Advanced Biometric Security System For Public Transport

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This Report Presented in Partial Fulfillment of the Requirements for the Degree
Of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project/internship titled **"Advanced biometric Security system for Public Transport"**, submitted by Samiul Haque, Md. Shamim Imtiaz Rakin And Nargis Akhter Mim, ID No: 161-15-7403, 161-15-7278 And 161-15-7183 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 31-05-2021.
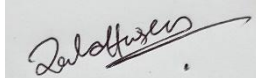
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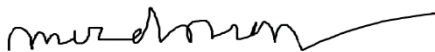Faculty of Science & Information Technology
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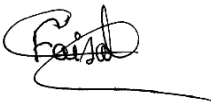
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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Fahad Faisal, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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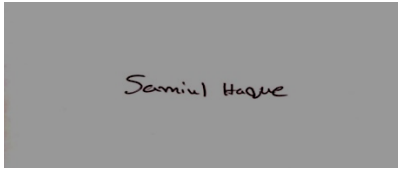
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Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

We have built an IOT device, which would digitalize the Bus with an advanced security system. Bus is one of the most used vehicles in Bangladesh. Almost 65% of the road in Bangladesh is occupied with bus. So, for a common bus user, bus's safety is the first priority. Almost every day, there's tons of bus accident. That's why we've made a Biometric security system in public transport. We've developed a device, through which user (bus driver) has only access to fuel supply to main engine. Only the driver has the control to switch on bus and no other person can use it. I believe that, this project would be a revolution in advancing public security system.

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Introduction

1.1Introduction:

Internet of Things is one of the most used technology in modern times. It is a concept, where you can turn any object, a smart object with connecting the object with internet. IOT is a new concept & now it is being used broadly all over the world. We've developed a project, where a Bus will be connected with biometric system. This IOT project will secure the bus from unwanted drivers as well as we can secure buses from stole.

Internet of Things is expected to develop communication between human to machine as well as machine to machine. The main objective of our project is to design and implement such a security system that offers controllability through a fingerprint sensor for vehicle engine by means of IOT.

The internet of things is the network of physical objects installed with electronics software, many types of sensors and connection to get a much better value and services by exchanging data with users or machine. Each thing is very unique in many ways through its computing system but can inter-relate within the existing internet configuration. It will due to offer better connectivity of devices, systems and user services.

1.2 Motivation:

Today's world cities have many public transportation systems. Most of common people in cities and rural areas uses bus to travel here and there. However, for some unwanted person, so many accidents are occurring all over the world.
Therefore, we have taken this project to make our road safe from those people who are not qualified for driving bus or many other public vehicles. In future, it will prevent stealing from many people.

Bus is one of the most used vehicles in Bangladesh. Almost 65% of the road in Bangladesh is occupied with public transport. So, for a common public transport

user, people's safety is the first priority. Almost every day, there's tons of bus faces accident. That is because of unwanted person like inexperience bus drivers or their helpers drives buses often. That's why, we've made a Biometric security system in public transport. We've developed a device, through which selected person can control their accessibility. As many as 6686 people died and more than 8600 were injured in total of 4891 road accidents that occurs in Bangladesh in recent year. Most of the causes are for inexperience and unprofessional drivers in the road.

In recent year, two school going children had died because of an unqualified driver in the driving seat. A very large movement from students and all other working class people joined and stood up for "Road safety". These events gave us the motivation to do something for the public transports in Bangladesh and make our roads safer than any other time. We have to save as many lives as we can by doing small little things like our project can be very effective.

1.3 Objectives:

The main objectives of our project are:

- Only selected user can access the control: Our main objective is that who are only assigned for driving vehicles, only he can access the device and fueling system. If the device does not read the user, it will not work.
- User can on switch off the device: There is a switch off device that will stop the system to shut down. Only the user can access that system.
- User only can switch on engine through the device: There is process which only the user can access to switch on the engine.
- Decrease the number of road accident: Our device is now built only to minimize as much as road accident which are created by the unqualified and under aged drivers.
- Road Safety Movement: From the road safety movement from Bangladesh students, we had learned how much is important to make our roads safe for the future. We want to contribute our small but effective work for those people.

1.4 Expected outcome:

This device will be connected in the engine. So, no one can bypass the system to steal the device. Now to start the engine, we need finger print from specific person in order to switching on engine.

When the user put his fingerprint in the scanner, it should read whether that person eligible or not. If he is eligible, fuel from the fuel tank should be moved to engine by our device.

If not eligible, the device will not work. It will display that the user is not verified through our device.

1.5 Report Layout:

- Introduction
- Background Analysis
- Requirement specification
- System Design and implementation
- Testing and discussion
- Conclusion and future scope
- Appendix
- References

CHAPTER 2

BACKGROUND ANALYSIS

2.1Introduction:

IOT makes connection between objects with Internet. Here single or multiple objects are inter-connected with each other with the help of internet. IOT is now being briefly used in home security, office & home appliance, business office & industries etc.

This project is mainly focused on transport security sector. A 2-way connection between vehicle and bus driver. Though it is focused on bus security, but in can be implemented on other transport security too.

This project is designed for IOT based connection with bus. The main module gets the fingerprint of the bus driver. The module will work according to user's instruction.

2.2 Comparative Studies:

We didn't have much knowledge about micro-controllers. So the basic and advance use of Arduino had to re-study and gather knowledge, Finger print sensors & concepts from online learning platforms and different articles. Again I had to learn about the bus's engine and fuel system to install our device in the bus. [1]

From many reports from various sources, we came to know about how the security system works in vehicles. From researching those papers, we know, if we can build a device by using fingerprint sensor, it is useful for secure vehicles and provide access only to authorize users automatically. Users are allowed to register into the system first by fingerprint scanner. After enrollment, the system will check every time if the user is registered or not. In this mode, the system will pay continued close attention for those user's fingerprints. [2]

From other studies, we came to know that a single channel relay module can work as a switch for our project.

Many other people worked on same type of projects but not like ours. That mostly because public transport is not that important or valuable to people. But we think if we maintain our security system, people's life will be more valuable than other things. [3][4]

In the last recent years, important research efforts have been conducted to study the vulnerabilities of biometric systems to direct attacks to the sensor such as gummy fingers or high quality iris printed images. It has surpassed the scientific field to make this security less vulnerable and different standardization initiatives at international level have been working on this security. Some important actions have been taken for all this direct attacks carried out against fingerprint recognition system. [5]

Many different liveness detection algorithms have been proposed for traits fingerprints and it can be divided into two categories:

- Software- based: In this case fake traits are detected when the sample has been collected with a standard sensor. It can make use of static features which can detect from multiple image frames.
- Hardware-base: This system is much more expensive. Some specific devices are added to the sensor in order to detect particular fault of a living traits. It can detect blood pressure, the odor or the pupil hippos. [13]

There are so many ups and downs for a security system. We have learnt so much after studying different papers of different works. Fingerprint sensor is much more easy than any other system. It is very cheaply cost and easy to use.

2.3 Scopes:

There are huge future scopes for our project. At this moment we are concentrating on the project which is only works with the bus. But in future, it can be developed for car and other vehicles too.

Our project is also useful preventing from stealing. Our system will provide the security that a thief cannot get access of full vehicle if he has the key. It can also work for cars, bikes.

2.4 Challenges

The challenges are:

- Required devices are very costly. We did not find such devices that are required, so we had to buy cheap ones from different places.

- Cheap devices are often show false result or cannot get input sometimes.

- We had to study many different papers, articles and study about the device requirements, there working procedure.

- Our device depends on voltage. If it gets low voltage it will stop working. That is why we needed to create a system to keep our device in same voltage of 12V.

- If voltage gets higher than 12V, it will fire the module and our project will be finished.

- For covid situation, it was hard to get the required devices in time.

- We did not know how much power it needed to get the fuel from fuel tank to engine. We needed more powerful pump for future real life implementation.

- Space in the engine and its outside is very little. So that we had to find out how to implant the device and keep it safe.

CHAPTER 3

REQUIRMENT SPECIFICATION

3.1 Business process model:

Before implanting our device in the bus system, we had to make a model. This model (Figure 3.1) will show the basic steps how the device function is working. At the start, there is no fingerprint enrolled in the fingerprint sensor. It will ask for fingerprint to enroll. Our fingerprint sensor will store users fingerprint in its memory. When the user wants to access our device, it will verify if the fingerprint stored in the memory or not according to its command. If it finds the verified fingerprint, the device will start.
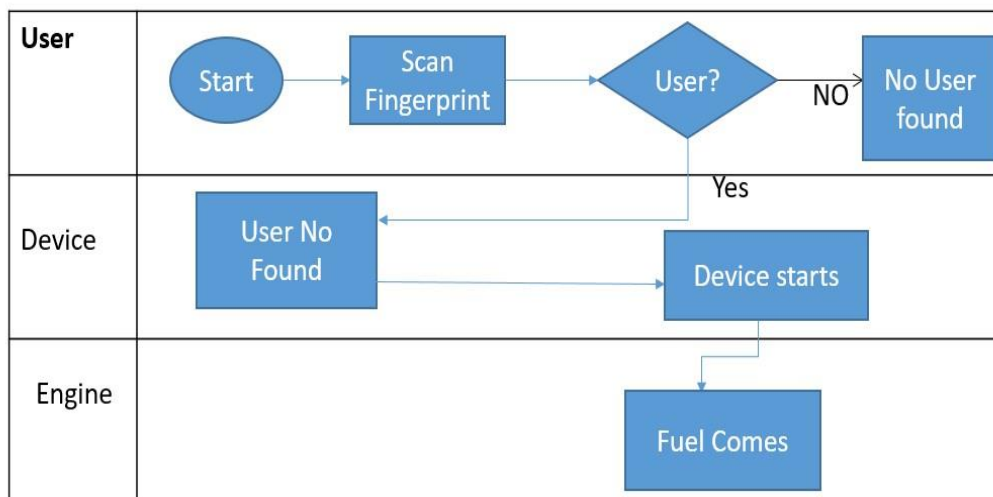

Figure 3.1: Business process Model

The device will be attached with bus's engine system. User will control the device with relay module. User will give instruction; the device will receive the instruction through Fingerprint sensor according to that instruction (fig 3.1).

3.2 Use-case Modeling and description

This is our project's use-case model. Here is showing how human to machine communication is connected through the device.
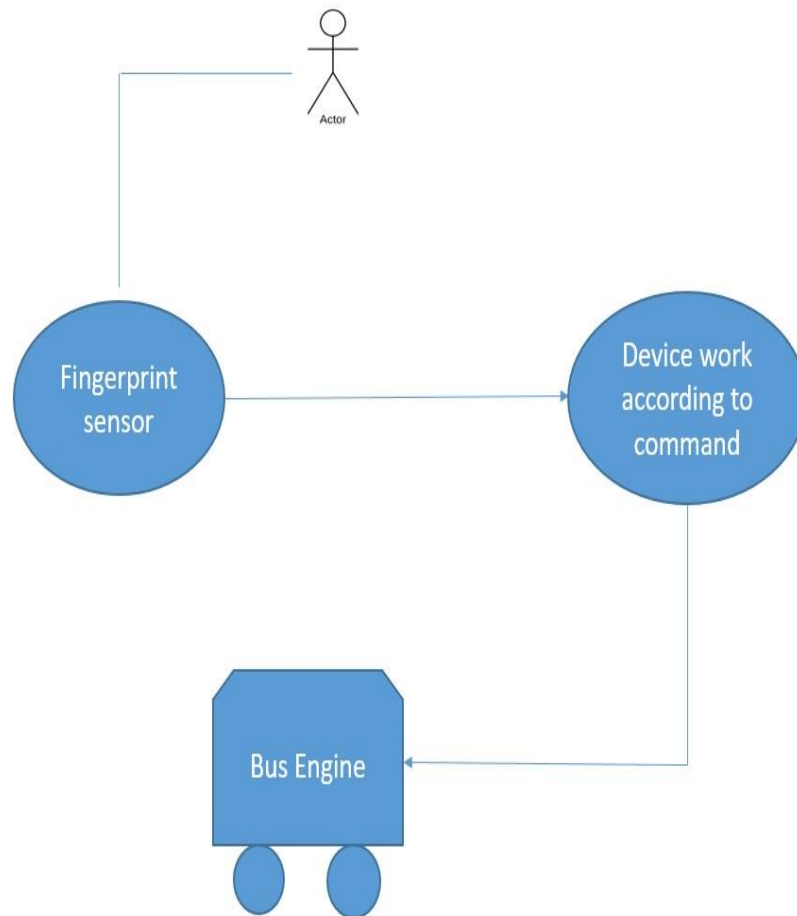

Figure 3.2: Use-case Modeling

Here (figure 3.2) user's fingerprint sensor will work as a command transmitter module and the device will work as a command receiver module. From the figure 3.2, we can see that the device mainly connected with the user. User fingerprint is must needed. When the system verified the fingerprint from the user it will start the relay module. Here relay module is working as switch. As the device was commanded, after verifying fingerprint, pumping of fuel will start. Then the engine will start and start moving the vehicle.

3.3 Requirement Collection and Analysis:

I had to use many electrical components to build this device. List of components:

- Arduino Uno

- 1 channel 12v relay module

- Fingerprint reader optical

- Cables

- DC power source

- R385 Diaphragm pump

- Small pipe

- Step-down booster

- Voltage Stabilizer

3.3.1 Arduino UNO:

Arduino Uno is a controller unit, which is used for IOT based projects most of the time. It is a programmable micro-controller unit. We used 1 piece Arduino UNO for our project.

Figure 3.3.1: Arduino UNO [6]

3.3.2: Single channel Relay Module:

Single channel relay module is a module with a single working relay system. A relay is a module, which is basically a switch, used for programmable boards. We used this 1 channel 12V relay module to control the bus's engine system on and off.
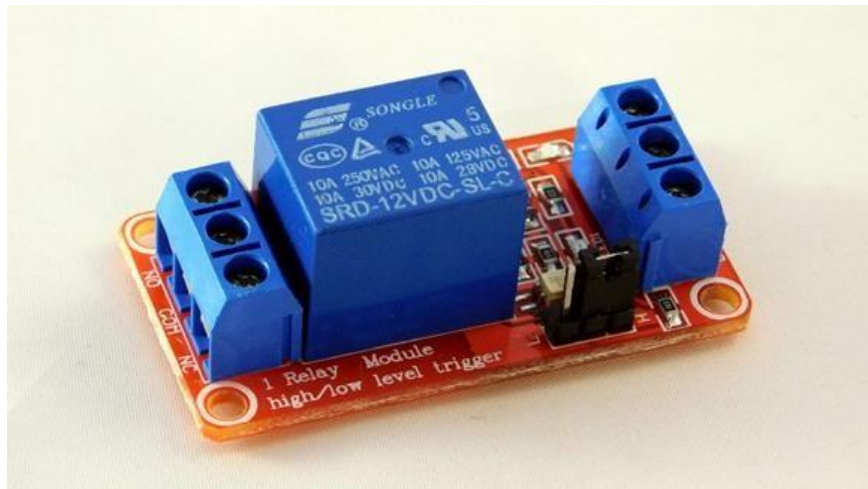

Figure 3.3.2: Single channel Relay Module [7]

3.3.3: Finger Print Optical:

This all-in-one optical fingerprint sensor will make adding fingerprint detection and verification super simple. These modules are typically used in safes - there's a high powered DSP chip that does the image rendering, calculation, feature-finding and searching. Connect to any microcontroller or system. There's a red LED in the lens that lights up during a photo so you know it's working.

Figure 3.3.3: Fingerprint Reader Optical

3.3.4: Jumper Wire:

These are the most used wires for DIY projects. We used multiple cables to build the project.

Figure 3.3.4: Jumper Wire [8]

3.3.5 DC power source:

When we apply our project in bus, we will connect our project with the bus power system.

Figure 3.3.5: Power Adapter

We connected with adapter in our project. The device will connect with bus battery to run the pump.

3.3.6: Fuel

We used water to show it as fuel in the engine. It will also work for other fuels like Octane, Diesel etc.

3.3.7: R385 diaphragm pump

To move the fuel from tank to engine we will need a strong pump. For demo we have used a small pump in our project.

Figure 3.3.7: R385 diaphragm pump [9]

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3.3.8: Small Pipe:

We used pipe for move the fuel from fuel tank to engine.

Figure 3.3.8: Small pipe [10]

3.3.9: Step Down Booster:

When we implement this device in the bus, voltage might get higher more than we are giving.
Speed of the vehicle may change voltage of battery. It will stop our device working as it was designed and engine will not get continuous fuel.
That is why we will include step down booster in the device when applying it in real life.

Figure 3.3.9: Step Down Booster [11]

3.3.10: Voltage stabilizer:

Voltage can change many times. It will hamper, sometimes destroy our device. That is why we will also include voltage stabilizer with device.

Figure 3.3.10: Voltage Stabilizer [12]

If the voltage is more than 12V, the circuits will burn and the full system will off. If the voltage is lower than 12V, our system will not get enough power to start the pump. That is why we need this voltage stabilizer,

Chapter 4

SYSTEM DESIGN AND IMPLEMENTATION

4.1: Front-End design:

4.1.1: Setup Finger prints:

To setup the system, first we need to scan person's finger print by the fingerprint sensor optical. It will store that specific person's fingerprint according to its command.

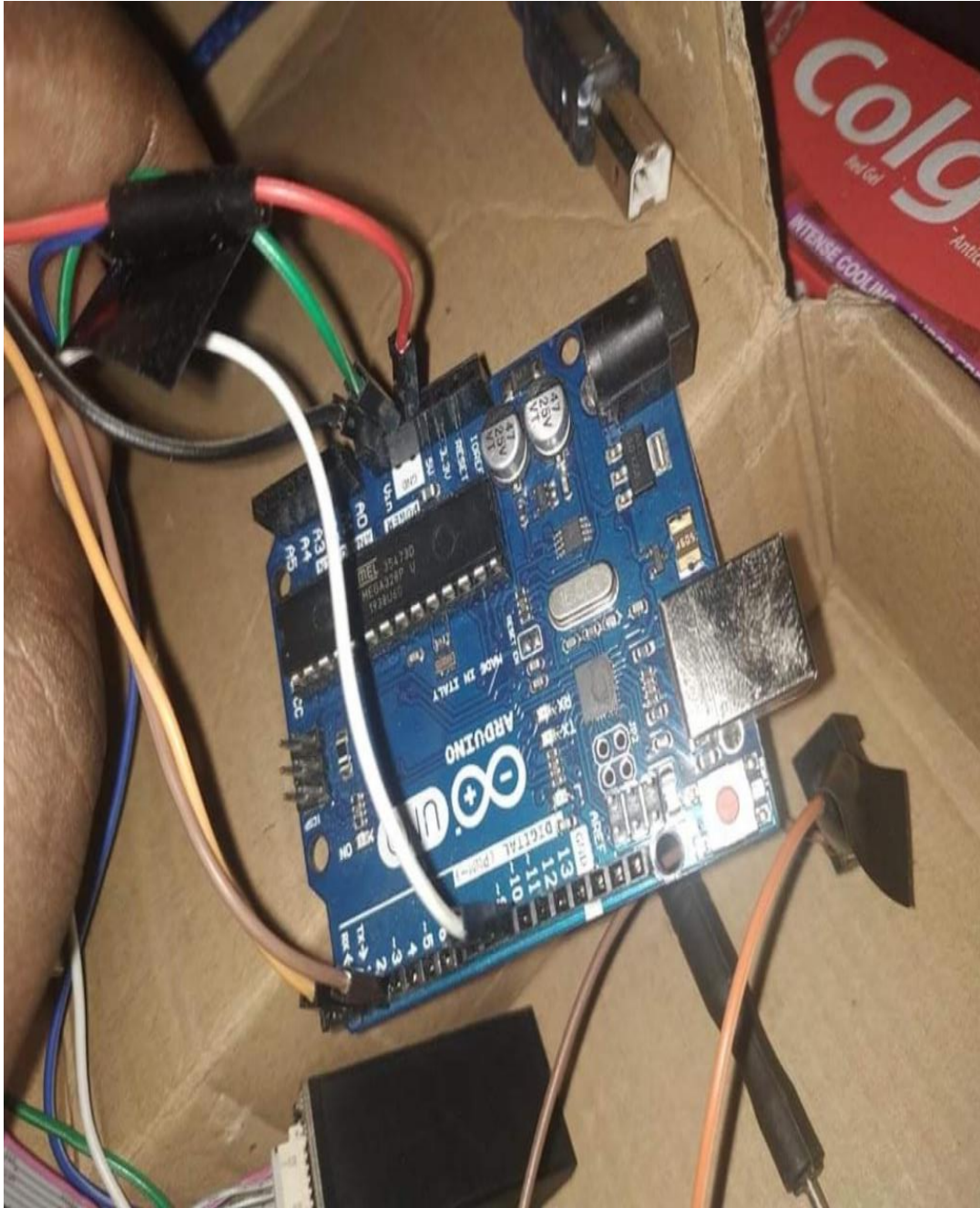Figure 4.1.1: Fingerprint scanner with Arduino

Figure 4.1.2: Connection of Fingerprint sensor and Arduino

Pin no 2 and 3 can be configured to trigger an interrupt on a low value, a rising or falling edge or a change in value. We have setup the fingerprint sensor with the Arduino. Firstly, we used wires in the pin no 2 and 3 of Arduino board with the fingerprint sensor. Other wire of fingerprint sensor connected with ground. Pin no 2 was used for inputting fingerprints from the sensor. It will transmit fingerprint to Arduino. Pin no 3 was used for output from Arduino. As is shown on figure 4.1.2

Pin no 10 can provide 8-bit PWM output with analogWrite () function. Relay Module wires is connected in pin no 10 and ground. Pin no 10 is the output of the result that had given in input by the fingerprint sensor. Figure 4.1.3 it has shown the connection of relay module with Arduino.
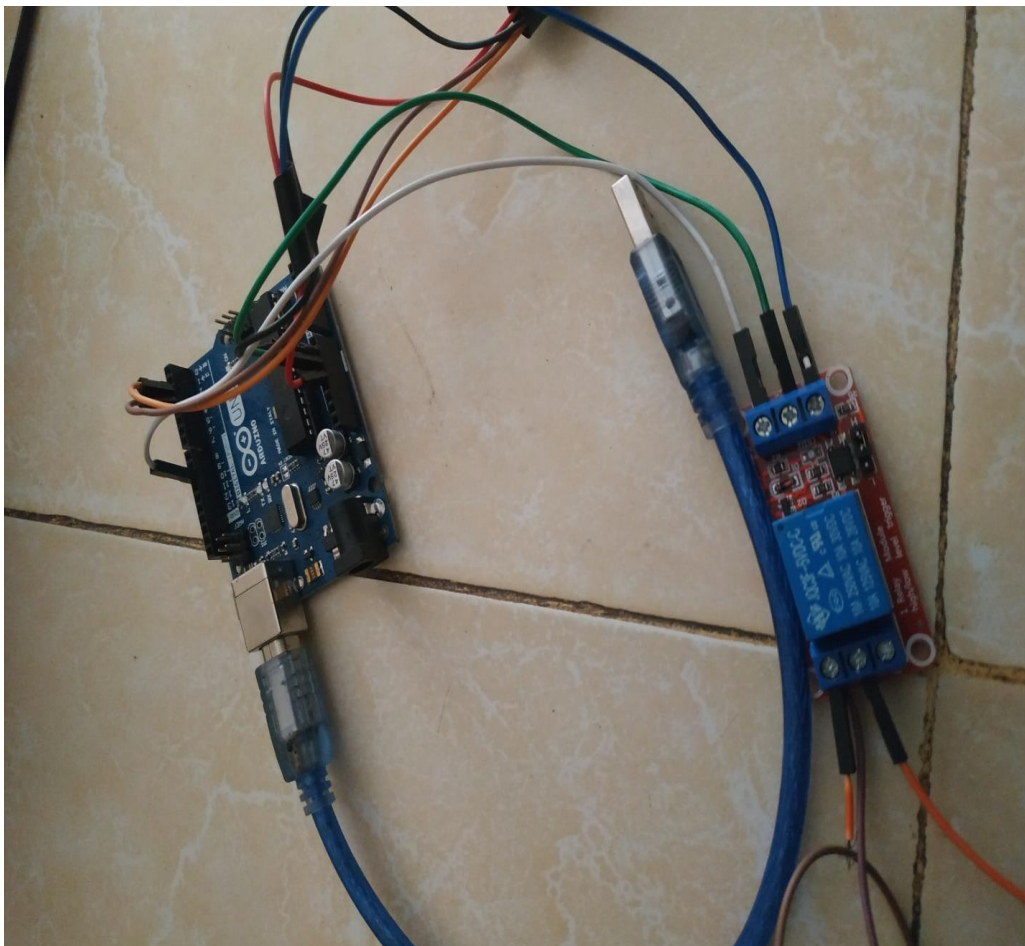

Figure 4.1.3: Connection between relay module and Arduino

Pump was connected with the relay module plus and minus point.

Figure 4.1.4: Connection between pump and relay module

4.1.2: Starting Pump:

When fingerprint scanner verified users fingerprint, relay module will start the pump. The pump will move the fuel from fuel tank to engine.

Figure 4.1.5: Full system with pump

4.2: Back-End design:

4.2.1: Creating Project:

Figure no 4.2.1 is showing that the system had already stored some verified fingerprint. All the person in the list are selected and already given one specific ID number.


```
void loop(){
//  displayMainScreen();
  fingerprintID = getFingerprintIDez();
  delay(50);
  if(fingerprintID == 1 ){
    IDname = "Fardin";
    //displayUserGreeting(IDname);
    Serial.println("Id Verified, Fardin");
    digitalWrite(pinOut, HIGH);
  }
  else if(fingerprintID == 2){
    IDname = "Rakin";
    //displayUserGreeting(IDname);
    Serial.println("Id Verified, Rakin");
    digitalWrite(pinOut, HIGH);
  }
  else if(fingerprintID == 5){
    IDname = "Nitol";
    //displayUserGreeting(IDname);
    Serial.println("Id Verified, Nitol");
    digitalWrite(pinOut, HIGH);
  }

  }
```

Figure 4.2.1: Scanning fingerprint

Chapter 5

Testing and Discussion

5.1: Test results:

When we run the code, the system will ask for fingerprint. If fingerprint cannot be found, the system will give notification that it "did not find fingerprint sensor".

When it found specific fingerprint it will show "ID Verified" and show the name and id number (Fig 4.2.1).
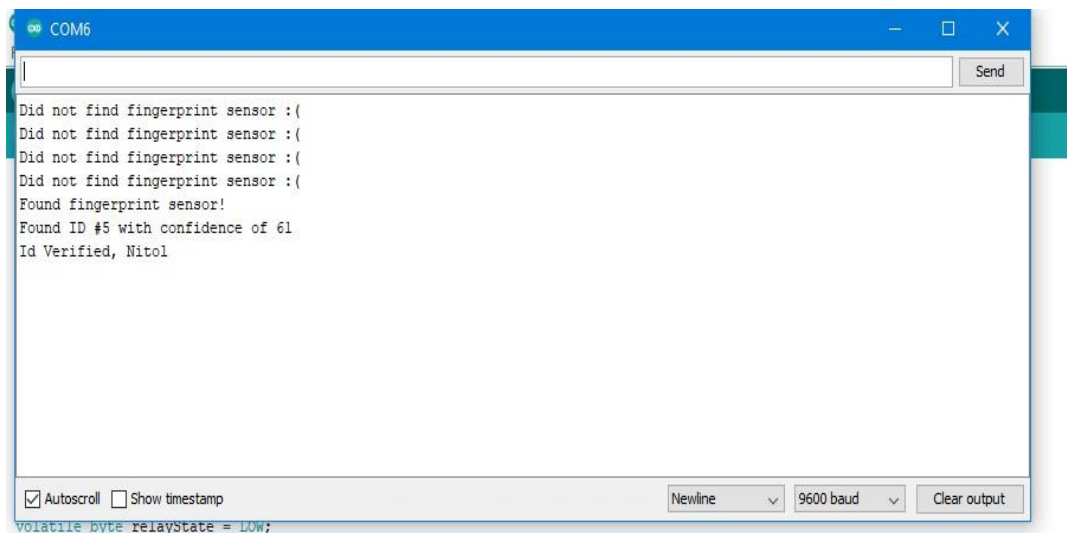
Table:

Fingerprint Reading	If no fingerprint added	Asks for fingerprint
Fingerprint Reading	No matching fingerprint found	Did not find fingerprint sensor
Fingerprint Reading	If matching fingerprint found	Found fingerprint sensor Display: Name and ID
Switch OFF	Off	Off

TABLE 5.1: TEST RESULTS

5.2: Final Output:

After testing all the fingerprints that were given, it will show results as given below:

Figure 5.1: Output Result

When the scanner reads fingerprint, it will command the relay module and start the pump (shown in the video link above). The pump will then pump up the fuel from the fuel tank and move it to engine. Then the engine will start. It will only start with verified person like driver.

Figure 5.2: Device pumping fuel

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We can see in the figure that the system worked as it was setup. When the fingerprint sensor verified our fingerprint, it switched on the relay module. The relay module started the pump pumping fuel from the red jar to the bottle. It confirmed that our device was working as we commanded.

5.3: Future scope:

For the future this system can be change more digital and modern way. We will develop this project by adjusting GPS system with vehicle.

We will create a database for the driver's information, phone number, license number etc. in software.

We are also looking forward to implementing tracking device. If any other accident happens to vehicle, we will get the location of that bus.

APPENDIX

APPENDIX-A

List of components and basic user of item:

Arduino UNO

Single Channel 12v Relay Module: We use as control the switching system

Fingerprint scanner optical: For scanning fingerprint

Pump: For moving the fuel from fuel tank to engine.

Step down booster: To maintain voltage for our device

Voltage stabilizer: To keep our device from burning because of voltage.

Reference:

[1]   IFSECglobal.com available at <<https://www.ifsecglobal.com/global/biometricsecurity-systems-guide-devices-fingerprint-scanners-facial-recognition/>> last accessed on 10 April,2021 at 6PM

[2]   Ms. Shraddha S. Giradkar, and Dr. N. K. Choudhari "A survey paper on Various biometric security system methods" International Research Journal of Engineering and Technology (IRJET), Maharashtra, India, 02 February, 2016

[3]   Nevonprojects.com, available at <https://nevonprojects.com/fingerprint-basedsecurity-system/>>last accessed on 10 April,2021 at 5PM

[4]   Debajyoti Mukhopaddhyay, Megha Gupta, Tahesin Attar, Prajakta Chavan, and Vidhi Patel, "An Attempt to Develop an IOT based Vehicle Security System" 2018 IEEE International Symposium on Smart Electronic Systems (iSES) (Formerly iNiS), Mumbai, India, 23 July 2019.

[5]   Yeong Gon Kim, Kwang Yong Shin, Eui Chul Lee, and Kang Ryoung Park "Multimodal Biometric System Based on the Recognition of Face and Both Irises", International Journal of Advanced Robotic Systems, Renison University College, 20 Jun 2012

[6]   Wikpedia.com ,available at https://en.wikipedia.org/wiki/Arduino_Uno last accessed on 30 April,2021at 6PM

[7]   Netigo.eu, available at <<https://nettigo.eu/products/relay-module-1-channel-12v >> last accessed on 30 April, 2021 at 6PM

[8]   Uk.rs-online.com, available at <https://uk.rs-online.com/web/p/breadboard-jumperwire-kits/7916454/>> last accessed on 30 April, 2021 at 6:10PM

[9]   Elecrow.com, available at <<https://www.elecrow.com/6-12v-r385-dc-diaphragmpumps.html>> last accessed on 30 April,2021 at 6:15PM

[10]   Screwfix.com, available at <<https://www.screwfix.com/p/mdpe-pipe-blue-25mm-x-50m/19606>> last accessed on 30 April, 2021 at 6:15PM

[11]   Circuit.rocks, available at <<https://circuit.rocks/dc-dc-buck-step-down-5axl4005.html>> last accessed on 30 April, 2021 at 6:20PM

[12]   Alibaba.com, available at <<https://www.alibaba.com/product-detail/VoltageRegulator-DC-DC-Voltage-Stabilizer_1600056896433.html>> last accessed on 30 April, 2021 at 6:22PM

[13]   J. Galbally, F. Alonso-Fernandez, J. Fierrez, and J. Ortega-Garcia, "A high performance fingerprint liveness detection method based on quality related features," Future Generate. Compute. Syst., vol. 28, no. 1, 2012.

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BIOMETRIC SYSTEM IN PUBLIC TRANSPORT BY Samiul Haque ID:161-15-7403 Shamim Imtiaz Rakin ID:161-15-7278 Nargis Akther Mim ID: 161-15-7183 This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering Supervised By Fahad Faisal Assistant Professor Department of CSE Daffodil International University DAFFODIL INTERNATIONAL UNIVERSITY DHAKA, BANGLADESH ACKNOWLEDGEMENT First we express our heartiest thanks and gratefulness to almighty Allah for His divine blessing makes us possible to complete the final year project/internship successfully. We are really grateful to Fahad Faisal, Assistant Professor, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of "IOT-Internet of Things" to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project. We would like to express our heartiest gratitude to Dr. Touhid Bhaiya, Professor, and Head, Department of CSE, for his kind help to finish our project and also to other faculty member and the staff of CSE department of Daffodil International University. We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work. Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT We have built an IOT device, which would digitalize the Bus with an advanced security system. Bus is one of the most used vehicles in Bangladesh. Almost 65% of the road in Bangladesh is occupied with bus. So, for a common bus user, bus's safety is the first priority. Almost every day, there's tons of bus accident. That's why we've made a Biometric security system in public transport. We've developed a device, through which user (bus driver) has only access to fuel supply to main engine. Only the driver has the control to switch on bus and no other person can use it. I believe that, this project would be a revolution in advancing public security system.

Chapter 1 Introduction 1.1 Introduction: Internet of Things is one of the most used technology in modern times. It is a c concept, where you can turn any object, a smart object with connecting the object with internet. IOT is a new concept & now it is being used broadly all over the world. We've developed a project, where a Bus will be connected with biometric system. This IOT project will secure the bus from unwanted drivers as well as we can secure buses from stole. Internet of Things is expected to develop human to machine communication as well as machine to machine. The main objective of our project to design and implement such a security system that offers controllability through a fingerprint sensor for vehicle engine by means of IOT. The internet of things is the network of physical objects installed with electronics software, many types of sensors and connection to get a much better value and services by exchanging data with users or machine. Each thing is very unique in many ways through its computing system but can inter-relate within the existing internet configuration. It will due to offer better connectivity of devices, systems and user services. 1.2 Motivation: Today's world cities have many public transportation systems. Most of common people in cities and rural areas people uses bus to travel here and there. However, for some unwanted person, so many accidents are occurring all over the world. Therefore, we have taken this project to make our

road safe from those people who are not qualified for driving bus or many other public vehicles. In future, it will prevent stealing from many people. 1 Bus is one of the most used vehicles in Bangladesh. Almost 65% of the road in Bangladesh is occupied with public transport. So, for a common public transport user, people's safety is the first priority. Almost every day, there's tons of bus faces accident. That is because of unwanted person like inexperience bus driver or their helpers drives buses often. That's why we've made a Biometric security system in public transport. we've developed a device, through which can control their accessibility. As many as 6686 people died and more than 8600 were injured in total of 4891 road accidents that occurs in Bangladesh in recent year. Most of the cause are for inexperience and unprofessional drivers in the road. In recent year, two school going children had died because of an unqualified driver in the driving seat. A very large movement from students and all other working class people joined and stood up for "Road safety". These events gave us the motivation to do something for the public transports in Bangladesh and make our roads safer than any other time. We have to save as many lives as we can from doing small little things. 1.3 Objectives: The main objectives of this project are: • Only selected user can access the control: Our main objective is that who are only assigned for driving vehicles, only he can access the device and fueling system. If the device does not read the user, it will not work. • User can on switch off the device: There is a switch off device that will stop the system to shut down. Only the user can access that system. • User only can switch on engine through the device: There is process which only the user can access to switch on the engine. • Down the number of road accident: Our device is now built only to minimize as much as road accident which are created by the unqualified and under aged drivers. 2 • Road Safety Movement: From the road safety movement from Bangladesh students, we had learned how much is important to make our roads safe for the future. We want to contribute our small but effective work for those people. 1.4 Expected outcome: This device will be connected in the engine. So, no one can bypass the system to steal the device. Now to start the engine, we need finger print from specific person in order to switching on engine. When the user put his fingerprint in the scanner, it should read whether that person eligible or not. If he is eligible, fuel from the fuel tank should be moved to engine by our device. If not eligible, the device will not work. It will display that the user is not verified through our device. 1.5 Report Layout: • Introduction • Background Analysis • Requirement specification • System Design and implementation • Testing and discussion • Conclusion and future scope • Appendix • References 3 CHAPTER 2 BACKGROUND ANALYSIS 2.1 Introduction: IOT makes connection between objects with Internet. Here single or multiple objects are inter-connected with each other with the help of internet. IOT is now being briefly used in home security, office & home appliance, business office & industries etc. This project is mainly focused on transport security sector. A 2-way connection between vehicle and bus driver. Though it is focused on bus security, but in can be implemented on other transport security too. This project is designed for IOT based connection with bus. The main module gets the fingerprint of the bus driver. The module will work according to user's instruction. 2.2 Comparative Studies: We didn't have much knowledge about micro-controllers. So the basic and advance use of Arduino had to re-study and gather knowledge, Finger print sensors & concepts from online learning platforms and different articles. Again I had to learn about the bus's engine and fuel system to install our device in the bus. From many reports from various sources, we came to know about how the security system works in vehicles. From researching those papers, we know, if we can build a device by fingerprint sensor, it is useful for secure vehicles and provide access only to authorize users automatically. Users are allowed to register into the system first by fingerprint scanner. After enrollment, the system will check every time if the user is registered or not. In this mode, the system will pay continued close attention for those user's fingerprints. 4 From other studies, we get to know that a single channel relay module can work as a switch for our project. Many other people worked on same type of projects but not like ours. That mostly because public transport is not that important or valuable to people. But we think if we maintain our security system, people's life will be more valuable than other things. In the last recent year's important research efforts have been conducted to study the vulnerabilities of biometric systems to direct attacks to the sensor such as gummy fingers or high quality iris printed images. It has surpassed the scientific field to make this security less vulnerable and different standardization initiatives at international level have been working on this security. Some important action has been taken for all this direct attacks carried out against fingerprint recognition system. Many different liveness detection algorithms have been proposed for traits fingerprints and it can be divided into two categories: • Software- based: In this case fake traits are detected when the sample has been collected with a standard sensor. It can make use of static features which can detect from multiple image frames. • Hardware-base: This system is much more expensive. Some specific devices are added to the sensor in order to detect particular fault of a living traits. It can detect blood pressure, the odor or the pupil hippos. There are so many ups and downs for a security system. We have learnt so much after studying different papers of different works. Fingerprint sensor is much more easy than any other system. It is very cheaply cost and easy to use. 2.3 Scopes: There is huge future scope in this project. At this moment we are concentrating on the project which is only works with the bus. But in future, it can be developed for car and other vehicles too. 5 Our project is also useful preventing from stealing. Our system will provide the security that a thief cannot get access of full vehicle if he has the key. It can also work for cars, bikes. 2.4 Challenges: The challenges are: • Required devices are very costly. We did not find devices that are required, so we have to buy cheap ones from different places. • Cheap devices are often show false result or cannot get input sometimes. • We have to study many different papers, articles and study about the device requirements, there working procedure. • Our device depends on voltage. If it gets low voltage it will stop working. That is why we needed to create a system to keep our device in same voltage of 12V. • If voltage gets higher than 12V, it will fire the module and our project will be finished. • For covid situation, it was hard to get the required devices in time. • We did not know how much power it needed to get the fuel from fuel tank to engine. We needed more powerful pump for future real life implementation. • Space in the engine and its outside is very little. So that we had to find out how to implant the device and keep it safe. 6 CHAPTER 3 REQUIRMENT SPECIFICATION 3.1 Business process model: Figure 3.1: Business process Model The device will be attached with bus's engine system. User will control the device with relay module. User will give instruction; the device will receive the instruction through Fingerprint sensor according to that instruction (fig 3.1). 7 3.2 Use-case Modeling and description Figure 3.2: Use-case Modeling Here (figure 3.2) user's fingerprint sensor will work as a command transmitter module and the device will work as a command receiver module. From the figure 3.2, we can see that the device mainly connected with the user. User fingerprint is must needed. When the system verified the fingerprint from the user it will start the relay module. Here relay module is working as switch. As the device was commanded, after verifying fingerprint, pumping of fuel will start. Then the engine will start and start moving the vehicle. 8 3.3 Requirement Collection and Analysis: I had to use many electrical components to build this device. List of components: • Arduino Uno • 1 channel 12v relay module • Fingerprint reader optical • Cables • DC power source • R385 Diaphragm pump • Small pipe • Step-down booster • Voltage Stabilizer 3.3.1 Arduino UNO: Figure 3.3.1: Arduino UNO Arduino Uno is a controller unit, which is used for IOT based projects most of the time. It is a programmable micro-controller unit. We have use 1 piece Arduino UNO for our project. 9 3.3.2: Single channel Relay Module: Figure 3.3.2: Single channel Relay Module Single channel relay module is a module with a single working relay system. A relay is a module, which is basically a switch, used for programmable boards. We have

used this 1 channel 12V relay module to control the bus's engine system. 3.3.3: Finger Print Optical: Figure 3.3.3: Fingerprint Reader Optical 10 This all-in-one optical fingerprint sensor will make adding fingerprint detection and verification super simple. These modules are typically used in safes - there's a high powered DSP chip that does the image rendering, calculation, feature-finding and searching. Connect to any microcontroller or system. There's a red LED in the lens that lights up during a photo so you know it's working. 3.3.4: Jumper Wire: Figure 3.3.4: Jumper Wire These are the most used wires for DIY projects. We have used multiple cables to build the project. 11 3.3.5 DC power source: Figure 3.3.5: Power Adapter We have connected with adapter in our project. The device will connect with bus battery to run the pump. 3.3.6: Fuel We have used water to show it as fuel in the engine. It will also work for other fuels like Octane, Diesel etc. 3.3.7: R385 diaphragm pump Figure 3.3.7: R385 diaphragm pump We used pump to get the fuel into the engine from fuel tank. 12 3.3.8: Small Pipe: Figure 3.3.8: Small pipe We used pipe for move the fuel from fuel tank to engine. 3.3.9: Step Down Booster: When we implement this device in the bus, voltage will be higher that we are giving down. Sometimes speed of the vehicle may change voltage of battery. That is why we will include step down booster in the device when applying it in real life. Figure 3.3.9: Step Down Booster 13 3.3.10: Voltage stabilizer: Voltage can change many times. It will hamper sometimes destroy our device. That is why we will also include voltage stabilizer with device. Figure 3.3.10: Voltage Stabilizer If the voltage is more than 12V, the circuits will burn and the full system will off. If the voltage is lower than 12V, our system will not get enough power to start the pump. That is why we need this voltage stabilizer, 14 Chapter 4 SYSTEM DESIGN AND IMPLEMENTATION 4.1: Front-End design: 4.1.1: Setup Finger prints: To setup the system, first we need to scan person's finger print by the fingerprint sensor optical. It will store that specific person's fingerprint according to its command. Figure 4.1.1: Fingerprint scanner with Arduino 15 Figure 4.1.2: Connection of Fingerprint sensor and Arduino 16 Pin no 2 and 3 can be configured to trigger an interrupt on a low value, a rising or falling edge or a change in value. We have setup the fingerprint sensor with the Arduino. Firstly, we had used wires in the pin no 2 and 3 of Arduino board with the fingerprint sensor. Other wire of fingerprint sensor connected with ground. Pin no 2 was used for inputting fingerprints from the sensor. It will transmit fingerprint to Arduino. Pin no 3 was used for output from Arduino. As is shown on figure 4.1.2 Pin no 10 can provide 8-bit PWM output with analog Write () function. Relay Module wires is connected in pin no 10 and ground. Relay module was connected with the Arduino in pin no 10. It is the output of the result input given in the fingerprint sensor. Figure 4.1.3 it shows the connection. Figure 4.1.3: Connection between relay module and Arduino 17 Pump was connected with the relay module plus and minus point. Figure 4.1.4: Connection between pump and relay module 4.1.2: Starting Pump: When fingerprint scanner verified users fingerprint, relay module will start the pump. The pump will move the fuel from fuel tank to engine. 18 Figure 4.1.5: Full system with pump 4.2: Back-End design: 4.2.1: Creating Project: Figure 4.2.1: Scanning fingerprint 19 Chapter 5 Testing and Discussion 5.1: Test results: When we run the code, the system will ask for fingerprint. If fingerprint cannot be found, the system will give notification that it "did not find fingerprint sensor". Figure 5.1: System verifying fingerprint When it found specific fingerprint it will show "ID Verified" and show the name and id number (Fig 4.2.1). Table: Fingerprint Reading If no fingerprint added Asks for fingerprint Fingerprint Reading No matching fingerprint found Did not find fingerprint sensor Fingerprint Reading If matching fingerprint found Found fingerprint sensor Display: Name and ID Switch OFF Off Off TABLE 5.1: TEST RESULTS 20 5.2: Final Output: After testing all the fingerprints that were given, it will show results as given below: Figure 5.1: Output Result When the scanner reads fingerprint, it will command the relay module and start the pump (shown in the video link above). The pump will then pump up the fuel from the fuel tank and move it to engine. Then the engine will start. It will only start with verified person like driver. 21 Figure 5.2: Device pumping fuel 5.3: Future scope: For the future this system can be change more digital and modern way. We will develop this project by adjusting GPS system with vehicle. We will create a database for the driver's information, phone number, license number etc in software. We are also looking forward to implementing tracking device. If any other accident happens to vehicle, we will get the location of that bus. 22 APPENDIX APPENDIX-A List of components and basic user of item: Arduino UNO Single Channel 12v Relay Module: We use as control the switching system Fingerprint scanner optical: For scanning fingerprint Pump: For moving the fuel from fuel tank to engine. Step down booster: To maintain voltage for our device Voltage stabilizer: To keep our device from burning because of voltage. 23 Reference: [1] IFSECglobal.com available at <<https://www.ifsecglobal.com/global/biometricsecurity- systems-guide-devices-fingerprint-scanners-facial-recognition/>> last accessed on 10 April,2021 at 6PM [2] Ms. Shraddha S. Giradkar, Dr. N. K. Choudhari "A survey paper on Various biometric security system methods" International Research Journal of Engineering and Technology (IRJET), Maharashtra, India, 02 February, 2016 [3] Nevonprojects.com, available at >last accessed on 10 April,2021 at 5PM [4] Debajyoti Mukhopaddhyay, Megha Gupta, Tahesin Attar, Prajakta Chavan, Vidhi Patel, "An Attempt to Develop an IOT based Vehicle Security System" 2018 IEEE International Symposium on Smart Electronic Systems (iSES) (Formerly iNiS), Mumbai, India, 23 July 2019. [5] Yeong Gon Kim, Kwang Yong Shin, Eui Chul Lee and Kang Ryoung Park ''Multimodal Biometric System Based on the Recognition of Face and Both Irises'', International Journal of Advanced Robotic Systems, Renison University College, 20 Jun 2012 [6] Wikpedia.com available at https://en.wikipedia.org/wiki/Arduino_Uno last accessed on 30 April,2021at 6PM [7] Netigo.eu available at <> last accessed on 30 April, 2021 at 6PM [8] Uk.rs-online.com available at <https://uk.rs-online.com/web/p/breadboard-jumperwire- kits/7916454/>> last accessed on 30 April, 2021 at 6:10PM [9] Elecrow.com available at <> last accessed on 30 April,2021 at 6:15PM [10] Screwfix.com available at <<https://www.screwfix.com/p/mdpe-pipe-blue-25mm-x- 50m/19606>> last accessed on 30 April, 2021 at 6:15PM [11] Circuit.rocks available at <> last accessed on 30 April, 2021 at 6:20PM 24 [12] Alibaba.com available at <> last accessed on 30 April, 2021 at 6:22PM [13] J. Galbally, F. Alonso-Fernandez, J. Fierrez, and J. Ortega-Garcia,"A high performance fingerprint liveness detection method based on quality related features," Future Generat. Comput. Syst., vol. 28, no. 1, 2012