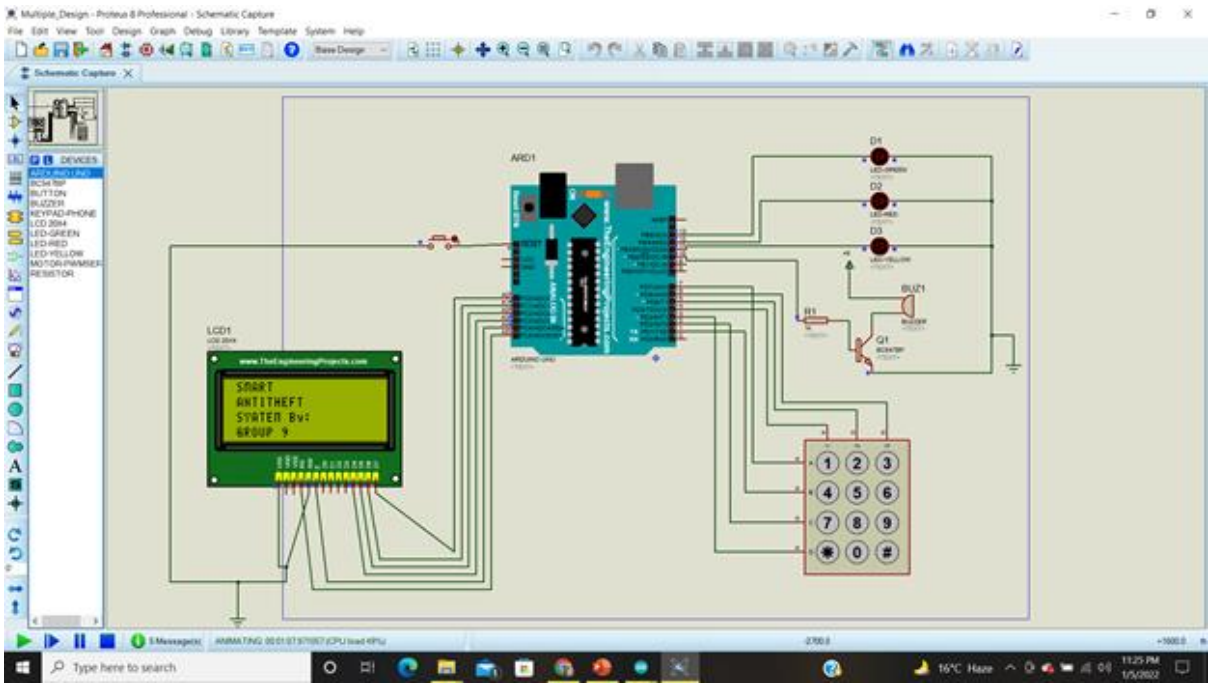
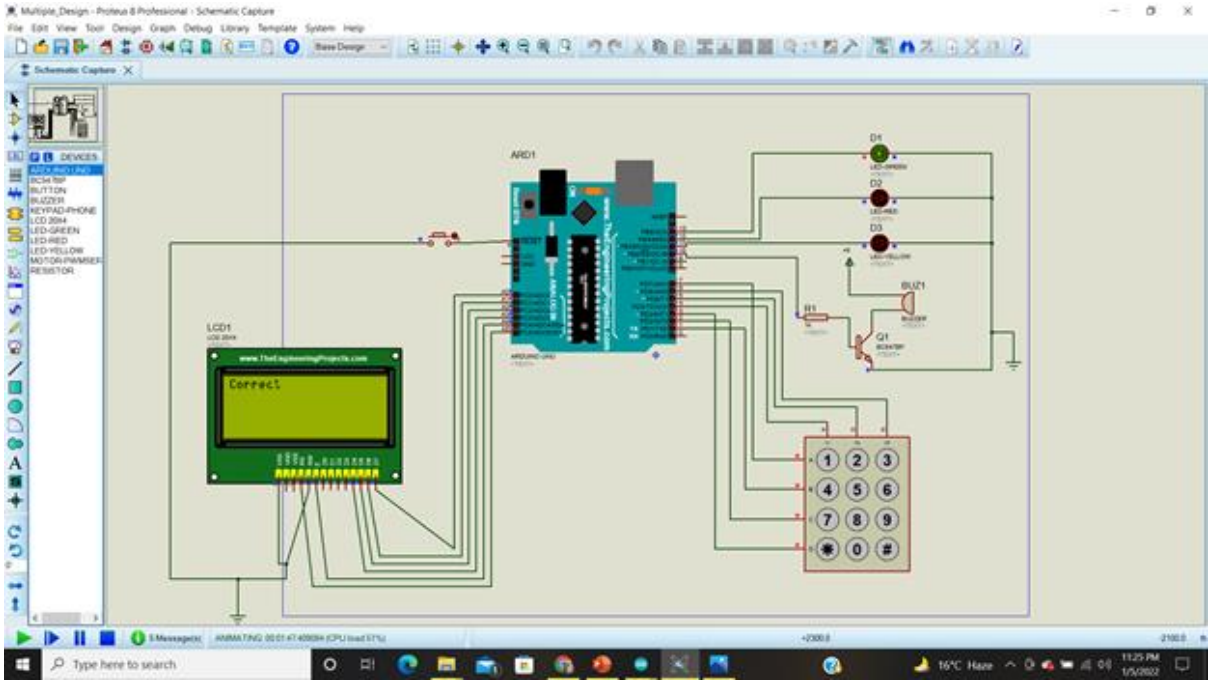
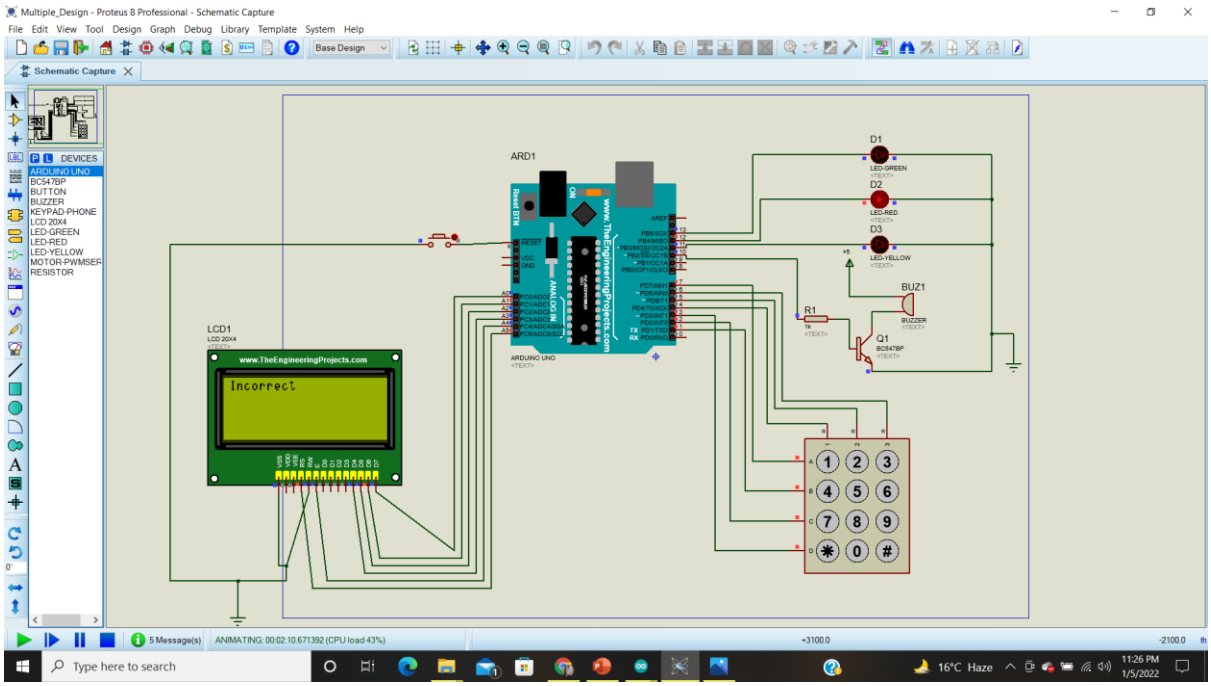
1/6/2022

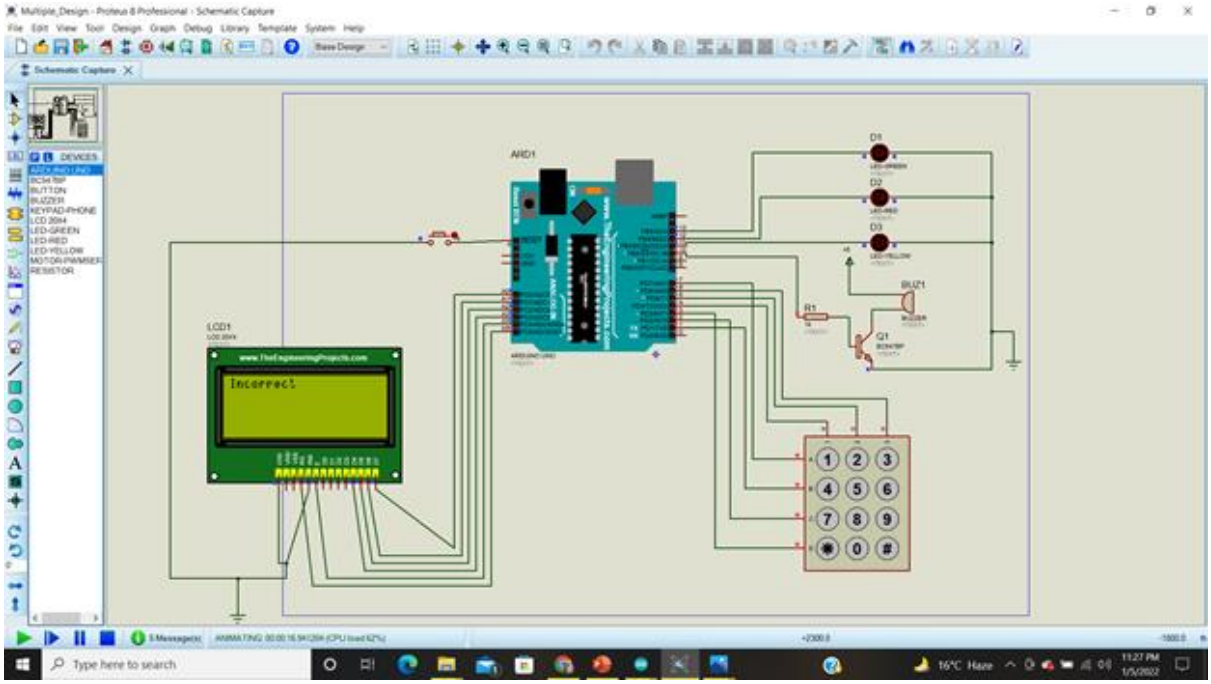


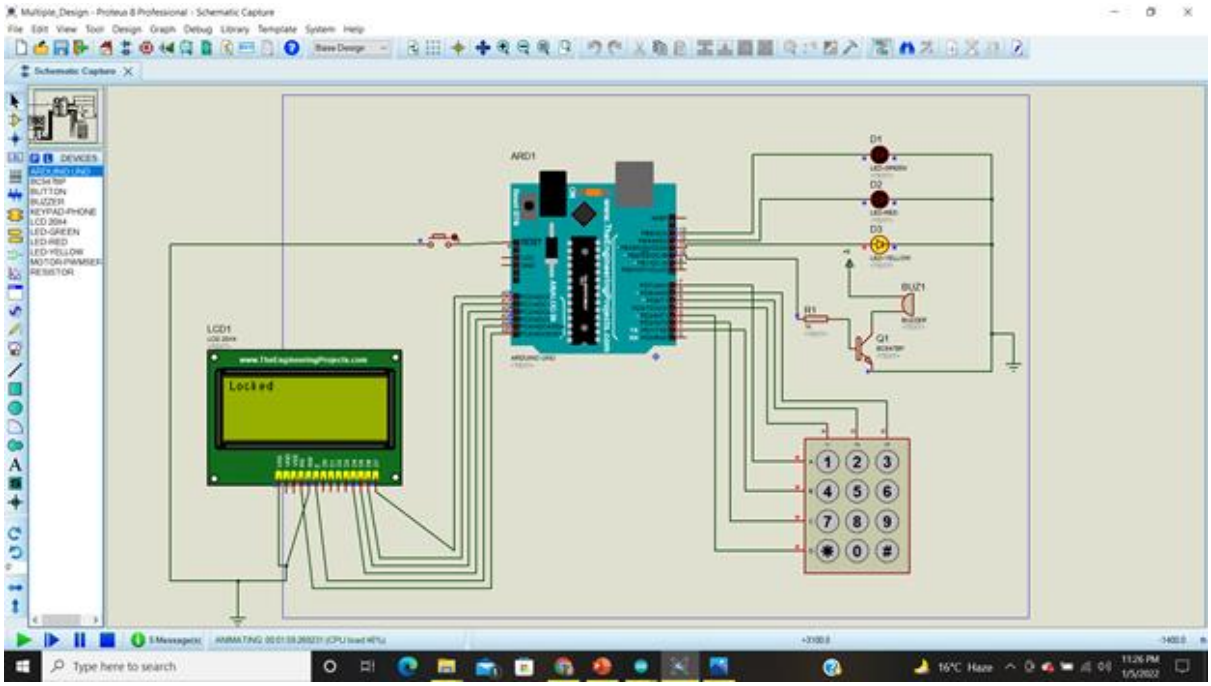
Alarm based security System:



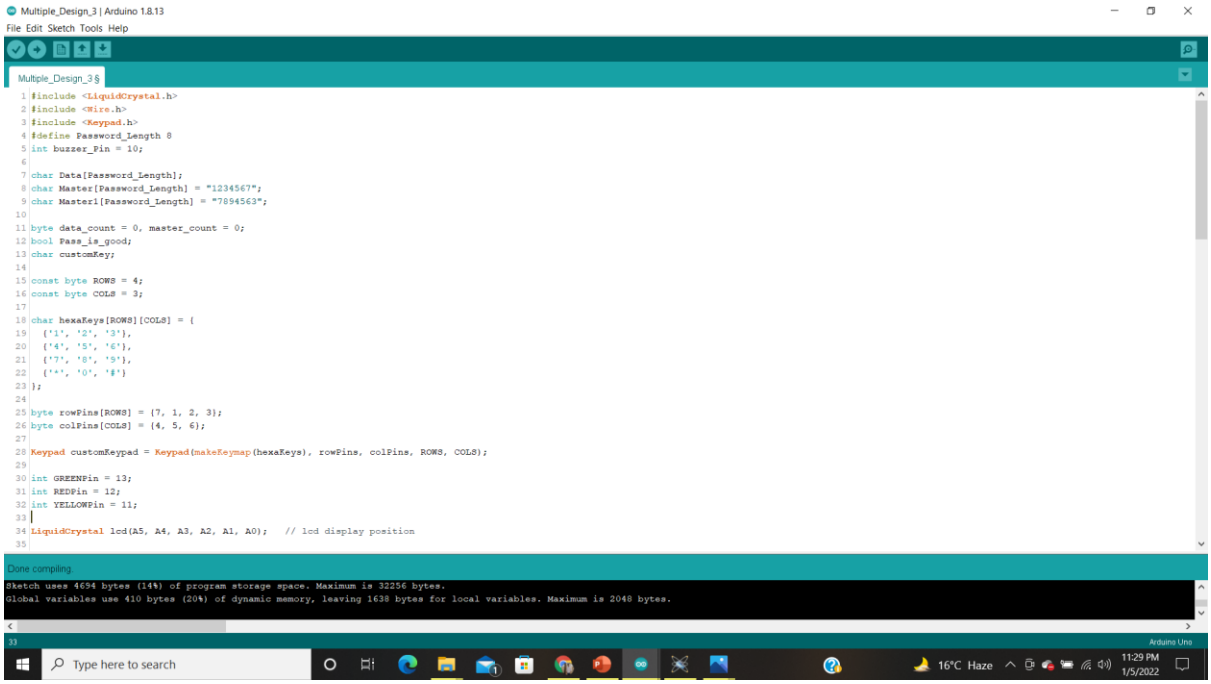

Multiple_Design - Proteus 8 Professional - Schematic Capture
ARD1
LCD1
Correct
D1
D2
D3
BUZ1
R1
Q1
1 2 3
4 5 6
7 8 9
* 0 #


Multiple_Design - Proteus 8 Professional - Schematic Capture
ARD1
LCD1
Incorrect
www.TheEngineeringProjects.com
D1
D2
D3
BUZ1
R1
Q1
1 2 3
4 5 6
7 8 9
* 0 #





Here, a password has been set up with an analog keyboard. If the password matches with the given one, the vehicle is unlocked and green led will blink. If it doesn't match, red led blinks and the buzzer will turn on in place of Piezo Alarm. For locking the bike another password is given and if it does match, yellow led blinks and the vehicle is locked.


Multiple_Design_3 | Arduino 1.8.13
File Edit Sketch Tools Help
Multiple_Design_3 §
#include <LiquidCrystal.h>
#include <Wire.h>
#include <Keypad.h>
#define Password_Length 8
int buzzer_Pin = 10;
char Data[Password_Length];
char Master[Password_Length] = "1234567";
char Master1[Password_Length] = "7894563";
byte data_count = 0, master_count = 0;
bool Pass_is_good;
char customKey;
const byte ROWS = 4;
const byte COLS = 3;
char hexaKeys[ROWS][COLS] = {
{'1', '2', '3'},
{'4', '5', '6'},
{'7', '8', '9'},
{'*', '0', '#'}
};
byte rowPins[ROWS] = {7, 1, 2, 3};
byte colPins[COLS] = {4, 5, 6};
Keypad customKeypad = Keypad(makeKeymap(hexaKeys), rowPins, colPins, ROWS, COLS);
int GREENPin = 13;
int REDPin = 12;
int YELLOWPin = 11;
LiquidCrystal lcd(A5, A4, A3, A2, A1, A0); // lcd display position
Done compiling.
Sketch uses 4694 bytes (14%) of program storage space. Maximum is 32256 bytes.
Global variables use 410 bytes (20%) of dynamic memory, leaving 1638 bytes for local variables. Maximum is 2048 bytes.
Arduino Uno
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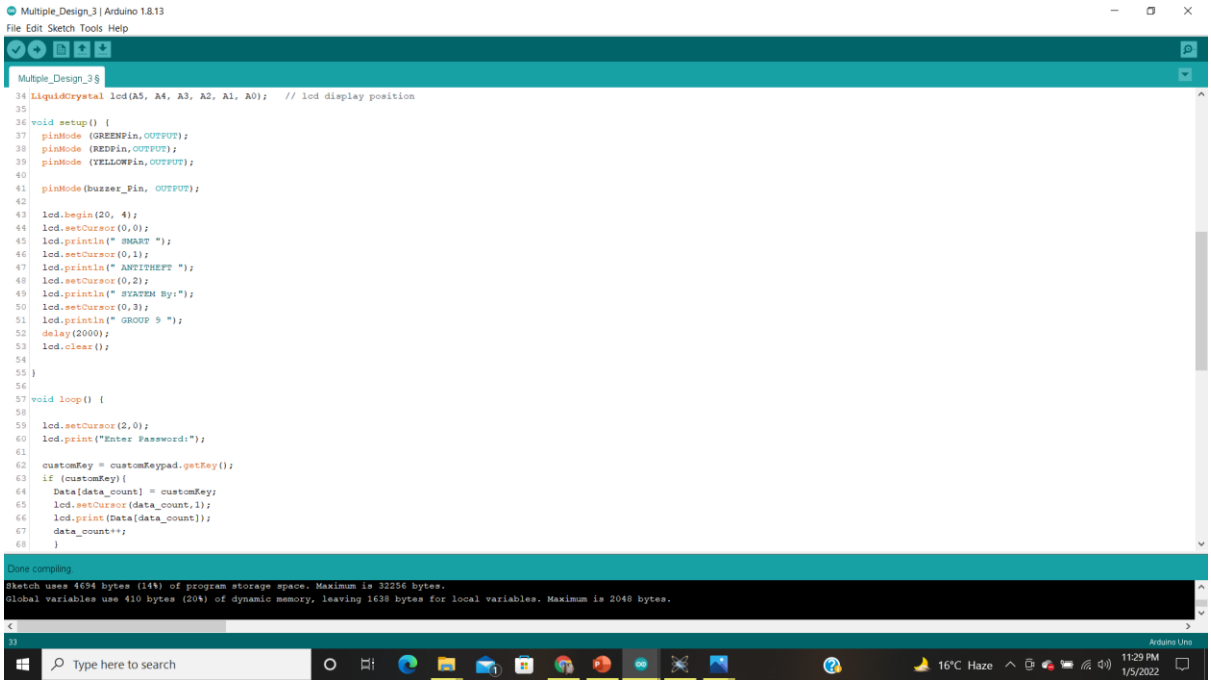
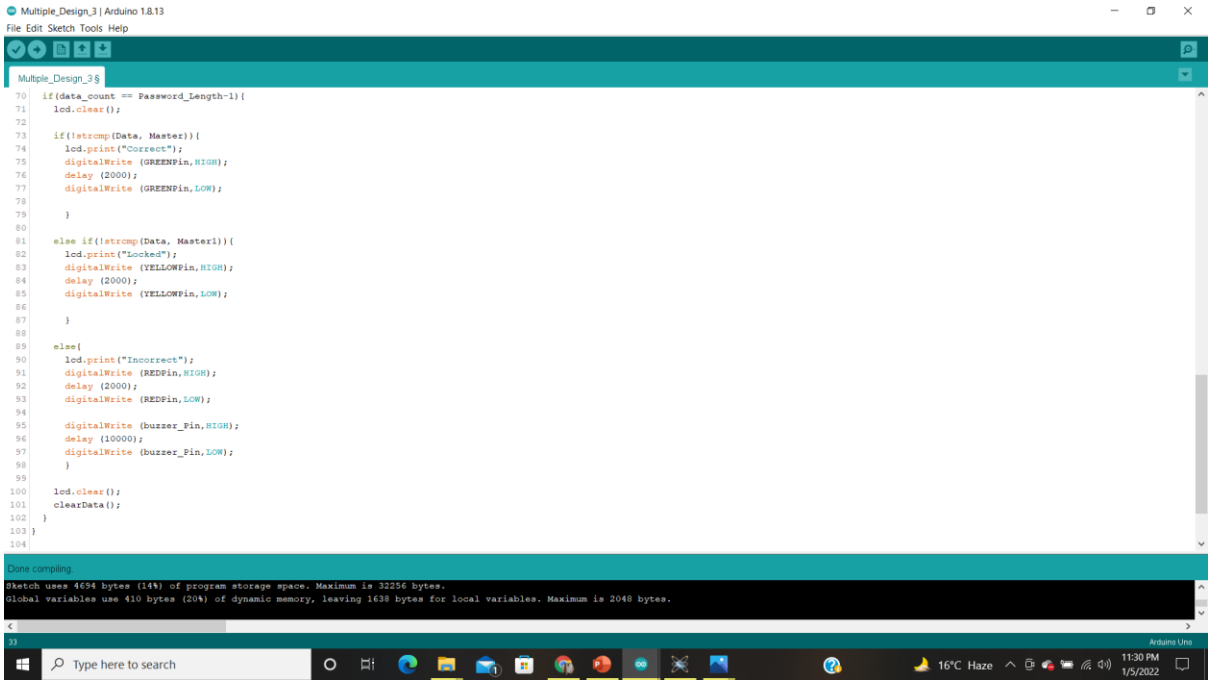
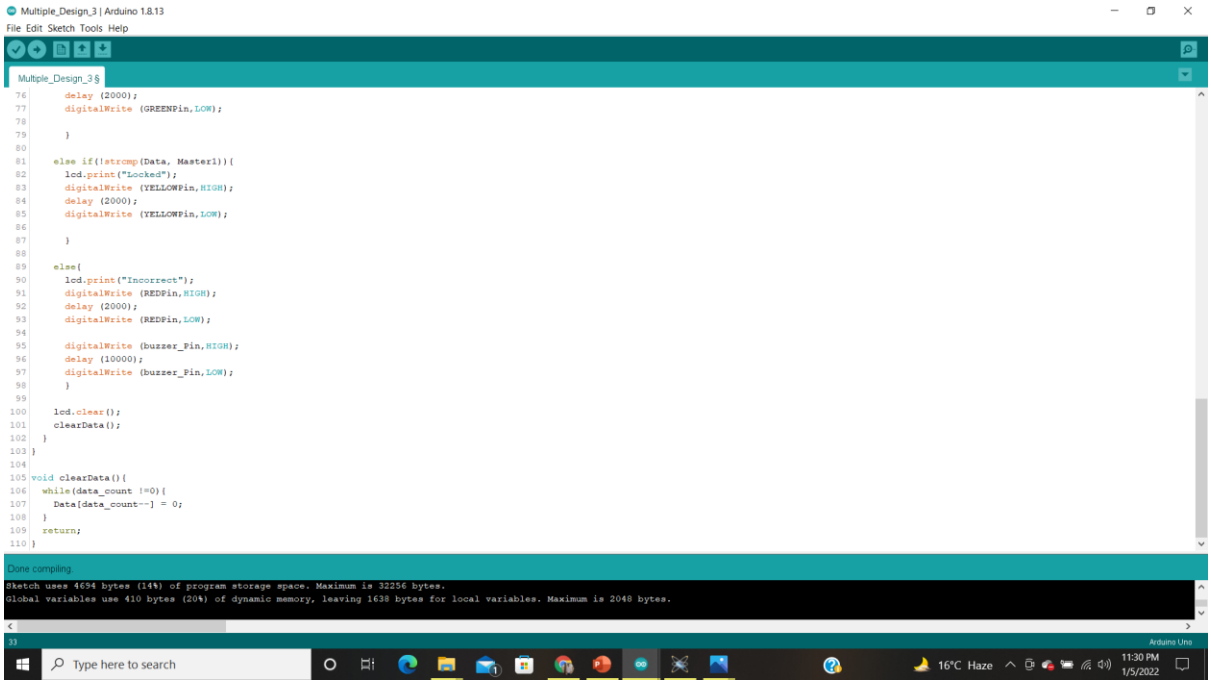
1/5/2022


Multiple_Design_3 | Arduino 1.8.13
File Edit Sketch Tools Help
Multiple_Design_3 §
LiquidCrystal lcd(A5, A4, A3, A2, A1, A0); // lcd display position
void setup() {
pinMode (GREENPin,OUTPUT);
pinMode (REDPin,OUTPUT);
pinMode (YELLOWPin,OUTPUT);
pinMode(buzzer_Pin, OUTPUT);
lcd.begin(20, 4);
lcd.setCursor(0,0);
lcd.println(" SMART ");
lcd.setCursor(0,1);
lcd.println(" ANTITHEFT ");
lcd.setCursor(0,2);
lcd.println(" SYATEM By:");
lcd.setCursor(0,3);
lcd.println(" GROUP 9 ");
delay(2000);
lcd.clear();
}
void loop() {
lcd.setCursor(2,0);
lcd.print("Enter Password:");
customKey = customKeypad.getKey();
if (customKey){
Data[data_count] = customKey;
lcd.setCursor(data_count,1);
lcd.print(Data[data_count]);
data_count++;
}
Done compiling.
Sketch uses 4694 bytes (14%) of program storage space. Maximum is 32256 bytes.
Global variables use 410 bytes (20%) of dynamic memory, leaving 1638 bytes for local variables. Maximum is 2048 bytes.
Arduino Uno
Type here to search
16°C Haze
11:29 PM
1/5/2022





4.3 Identify optimal design approach

Cost:

Designing the system in proteus won't cost that much as the licence for the whole platform can be bought only for $35(USD). There are different types of modules that can be bought at a reduced price. Our project module can be bought for only $25/month and $250/year. So our optimal choice for costing is Proteus software.

Efficiency:

Proteus has an overhead of about a factor of two for simulating sequential code, compared with a factor of several hundred of simulators that interpret each instruction. Proteus is 10 to 100 times faster than such simulators. A vital asset for Proteus is its support for monitoring and debugging. It also provides an integrated sub system for data collection and display. For these reasons our only optimal choice in efficiency is Proteus software.

Usability:

Proteus has the integrated ARES PCB designing suit. By using this we can easily develop the PCB layout. After simulation save the circuit designing and click on tools then select netlist to ARES. There are numerous tools on Proteus software and they are also really familiar in our country and that made our work easy. So the optimal choice is only Proteus software.

Manufacturability:

Proteus is a complete development platform from product concept to design completion. Its advantages are intelligent principle layout, hybrid circuit simulation and accurate analysis, single-chip software debugging, single-chip and peripheral circuit co-simulation, PCB automatic layout and wiring. It has sources, signal generators, measurement and analysis tools like oscilloscope, voltmeter, ammeter etc., probes for real time monitoring of the parameters of the circuit, switches, displays, loads like motors and lamps. So the optimal choice is Proteus software.

Impact:

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. Proteus is a simulation software, which can simulate analog circuits, digital circuits, microcomputer circuits and embedded systems. Proteus software applied to the teaching of electric courses can not only improve the overall teaching effect, but also reduce the cost of laboratory construction, and promote the teaching reform of electric courses. Practice has shown that this method can better help students understand the electric courses, and greatly improve the students' interest and enthusiasm. That’s why the optimal choice is only Proteus software.

Sustainability:

Proteus is famous among engineers and hobbyists with which they design and verify their circuit virtually without developing the hardware. This saves a lot of time and costs in designing a circuit. So it is a bit lagging right now but in future with the fast development of technology this software will be more sustainable.

Electronics:

To run the Proteus software we need a computer or a laptop

4.4 Performance evaluation of developed solution:

1st Design Comparison

Biometric Based		**Optimal design**	
Fingerprint sensor AS608	Yes	Fingerprint sensor R305	Yes
Fuel control solenoid valve	Yes	Fuel control solenoid valve	Yes
GPS /GSM module	No	GPS /GSM module	Yes
Alarm system	No	Alarm system	Yes

2nd design comparison

Alarm Based		**Optimal design**	
Fingerprint sensor	No	Fingerprint sensor	Yes
Fuel control solenoid valve	No	Fuel control solenoid valve	Yes
GPS /GSM module SIM900	No	GPS /GSM module SIM800	Yes
Alarm system	Yes	Alarm system	Yes

3rd design comparison

Cloud Based		Optimal design	
Fingerprint sensor	No	Fingerprint sensor	Yes
Fuel control solenoid valve	No	Fuel control solenoid valve	Yes
GSM module SIM900	Yes	GPS /GSM module SIM800	Yes
GPS module NIO 6M v2	No	GPS module NIO 6M v2	Yes
Alarm system	No	Alarm system	Yes

4.5 Conclusion:

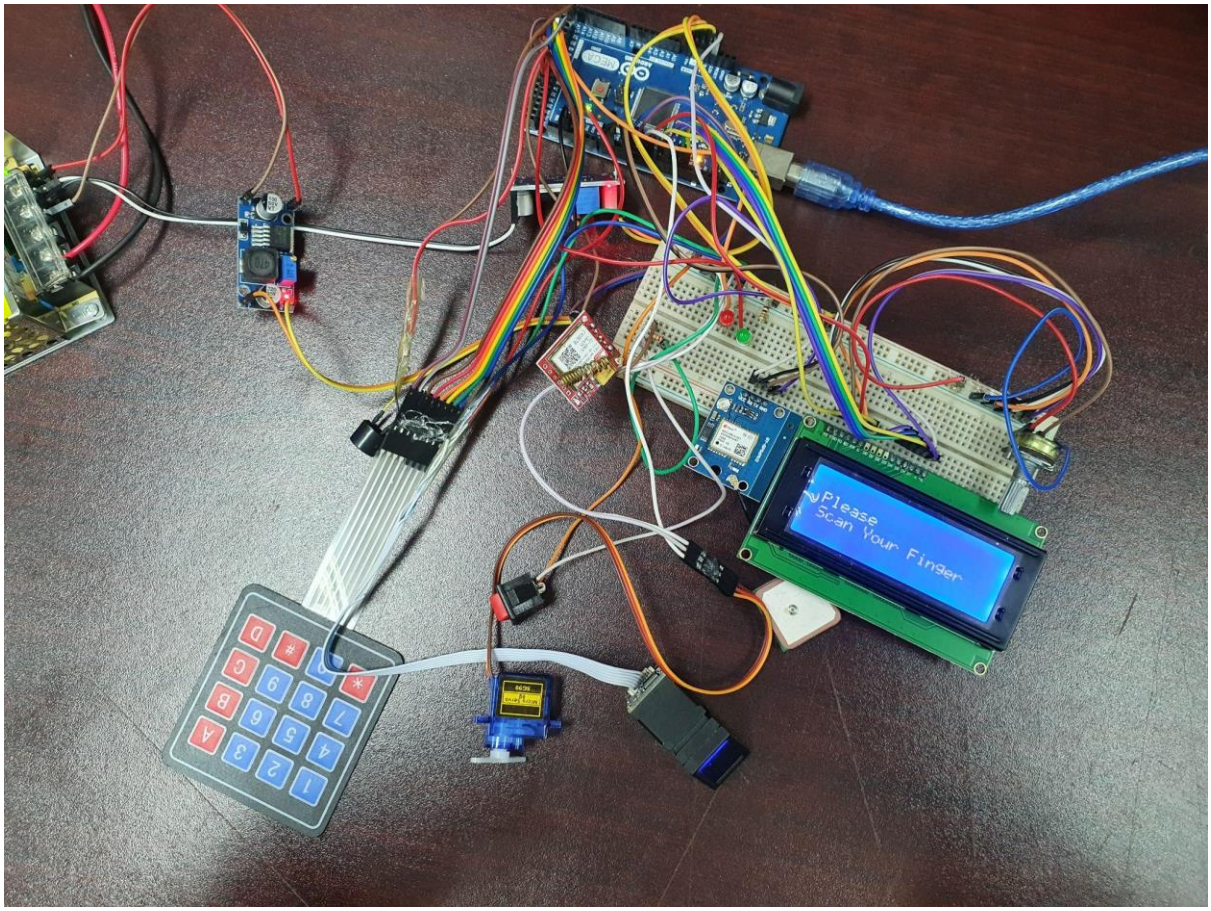
To sum up multiple design optimization we can conclude with our most specified and suitable design. From the above discussion we can see that the approach of optimization technique design is discussed with More emphasis on the challenges related to complex engineering, analytical skills, and nature according to some criteria of practical engineering design problems. As the only option is to consider challenges, achieving an optimized approach in the framework of an integrated design environment is considered for the key success to win the industry.

Chapter 5: Completion of Final Design and Validation. [CO8]

5.1 Introduction

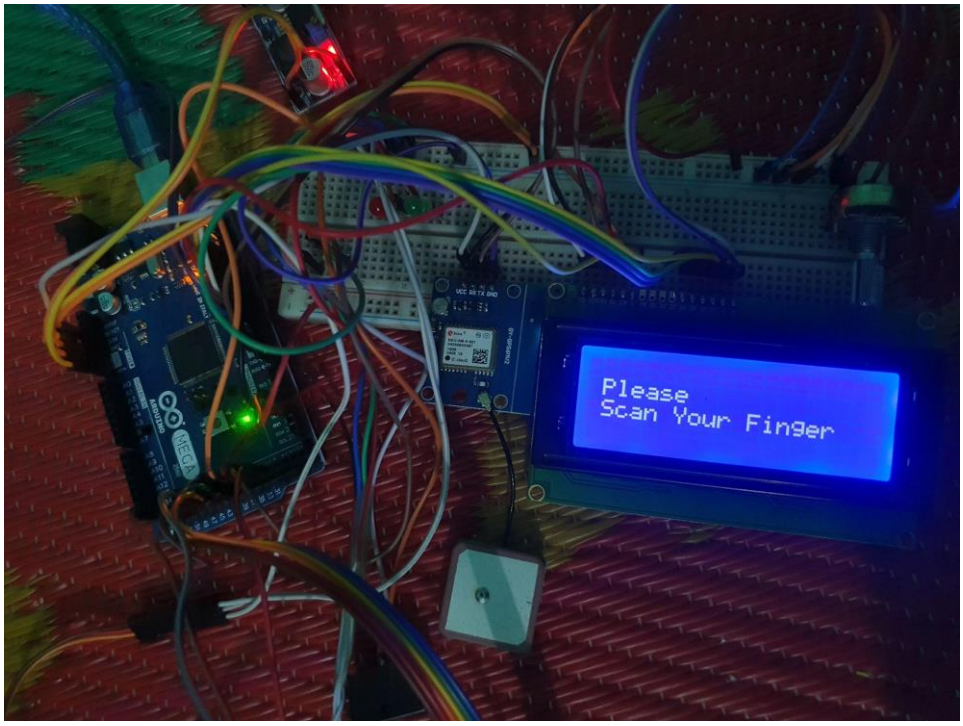
In the previous semester, our proposed design and our implemented device was changed a bit. We've updated some components as we had to change some requirements. We replaced the solenoid valve with a servo motor as it wasn’t feasible . Also we had to replace the GSM module as it was causing problems with the microcontroller.

5.2 Completion of final design

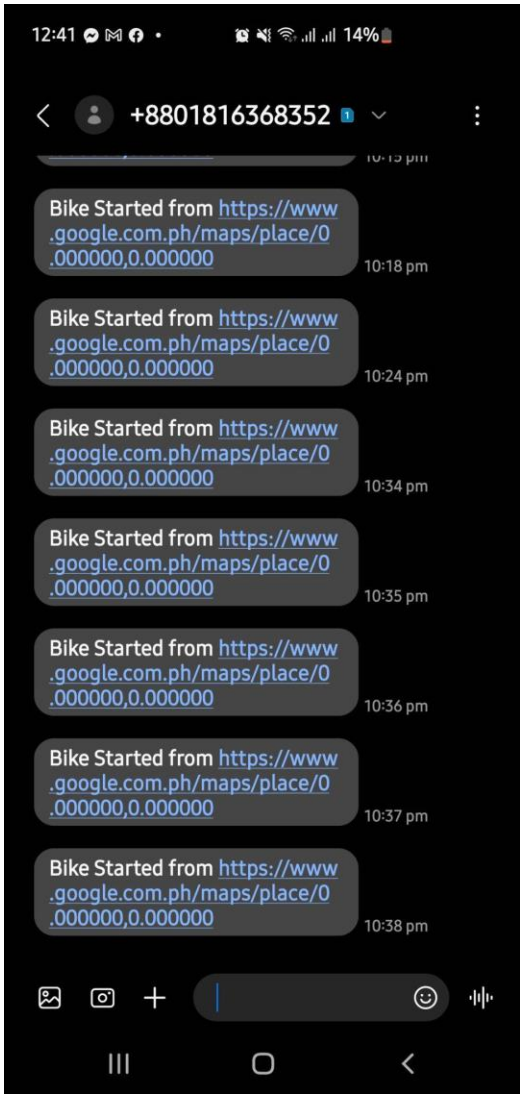


5.3 Evaluate the solution to meet desired need

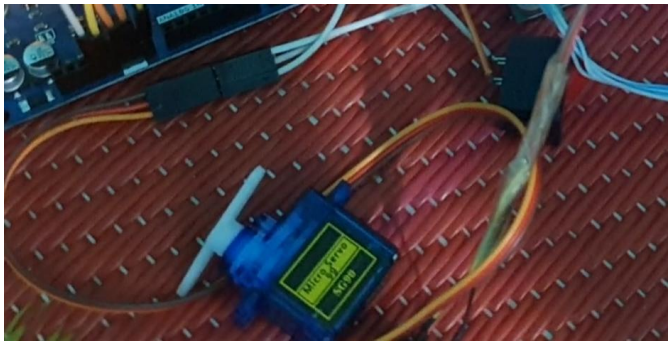
Biometric Sensing System: At first, the owner have to set a fingerprint with the system to start the bike. If the fingerprint matches a green led will blink then he will be able to turn on the motorbike.



Cloud Based Security System: A location will be sent to the owner's smartphone. By which he will be able to track his bike. It will be sent by GSM module sensor. And location will be sent by GPS module.



Fuel Control System: If the fingerprint matches, the servo motor will allow the fuel tank to flow fuel to the engine. If the fingerprint doesn't matches, the will not motor will not turn on.



Alarming System: If the fingerprint doesn’t match a buzzer will be turned on.

Backup Power Supply: A solar panel is added to the system as a backup power supply if incase the main power supply fails.

Backup Security: A keypad is added as a backup security system if in case the main security system fails.

Backup cloud system: The owner will be able to track his bike with a GPS sensing system if the gsm sensing system doesn't work. He will only have to convert his location with degree and he will be able to locate his bike in google maps.

```
$GPVTG,,T,,M,1.437,N,2.662,K,A*22
$GPGGA,163122.00,2345.26716,N,09022.94419,E,1,04,2.68,97.3,M,-49.7,M,,*47
$GPGSA,A,3,18,23,24,10,,,,,,,,,8.86,2.68,8.44*0F
$GPGSV,3,1,10,10,40,328,22,15,14,047,,18,64,142,30,22,24,239,*75
$GPGSV,3,2,10,23,51,016,16,24,44,066,25,25,02,154,,27,19,290,*7E
$GPGSV,3,3,10,29,06,175,,32,40,254,11*70
$GPGLL,2345.26716,N,09022.94419,E,163122.00,A,A*60
$GPRMC,163123.00,A,2345.26780,N,09022.94386,E,1.707,,270422,,,A*76
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```

5.4 Conclusion

After many trials and errors, we have managed to complete our project prototype. Although it was varied from the proposed model, still it fulfilled our specific requirements. All internal block systems work properly. thus we can conclude our completion of the design project.

Chapter 6: Impact Analysis and Project Sustainability. [CO3, CO4]

6.1 Introduction

Impact analysis and project sustainability are one of the major parts in completion of any project. If any project is made up then it's first and foremost object would be to keep the impact it;s creating and sustainability in check. The term "impact analysis" refers to the process of determining the impact of changes to a deployed product or application. It provides details on the parts of the system that may be impacted by a change in a certain section or feature of the application. The sustainability plan outlines the various parts of the project that must be maintained in order for it to continue to work in the long run. The long-term viability of your project is outlined in the sustainability plan. It ensures that the project's resources are not wasted.

6.2 Assess the Impact of the solution

- **Societal:** Installing an anti theft system in vehicles can reduce social anarchy to a limit. Because people will feel safe about their vehicles when they take them outside for their day to day activities. Various crimes which are committed through stolen bikes will decrease significantly which will bring harmony in the society.

- **Health:** The components we are using to set up our anti theft system do not emit radiation which can be dangerous to human health. Thus they are eco friendly, people use them in various sectors of the society.

- **Legal:** Our anti theft system will need permission from the Roads & safety ministry and ICT ministry. This system will also be verified by different govt. institutions and its performance will also be monitored so that it's performance does not drop down. Contracts can be signed with motorbike production companies for maintaining the standard and performance of the anti theft system.

- **Safety:** Through our system we can track down the vehicle even if it is stolen. We have GSM in our system which will instantly send a message to the owner's mobile if his bike is moved from the parking place and GPS can constantly tell us it's location.

- **Cultural:** We have a common believe in our country that bikes are not safe to buy as they can be easily stolen. By setting up this anti theft system in motorbikes a message can be sent to the people that their common believe can be proved wrong and is wrong. People will certainly get out of their mental barrier about bikes and feel encouraged about parking their bikes in fixed parking places.

6.3 Evaluate the sustainability

Multiple Designs	Security (25%)	Economic (25%)	Environmental (25%)	Societal (25%)	Total Percentage
Approach 1	18%	20%	17%	20%	75%
Approach 2	12%	20%	15%	13%	60%
Approach 3	22%	18%	20%	20%	80%
Our Proposed Design	23%	24%	23%	20%	90%

Sustainability is crucial for a variety of reasons, including the following: Environmental Quality-We need clean air, natural resources, and a nontoxic environment to have healthy communities. Sustainability enhances our quality of life while also safeguarding our ecosystem and natural resources for future generations. In the business world, sustainability is linked to a company's holistic approach, which considers everything from manufacturing to logistics to customer service.

6.4 Conclusion

Our proposed system has met a large number of the criteria’s needed for an sustainable and environment friendly project and in future we will try to develop it so that it’s performance get’s better and better in the future.

Chapter 7: Engineering Project Management. [CO11, CO14]

7.1 introduction

To complete our project, we had to work for months and create a project plan for management. We had to continuously update our project plan just to keep on schedule.

7.2 Define, plan and manage engineering project

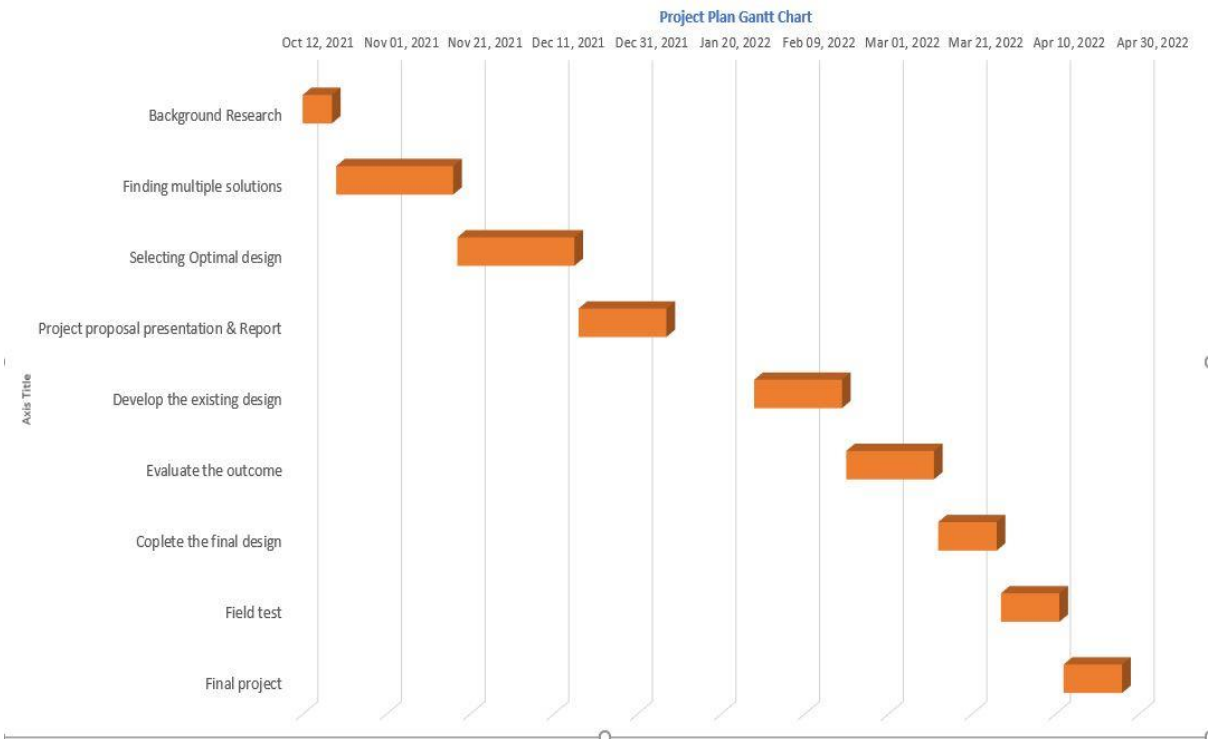

fig- Previous project plan

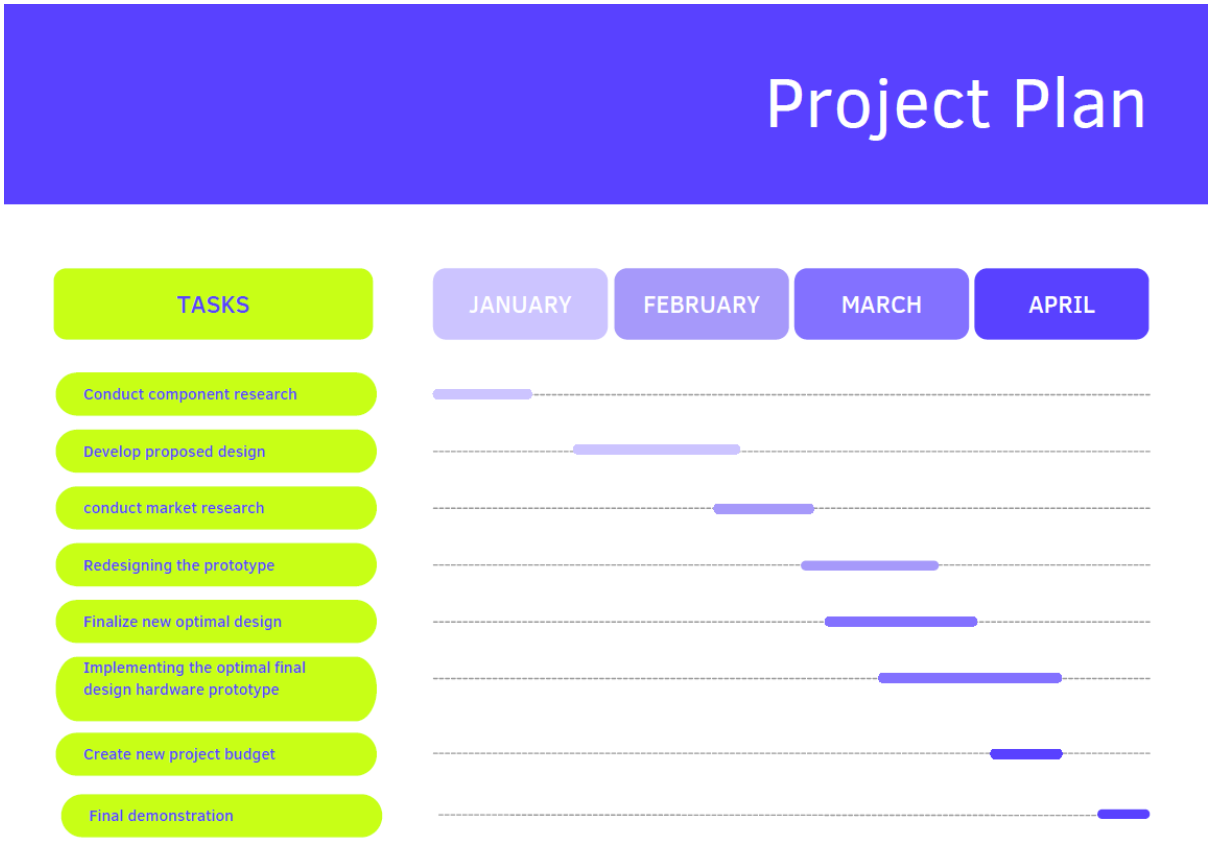

fig-Current project plan

In our previous project plan we planned that we will be able to implement the prototype within march. Although we did face some difficulties integrating all the proposed features within a single system, we had to redesign our optimal final design again. so we couldn't keep up with our proposed plan. still we managed to stay within schedule for implementation of our working prototype.

7.3 Evaluate project progress

We have tried cover up with deadlines through out the project though we have lacked in some parts to complete the required fulfillment. But overall we have progressed the way we planned and succeeded to complete our project.

7.4 Conclusion

Hardware implementation of our working prototype was the most challenging thing we had to manage so far. As we have finalized and integrated the prototype, hopefully we can initiate the next phase of the project and go for market production within the scheduled plan.

Chapter 8: Economical Analysis. [CO12]

8.1 Introduction:

Economic analysis enables us to make decentralized judgments about the best use of scarce resources, with costs and benefits specified and assessed in order to assess the projects' impact on the aspects of human life.

8.2 Economic analysis:

Components	Cost value	Reason for choosing
Fingerprint sensor (R305)	1600/-	Commonly used module all over the world and its less costly than ZKTeco SLK20R, Eikon Touch 510, ZKTeco ZK-4500
Arduino Mega	1300/-	There are so many uses and pins in this controlling device. So that in future according to users' requirements, we will be able to add more security levels.
4 Channel 5V Optical Isolated Relay Module	240/-	Connect Multiple Sensors

GSM Module (SIM800GSM + GPRS Modem with SMA Antenna)	1000/-	--
Solar panel	350/-	Backup power supply
4x4 Keypad - 16 Key - Matrix Membrane Type (RBD-986)	75/-	Backup for Biometric
GPS Module (NEO-6M GPS Module with EPROM)	600/-	Backup Tracking Device.
Jumper wire	60/-	--
Buzzer	180/-	--
LCD	600/-	--
DC jack	20/-	--
Total	5425/-	

Table- Total Expense

8.3 Cost benefit analysis

All our components are chosen carefully. Our fingerprint sensor is cheap comparing to its market counterparts. Also we've used the GSM800D module which is very efficient. our device is very lightweight and compact so it doesn't cost much. Most of our materials are available and are not expensive.

8.4 Evaluate economic and financial aspects

In the initial stage of our project, we overestimated some of the features that would be integrated into our system. But when we were assembling the prototype we saw that some components were not working properly with the whole system. So we had to redesign the system which cut the cost of the whole system. Previous proposed system was about nine thousand taka. But the final design prototype was cut down to around 5500 taka. So that will lower our overall budget for the project. We've cut down our cost around 40% and created an optimal security system for bikes.

8.5 Conclusion

To implement our project in real aspect budget and economic analysis is really important and we have shown the analysis of our budget needed to fully establish our project.

Chapter 9: Ethics and Professional Responsibilities CO13, CO2

9.1 Introduction:

Ethical Considerations can be specified as one of the most important parts of the research. Engineers are granted certain benefits by society, one of which is the ability to apply their education in a purposeful and respected work. On the other hand, have ethical devotion to a variety of contributors in society. Engineering professional responsibility encompasses the ethical accountabilities of engineers in their professional relationships with clients, employers, other engineers, and the public.

9.2 Ethical issues and professional responsibility:

Projects must maintain several ethical rules and conditions while developing and describing final work. In addition, responsibilities in professional life must be exercised for the wellbeing of the environment, society & the country. Some key issues and responsibilities include:

1. If a project draft decision is invalidated in a life or property-threatening situation, the owner or customer and other appropriate authorities should be notified.

2. Facts, data or information may not be disclosed without the prior consent of the customer or tracking owner unless permitted or required by standard code. The design of the project must be true in any professional report, statement, or testimony, including any relevant information pertaining to the report, statement, or testimony.

3.Before a project can be published anywhere that requires proof of copyright or a patent, a positive agreement of ownership is required. Project designs, data, records, and all content must refer solely to the original work.

9.3 Applying ethical issues and professional responsibility:

Through the code of ethics, professional engineers have a clearly defined duty to the public welfare as paramount. Following the discussion above, there are several issues to consider when developing the project. All considerations are broken down into environmental, legal, liability, and safety aspects.

Safety measures: In our project, if overrated conditions and short circuits occur accidently then there might be a high chance the electric components get damaged and our system might collapse. To prevent such a situation, we will double check all the connections and components. We will check if there is any wrong connection which can damage our motor vehicle. In order to implement our system we will solder some of our components, so to avoid any accident such as skin burning or inhaling smoke, we will take protection. We will also use a screw drill machine, which can cause serious accidents. So, we will wear masks, goggles and gloves to protect us from such accidents.

Accountability: Proper measurements will have to be maintained so that a constant check is there for various types of defective parts. We will monitor our device frequently so that bad people cannot malfunction it and break it's safety feature. Finally, we will ensure the user's and motorbike's privacy by not sharing or selling any of their information to others. Other than this, to complete our project and goal we will follow all the code and conducts from IEEE and won't break any kind of protocol of the motorbike's company. We will also follow the country's law and order in case of implementation.

Legal Issues: In this project Hardware components we are using are easily available in the marketplace such as Arduino Mega, Arduino Uno R3, Fingerprint sensor (R305), GSM Module, Large Piezo Alarm etc. As they are commonly sold in the marketplace, it is highly possible to find faults. We will make sure every sensor and components are tested and analyzed properly so that our work can make our customer's easily accessible and uphold its benefit and safety.

Environmental Ethics: This project will not bring any harmful impact on our environment. During our project we won't use any component which has the potential to harm the human, animals or the overall environment. Moreover, there is no kind of biological, chemical or flammable substance that will be used for this project.

9.4 Conclusion

Lasty, the proposed project will have to be implemented and made available at an affordable cost. As we are going to implement the designing portion of our project from next semester, we will pledge to uphold the highest ethical and professional standards and acknowledge responsibility for making decisions that affect the public safety, health and wellbeing.

Chapter 10: Conclusion and Future Work.

10.1 Project summary/Conclusion:

This project describes an gps/gsm based industrial security system developed with Arduino and fingerprint sensor. To find the optimal solution we had to go for multiple solutions. Also we found limitations of our project. In our security system, for two systems we will use both Arduino uno and for cloud based system and smart security system(optimal), we will use Arduino Mega, cause we need to use more pins for cloud based system and optimal system. Instead of a biometric security system we used an analog security system. For the alarm system we used a buzzer. In the smart security system we used a virtual monitoring system. In the very next semester we will conduct hardware implementation according to our observation as we have already implemented it on a small scale. Hope it will give us the desired result in terms of cost efficiency and effectiveness.

10.2 Future work:

There is a lot of potential to develop an anti-theft system based on buyers/customers requirements. We can add many features and increase security levels. Face recognition sensing system, voice recognition sensing system and video security system can enrich our anti-theft system.

Chapter 11: Identification of Complex Engineering Problems and Activities.

11.1: Identify the attribute of complex engineering problem:

	Attributes	**Put tick (√) as appropriate**
P1	Depth of knowledge required	✓
P2	Range of conflicting requirements	
P3	Depth of analysis required	✓
P4	Familiarity of issues	✓
P5	Extent of applicable codes	✓
P6	Extent of stakeholder involvement and needs	✓

P7	Interdependence	✓

11.2: Reasoning how the project address selected attribute

This project requires a depth of knowledge of cloud based system which is now a rapidly increasing sector that is contributing to the industrial economy. There is no conflict between the key requirements of our proposed system Dept of analysis must require as we analyze multiple ways to come up with the final solution for this project. Many projects have been done related to the project so there are available similarities that can be found in many articles. we follow IEEE and IEC/Iso standards for this project and the components we use follow the same way which is already discussed in the applicable standard and codes section.

11.3 Identify the attribute of complex engineering activities:

	Attributes	**Put tick (√) as appropriate**
A1	Range of resource	✓
A2	Level of interaction	✓
A3	Innovation	
A4	Consequences for society and the environment	✓
A5	Familiarity	✓

11.4 Reasoning how the project address selected attribute

We have considered a lot of resources like research papers, hardware components to establish this project. We have to interact deeply to make this project output more appropriate. Though interacting in lockdown was very hard, we managed it in the google meet to meet our desired output. If we talk about innovation there is no further new task in this project. We had just integrated some problem solutions into one design and tried to develop it. Moreover, this project doesn't have any direct consequences on society and the environment. This project isn't very innovative and unfamiliar in our society but by integrating some extra features in it has made this design more effective.

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1-5Department of Information Technology Technology, College of Information Technology and Computing University of Science and Technology of Southern Philippines Philippines.
C.M. Recto Avenue, Lapasan, Cagayan de Oro City, 9000 Philippines

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Appendix

Logbook

Date/Time/Place	Attendance	Summary of Meeting Minutes	Responsible	Comment by ATC
Date: 03.02.2022	1. Ahnaf 2.Amirul 3.Minhaz 4.Tasriqul 5.Nayel	Discussion about implementation of prototype		.
Date: 10.02.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tasriqul 5.Nayel	ATC meeting Progress flow... Prototype implementation		
Date: 14.02.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tasriqul	ATC meeting 1.Problem finds out regarding fingerprint sensor.		Find out appropriate background and literature review with reference

	5.Nayel			
Date: 20.02.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tasriqul 5.Nayel	1.Discuss about extra power supply,		
Date: 25.02.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tasriqul 5.Nayel	ATC meeting Build prototype, GPS/GSM implementation. 2. facing a problem implementing the GPS/GSM module.		
Date: 02.03.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tasriqul 5.Nayel	ATC meeting 1.need to collect industrial data 2.GPS/GSM problem discussed and asked to be solved		Work with the given task individually.

Date 09.03.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tasriqul 5.Nayel	1. Problem facing with Coding. 2. Gsm module compile error		
14.03.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tasriqul 5.Nayel	ATC Meeting 1. implemented solution testing 2. progress presentation.		1. Prepare slide for presentation
21.03.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tariqul 5.Nayel	ATC meeting 1. slide modification Discus C09, CO10 to evaluate the progress.	Prepare for presentation.	1. need to submit progress slide
22.03.2022		Progress presentation.		

08.04.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tariqul 5.Nayel	ATC Meeting 1. report progress		1. Evaluate C013 for ethical consideration.
13.04.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tariqul 5.Nayel	ATC Meeting 1. finalize coding problem. 2. Update final report		Submit a Draft report of final project report within
24.04.2022	1.Ahnaf 2.Amirul 3.Minhaz 4.Tariqul 5.Nayel	1. Finalize design and develop the solution 2. progressing on report		

Related code/theory:

https://drive.google.com/drive/folders/16szgYhgNBR4n7hD1z6wN-IQEVJoylrO8?fbclid=IwAR2z9HUPkTf7Axf1_oTtuOZ7a5gDzhAGq4NgpYmvledSjTZZDcsaY_yyvwQ