AUTOMATED BARRIER GATE SYSTEM BY USING RFID (ABGS)

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AUTOMATED BARRIER GATE SYSTEM BY USING RFID (ABGS)

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Thesis submitted in fulfilment of the requirements for the award of the degree of Bachelor of Computer Science (Computer Systems & Networking) with Honours

Faculty of Computer Systems & Software Engineering
UNIVERSITI MALAYSIA PAHANG

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ABSTRAK

Sistem Gate Barrier Automatik dengan Menggunakan RFID adalah untuk membangunkan sistem yang dapat mengesan tag yang telah diberikan kepada pelajar Sekolah Sukan Malaysia Pahang dan kakitangan yang telah mendaftar untuk akses kenderaan ke kampus SSMP dan tag ini digunakan untuk menyemak dan menyemak . Sistem ini juga dapat meningkatkan perlindungan keselamatan di kawasan terjamin tertentu dan juga dapat mencegah akses yang tidak diingini. Walau bagaimanapun, sistem ini adalah untuk pelajar dan kakitangan. Apabila pengguna mengimbas tanda pada pembaca RFID apabila melewati pintu penghalang sistem akan menyimpan butiran pengguna yang bernama, nombor id, nombor kenderaan, masa dan tarikh akses. Terdapat beberapa tempat yang masih akan menggunakan sistem pintu halangan yang dikendalikan secara manual. Sistem gerbang penghalang yang dikendalikan secara manual tidak akan mengemaskini maklumat pengguna yang menggunakan sistem. Selain itu, akan ada banyak masa membuang masa kerana pengawal keselamatan perlu menyemak pengguna secara manual sama ada mereka pelajar atau kakitangan Sekolah Sukan Malaysia Pahang atau orang luar. Sehingga, akan ada lebih banyak kereta yang menunggu untuk lulus gerbang sejak dikendalikan secara manual. Pada akhirnya, butiran pengguna dan masa dan tarikh tidak akan diambil kerana kekurangan masa. Walau bagaimanapun, ada yang akan mengambil maklumat dengan menulis secara manual butiran buku log. Tetapi jika buku log rosak bermakna tidak ada maklumat yang disimpan. Walau bagaimanapun, dengan sistem ini, tidak ada peluang untuk rosak pada maklumat yang disimpan dalam pangkalan data. Pentadbir boleh menyemak pada bilabila masa pangkalan data yang menyimpan maklumat tersebut. Oleh itu, dengan menggunakan pengguna sistem ini dapat mengurangkan waktu menunggu untuk lulus di pintu masuk. Sistem ini akan dapat menyimpan data ke dalam pangkalan data dan fail boleh dimuat turun ke jenis fail lain yang akan menjadikan tugas pentadbir dapat dilakukan dengan lebih mudah untuk diperiksa.

ABSTRACT

Automated Barrier Gate System by Using RFID is to develop a system that able to detect the tag that has given to Sekolah Sukan Malaysia Pahang (SSMP) students and staffs who already registered for the vehicle access to SSMP campus and this tag is used for checking in and checking out. This system also able to increase a safety protection in particular secured area and also can prevent unwanted access. However, this system is mainly for students and staffs. When a user scans a tag at the RFID reader when passing by the barrier gate the system will stored the details of users which is name, id number, vehicle number, time and date of access. There is some place that will be still using manually operated barrier gate system. Manually operated barrier gate system will not updating the information of user who is using the system. Besides that, there will be a lot of wasting time since a security guard have to check the user manually whether they are Sekolah Sukan Malaysia Pahang students or staffs or non-user. So that, there will be more cars waiting to pass the gate since manually operated. At the end, the details of users and the time and date will not be taken due to lack of timing. Eventhough, there is some will taking the information by manually writing the details on log book. But if the log book is damaged then there is no saved information. However, with this system, there is no chance to be damaged on saved information in database. The administrator can check at any time the database that stored the information. Therefore, by using this system user can reduce the time of waiting to pass at the entrance gate. This system will able to stored data into the database and the file can be downloaded into other file type which will make the administrators job can be done easier for checking.

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LIST OF ABBREVIATIONS

RFID	Radio Frequency Identification
SSMP	Sekolah Sukan Malaysia Pahang (SSMP)
NFC	Near-field communication
LED	Light-emitting diode
PHP	Hypertext Preprocessor
CSS	Cascading Style Sheets
USB	Universal Serial Bus
PC	Personal Computer
ID	Identity Document
ABGS	Automated Barrier Gate System by Using RFID

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

According to Eltoum & Xue (2014), nearly everything in the current world is going programmed and also to rise the comfort and security at the entrance gate. The main entrance gate will be seen in every shopping malls, residential area and also in particular secured area which is required more security at there. There is also required to have a barrier gate system to solve the problem of control of visitor's entry into a particular area. Automatic gates are additionally utilized at inside zones which is faculty. For instance, automatic gates are usually utilized inside within a parking structure to isolate worker parking areas from open regions of the carport. (Silva Consultants , 2017)

The main purpose of Automated Barrier Gate System by using RFID is to improve a system that able to detect the tag that has given to Sekolah Sukan Malaysia Pahang students and staffs who already registered for the vehicle access to Sekolah Sukan Malaysia Pahang campus and this tag is used for checking in and checking out. Furthermore, the details of users will be stored in database of security when checking in and checking out time with time and date of access and identify the number of visitors more easily and quickly.

There are many types of barrier gate system such as vehicle license plate recognition, tag, fingerprint, face recognition and so on. According to Bombini, Broggi, Debattisti (2015), the automatic gates and barriers, swing and sliding doors, bollards and barriers to avoid undesirable access or to direct movement stream.

Sekolah Sukan Malaysia Pahang (SSMP) is one of the institution that still not using the barrier gate system and there is manually operated by security guard. In the way to pass the gate from manual method, students should fill up the form of checking out from the campus while have to scan the card on computer and the staff of SSMP does not important to scan and pass the gate. Without scan also the staff can check in and check out.

This process will be wasting users timing because security guard required to check the details of users and outsider manually before allowing them to enter the particular area. The users or outsider have required to wait until the security guard proceed to allow. The best way to keep away from the wasting of time and to take details of users and outsider is by developing a system that will able to take the details of users and outsider by using tag that has given to Sekolah Sukan Malaysia Pahang students and staffs who already registered for the vehicle access to Sekolah Sukan Malaysia Pahang campus and also there is no manual method since the barrier gate will be open automatically after verification of tag. Hence, a systematic Automated Barrier Gate System by Using RFID will be required by the campus and other institution.

1.2 PROBLEM STATEMENT

The main difficult is there will be a manually operated barrier gate system. Once a vehicle wants to check in or check out, there should be a security guard who in charge of opening the barrier gate manually so that it can pass through the barrier gate. There is an improper checking for who is access on and off the particular secured area. Manually operated barrier gate system will not updating the information of user who is using the system.

Besides that, there will be a lot of wasting time since a security guard have to check the user manually whether they are Sekolah Sukan Malaysia Pahang students or staffs or outsider. So that, there will be more cars waiting to pass the gate since manually operated. At the end, the details of users and the time and date will not be taken due to lack of timing. With this system, there will be no wasting time and the whole details will be updating such as name of user, matric id, time and date of using the system. Then, can reduce the number of waiting's cars at the entrance.

Lastly, the detailed information of users or outsiders that being given will not be saved since the security guard will be busy with other user's car. By utilizing this system, user and outsiders will capable to validate that their details have officially taken and stored in database.

1.3 OBJECTIVE

The intention of this project is to build up an efficient barrier gate system for Sekolah Sukan Malaysia Pahang (SSMP) which will be name as Automated Barrier Gate System by using RFID. To accomplish the target of the project, all the three objectives must be meets. The objectives of the project are:

- 1. To design a simple model to show the system works.
- 2. To develop a prototype system that able to recognize the Tag of users which will be using radio-frequency identification (RFID).
- 3. To evaluate the functionality of the prototype system.

1.4 SCOPE

To assure that the objectives will have the capacity to accomplish, there are a couple of scopes that will be characterized. The scopes include of three classifications which are location, hardware and software.

- 1. Target User
 - The system will be using by the the user which is students and staffs from the campus of Sekolah Sukan Malaysia Pahang (SSMP) which is at Gambang.
- 2. Hardware
 - Arduino UNO to connect RFID with the RFID reader.
 - > RFID reader to recognize and track the user's tag.
- 3. Software
 - In this project, Arduino programming language will be used.
 - The data will be stored into database by using XAMPP.

1.5 THESIS ORGANIZATION

This thesis varies from three chapters which are the introduction, literature review and methodology. The first chapter is related to the introduction of the system, problem statement, objective and scope for the system. The second chapter is explained about the literature review of the new system and the existing systems completed by others. The chapter also explains about how the automated barrier gate system is worked through various ways using simple diagrams and snapshots of the interface. Lastly, the third chapter will explain the methodology of technique and approach used to complete the proposed system.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

In this part, the existing systems that have been did before this will be explained. The barrier gate usually will be used at shopping malls, universities, private sector areas. The reason why using barrier gate is to avoid the traffic jam and also it will be automatically update the information of users in database when the users scanning the tag.

The RFID reader will detect the tag of users who have registered the vehicle access to campus. According to Arulogun, O.T & Olaniyi, O.M & Afolabi,O.A, (2017), RFID is an automatic card that will collect the data that saved inside with details and also it is more exact and data entry according to time.

The Arduino is a programmable rationale controller and an open source hardware prototyping stage. Buttons, LEDs, GPS units, cameras, the internet, and even the smartphone or TV can be interact with Arduino. Connecting to computer through USB to do communicate using serial protocol and as interface connected to PC will be easy to use.

2.2 **REVIEW ON EXISTING SYSTEM**

This section of the report will explain more on the review on existing system of similar system that has been developed before this will be compared based on a few significant features. This section will compare three existing systems which are:

- Automatic Gate Control System Based On Vehicle License Plate Recognition.
- 2. IoT Based RFID Gate Automation System.
- Automation Gate Opening System for Vehicle with RFID or Password.
- Manual Security Guard System of Sekolah Sukan Malaysia Pahang (SSMP).

2.2.1 Automatic Gate Control System Based On Vehicle License Plate Recognition

Thiss system is built on vehicle authorization number where the image scanner will scanning the only vehicle plate number that has been registered whether can let in or not. This system developed by Ismael Saad Eltoum and Zhaojun Xue. According to Eltoum & Xue, (2014), this innovation can be utilized as a part of a different security and traffic applications.

The next subtopic will discuss about the advantages and disadvantages of this system.

2.2.1.1 Advantages

- 1. This system can be utilized for entire license plates with various color is dark or white or different colors. (Eltoum & Xue, 2014).
- 2. Can be promptly stretched out to adapt to license plates of numerous nations with the license plates of cars that with 6 characters and numbers, particularly those utilizing English characters. (Eltoum & Xue, 2014).
- 3. The auto gate control will have the capacity to works naturally without require people. (Eltoum & Xue, 2014).

2.2.1.2 Limitations

- 1. Analysis depends on one-row plate number. (Eltoum, Xue & 2014).
- 2. There should be have 6 English character and numbers for licesnse plate number. (Eltoum & Xue, 2014).
- 3. The entryway and the exit barrier gates can't work meanwhile because of we have been utilized just a single micro controller and every one must hold up the other one got done with handling. (Eltoum & Xue, 2014).



Figure 2.1: Matlab GUI based Automatic Gate Control

2.2.2 IoT Based RFID Gate Automation System.

This system is based on RFID which is fully automated and also can be manually operating by the human beings who is owner and also can accesses from anywhere around the globe by the owner. By executing this innovation technology in a gateway it upgrades the framework by giving greater security. (Sighila & Valsan & Preethibha, 2016). IoT is the network of physical objects like gadgets, vehicles, structures and different things that empowers these items to gather and trade information and this system can enables a more secure and highly reliable gateway. (Sighila & Valsan & Preethibha, 2016).

2.2.2.1 Advantages

- Internet of things (IoT) encourages us in monitoring all the ENTRY and EXIT points of interest of the territory with the assistance if Internet. (Sighila & Valsan & Preethibha, 2016).
- The IN and OUT time of each vehicle that enters the region is stored in a database and furthermore a webserver which encourages us to get to those subtle elements wherever we are utilizing IoT. (Sighila & Valsan & Preethibha, 2016).
- By using RFID in IoT, all the applications of this technology culminate in increased comfort, convenience, and better management, thereby improving the quality of life.
- 4. Can be more dependable. (Sighila & Valsan & Preethibha, 2016).
- It is a minimal cost and simple Circuit. (Sighila & Valsan & Preethibha, 2016).

2.2.2.2 Limitations

 By utilizing the IoT is a dissimilar and composite system. Any dissatisfaction or bugs in the item or apparatus will have certified results. Even the power can make disappointment to cause a great deal of burden. (Sighila & Valsan & Preethibha, 2016) 2. With the majority of this IoT information being transmitted, the danger of losing protection and security will be increments.



Figure 2.2: Block diagram

2.2.3 Automatic Gate Opening System for Vehicles with RFID or Password.

This system is based on RFID which is access control system for College ID Card in College .This system to give security in an association by permitting just the approved personnel to get to the protected zone.

2.2.3.1 Advantages

- 1. Just the approved individual through a legitimate RFID tag is permitted into the protected places. (Dipali & Roshani & Komal & Marhaba, 2014).
- Great reaction to beginning/stopping/reversing. (Dipali & Roshani & Komal & Marhaba, 2014).
- It is possible to achieve a little quickness of synchronous uprising with a weight that is directly fixed to the pole. (Dipali & Roshani & Komal & Marhaba, 2014).

2.2.3.2 Limitations

 Not simple to work at a great degree high speeds. (Dipali & Roshani & Komal & Marhaba, 2014). Resonances can happen if not legitimately controlled. (Dipali & Roshani & Komal & Marhaba, 2014).



Figure 2.3: Hardware of this project

2.2.4 Manual Security Guard System of Sekolah Sukan Malaysia Pahang (SSMP).

This system is based on security guard management system. There is no automatically control by the system. Security guard must be at entrance gate place to handle this system because of have to take the details of user and outsider.

2.2.4.1 Advantages

- 1. Able to prevent from cheating like when the user and outsider want to pass the gate they must show and give the IC and other details.
- 2. Can catch up the user or outsider's faces if they showing the IC.
- 3. There is no cheating will be done by user and outsider since the security guard will checking the IC and others details.

2.2.4.2 Limitations

1. Manually operated barrier gate system will not updating the information of user who is using the system.

2. This process will be wasting users timing because security guard required to check the details of users and outsider manually before allowing them to enter the particular area.

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Figure 2.4: Letter of Checking out from the campus

2.3 COMPARISON BETWEEN EXISTING APPLICATIONS

The proposed system has been compared with the existing system to find the similarity and differences. Table 2.1 shows the comparison between existing system and proposed system.

Name of	Automatic	IoT Based	Automatic	Manual	Automate
System	Gate Control	RFID Gate	Gate Opening	System of	d Barrier
	System Based	Automation	System for	Sekolah	Gate
	On Vehicle	System	Vehicles with	Sukan	System by
	License Plate		RFID or	Malaysia	using
	Recognition		Password	Pahang	RFID
				(SSMP)	
Technology	Plate	RFID	RFID	Manually	RFID and
used	Recognition			operated	Arduino

Table 2.1: Comparison of the existing system

Can be	No	Yes	Yes	Yes	Yes
operated					
manually					
· ·					
Save and	True. The	True. The	True. The	Not saving	True. The
View	information of	information	information	any	informatio
Informatio	the check in	of the check	of the check	informatio	n of the
n	and out will be	in and out	in and out	n and just	check in
	recorded in	will be	will be	taking	and out
	the database.	recorded in	recorded in	manually.	will be
		the	the database.		recorded
		database.			in the
					database.
Complexity	Complex	Simple	Complex	Simple	Complex

Security	Yes	Yes	Yes	No	Yes
Message					
System					

Based on the table 2.1, we can see the differences between four systems. If we compared the above systems, each system used different kind of technology. The technology that systems were used plate recognition, RFID and Arduino. There are so many technology are exists. For example, face recognition, fingerprint, and voice recognition and so on. From the table 2.1, security message system is very important for this kind of project. Because when unknown person enters particular area there will be a notification message with "Unauthorized Person" that will be sending to the person who controlling the system. The information of the check in and out will be recorded in the database and also can view the information. There is some system that can operated manually.

2.4 RADIO FREQUENCY IDENTIFICATION (RFID)

RFID can be called as Radio-Frequency Identification. The abbreviation assign to small gadgets of electronic that comprise of a small chip and an antenna. RFID device serves the same purpose as a bar code or a magnetic strip on the back of a credit card or ATM Card. By using the bar code also can be scanned to catch the data and the device of RFID can be scanned to entrance for checking in and checking out system.

Therefore, Automated Barrier Gate System by using RFID, the RFID reader will identify the tag of users who have registered the vehicle access to campus and also sensor by sensor which there is no need to scan the tag at reader. RFID is a automated recognizable proof and information gathering innovation that guarantees more exact and opportune information passage. Subsequently, through the utilization of RFID the information will be saved more exactly if do compare with the manually saved information.

There are a couple of benefits of RFID that will allows a tag reading from a more better distance even in cruel condition. RFID is selected in this project since it has more advantages of utilizing.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The section will be cover the selected methodology that will be utilized to develop in this project. In order to finishing this project, a system or application has to follow the Software Development Lifecycle (SDLC) but there is many SDLC such as RAD, Agile Model, Waterfall model and so on (Singh & Thakur & Chaudhary, 2015). This is an important process as it will be functioning without any problems. Besides that, the method/tools/instruments and the related diagrams such as the context diagram and the use case diagram will be included as well in order to aid the understand of the system being developed.

3.2 Methodology

Methodology is an important part in system development. This process of development of an application must comply with certain rules and follow certain steps to achieve expected result. In order to finish this project, Waterfall model method is an appropriate to conduct the whole step throughout the process which is to analyse, design, implementation, testing and maintenance. It is also used to develop and support the information system and also to make sure that the system work properly.

We can simply understand the waterfall model easily and ease to use too. Before the next phase begins each phase will be completed done in a waterfall model. From this, we can do decide that the undertaking project is either on the correct way or whether not to proceed or stop the project. These things a review will takes place to determine at the end of each phase. Because of the inflexibility of the model it is easy to handle while every each of stage has particular expectations and a review procedure. And also waterfall model show the functions well for not bigger projects where necessities are obviously knew. (ISTQB EXAM CERTIFICATION, n.d.).

There are 5 stages requirement for system development which is:

- 1. Requirement or Analysis
- 2. Design
- 3. Development
- 4. Testing
- 5. Maintenance



Figure 3.1: Waterfall Model

3.2.1 Requirement or Analysis Phase

This can be said as the initial process of investigating and gathering data or information though active analysis. This analysis can be done on the client's institution such as the system they used, how they managing the check in and check out activities, how they taking the details of user in the usage for automated barrier gate system. The analysis could be also conducted by professionals such as system analysts by having a meeting with the client to gather requirement which could aid the developer of the system during the development of the system. Requirement or Analysis phase is used to find how the project is going to work. From this stage, identifying the objective, goals, project scope and requirement of the system such as software and hardware specification which is very important to make sure this system is success.

1. Problem Background

Problem study was recognized in view of barrier gate security where everyone needs to take suitable checking to avoid interruption. Then, the automated barrier gate system will be needed where the user and the owner can take advantage of the technological to make their life safer then easier. Later, this paper suggest a system that allows user to control automated barrier gate system by scanning the tag at the RFID reader by using Arduino MEGA.

- 2. Determination of system that will be developed.
 - a) System name : Automated Barrier Gate System by Using RFID.
 - b) System description : This are function to control the automated barrier gate with a sensor and tag.
- 3. Identify the objective and scope of the project.
 - a) Objectives of this project is to build a scanning sensor to make easier for users to check-in and check-out by using automated

barrier gate system and at the same time to save the date and time of access of user.

- b) The scope of this study is Arduino MEGA and Ethernet Shield to attach RFID with the RFID reader while RFID reader to detect and track the user's tag. In addition, the coding of Arduino language will be used on the Arduino and to store all the data into database via XAMPP.
- 4. Proceed to the project planning.

Planning is extremely about characterizing essentials: what issue needs solving, for whom this system is useful, and what will be finished.

5. Conduct and observe project planning.

It is important to decide the work required to finish the project. For example, we can review individuals but normally group members with in their own environment doing their tasks and carrying processes that are fundamental for finishing the tasks.

Hardware and software requirement are defined based on the needs during the development of the Automated Barrier Gate System by Using RFID.

Hardware	Software		
2 Arduino MEGA	- To control all the process and to connect with Ethernet Shield.		
2 Ethernet Shield	- To have an internet connection to store the database in MySQL.		

 Table 3.1: Hardware Specifications

Jumper Wire	- To connect the Arduino and Serve
	Motor and Ethernet Shield and
	LED display.
1 Individual Computer	- To configure the code on Arduino
	- To generate the report and
	documentation.
2 USB Data Cable	- To connect Arduino MEGA to
	personal computer.
4 LED	- As green lamp and red lamp
2 Servo Motor	- As a barrier gate
4 RFID Tag	- To access the system for check-in
	and check-out.
2 RFID Reader	- To gather information from an
	RFID tag to access the barrier
	gate.
2 LED Display	- To display either ACCESS
	DENIED or ACCESS
	GRANTED.
2 Protoboard	- For circuit connection
2 Lan Cable	- To connect with Ethernet Shield
	to Lan Port.

Software	Specification
Arduino IDE	- Used to create coding.
Draw.io	- Used to design context diagram and flowchart.
Proteus	- Used to design physical layout and block diagram.
Microsoft Office PowerPoint 2013	- Used to make slides for presentation.
Microsoft Office Word 2013	- Used for documentation.

Table 3.2: Software Specifications

3.2.2 Design Phase

This phase is the phase where the developer of the system designs the interface as well as the storyboard like interfaces in order to aid the developer to plan the flow of the system graphically. The design phase concentrate on system design in barrier gate related information together with data has been gathered in the analysis stage. This phases are includes 6 elements which is:

- 1. Context Diagram
- 2. Use Case Diagram
- 3. Flow Chart
- 4. Logical Design
- 5. Physical Design
- 6. Gant Chart

3.2.2.1 Context Diagram

Context diagram shows how many users involved as well as the relation that exists in between the user of the application and the process included in the application. RFID reader will scan the RFID tag in the student's and staff's NFC card and data of the check-in and check-out time and date will be recorded into the database of the system. Students and Staffs are required to register for the first-time user to this system. The admin of the system have to login through web application for updating and checking the information of users.



Figure 3.2: Context Diagram

3.2.2.2 Use Case Diagram

The Use Case Diagram are basic diagram which describes what are the actions that can be taken with the components in an application. Generally Use Case Diagram must include certain components in order to describe the functionality of an application or system being developed.



Figure 3.3: Use Case Diagram of the system

There are three actors involved in this use case diagram which is student, staff and admin. Five use cases are used where the registration is extended from login and other use case is manage report. Student and Staff are connected to one use case which only registration while the admin is connected to three use cases which is registration, login and manage report. a) Use Case 1 : Registration

The purpose of this use case is to register for the first time and also to get the details of student and staff such as name, age, gender, ID, vehicle number, phone number and so on. The registration for the student and staff are for access the system for example if want to check in or check out there must scan the tag to pass by. While for admin, they must do registration in order to login into system for checking the information.

b) Use Case 2 : Login

The purpose of this use case is to give authorization to admin who will be in charge of handling the automated barrier gate system. Login with admin as username and password in order to proceed.

c) Use Case 3 : Manage Report

The purpose of this use case is only for the admin because of admin only person who can handling the system. They can do add, search or view, delete and update the information of user from the saved database.

3.2.2.3 Flowchart

The flow of a system is determined by the total number of entity or user of the system. Usually there will be a user and an admin. Flowcharts can be used in certain situations. It can be either explains how a process is done as said earlier, to explain to others on how the process is done, as well as to plan a project and also to document the project being worked on (Hebb, 2015).

3.2.2.3.1 Flowchart of the system

Figure 3.4 shows the flowchart of the system. The flow of the system starts with registration for the first-time for the staff, student and admin. Next, the system will detect the tag of user which has been saved in RFID tags in the card with RFID reader that being attached to Arduino. The check in and check out time will be recorded in the database. If the outsider want to access the system, they have to use the boarding pass tag that will give by the guard and also exchange with their identification card until they do leave from the campus.



Figure 3.4: Flowchart of the system

3.2.2.3.2 Flowchart of Web Application

Figure 3.5 shows the flowchart for the web system. At first, if the connection is accepted, the admin is required to login into the system. As the system is working properly, the student that scanned their tag will be able to detect their access history on system. If there is any data being update such as new RFID tag to replace the broken RFID tag, the student information will be changed and the database will be updated on Arduino and RFID card. And also all the data of the users that check in and check out will be stored and can export to pdf to either print or keep for future reasons in the way to make ease the admin to view and check.



Figure 3.5: Flowchart of the web application

3.2.2.4 Logical design

Figure 3.6 describes a connection of the part that used in this system. The logical design is drawn before the development of the system start. Arduino will be attached with RFID reader. All the data read by the RFID reader will be kept in the database. The admin can access the web application to check the history of access system.



Figure 3.6: Logical design of the design

3.2.2.5 Physical design

Figure 3.7 demonstrations the physical design. Through physical design can see the overview of the project and it is the image of a complete object. RFID reader will be used and being attached to the Arduino. A jumper wire will be used to connect the RFID reader with Arduino. LED display will be connected to Arduino by using jumper wire. Servo Motor also will be used and being attached to the Arduino MEGA.



Figure 3.7: Physical design of the system

3.2.3 Graphical User Interface (GUI)

Designing a Graphical User Interface is very important before developing a web application. It is less demanding to utilize the GUI because it utilizes symbols or other visual markers in the best approach to communicate with an electronic gadget. And also will help the developer to construct the system based on the shown interface that have been design which is the graphical user interface.

1. Admin login Interface

The home interface will enable the admin to login. This login page is only for administrator. Then, admin have to write his/her username and password for continuing to home page.



Figure 3.8: Admin login Interface

2. Homepage Interface

If the login is valid, the admin will be able to see the five menu buttons that can be press by the admin which are:

- 1. View information : View the information of the user data of check in and check out list.
- 2. Update information : The changed of the data regarding the student's details.
- Manually access : This section is for manually register user whoever have problem with their Tag such as lost or damage or could not detect.
- 5. Registration : This section is for those who will do registration for accessing the system.
 6. Logout : Logout from the system.



Figure 3.9: Homepage Interface

3. View Information Interface

This page is for the admin to view the access history of user's details whose scan the Tag will be show in this page. Then, this page is combined with the information of history. So, the details of users will be displayed with the check-in and check-out access time.

Automated Barrier GRTE 1 System							
	INFORMA	TION OF ACCES	S HISTRO	Y		Logout	
					Ti		
Matric ID	Name	Hp Num	Vehicle	Data	Check-In	Check-Out	
CA15011	Alex Steven	017-113344567	WM 15088 Z	01-12-2018	21:30	Chick-Out	
AA15011	Muhammad Ali	017-116744567	QA 17891	01-12-2018		23:30	
TA15011	Mugen Chua	011-1216744567	AT 3897	02-12-2018	03:30		
						Print	

Figure 3.10: View Information Interface

4. Update Information

This will update the information of user that has been changed to new details such as vehicle number or handphone number.

	Automated Barrier GRTE *							
UPD	ATE PAGE				Logout			
User infor	mation							
Matric ID	Name	Hp Num	Vehicle Num					
CA15011	Alex Steven	017-1133442	MW 2811]				
AA15011	Muhammad Ali	017-116744567	QA 17891					
TA15011	Mugen Chua	011-1216744567	AT 3897					
				Con	firm			

Figure 3.11: Interface of update information page

5. Manually Access

This page is for the user who have lost and broken RFID Tag that not allowed to pass by barrier gate. Apart from that, user who forgot to bring their RFID Tag will be using by this page to check in and check out.

Automated Barrier GRTE 1 System								
MANUAL ACCESS PAGE								
Nam	le :	Date	:					
Matril	k ID :	Chec (Ti	k-In :					
Hp Num : Check-Out : (Time)								
					Tir	ne		
Matric ID	Name	Hp Num	Vehicle Num	Date	Check-In	Check-Out		
CA15011	Alex Steven	017-113344567	WM 15088 Z	01-12-2018	21:30			
AA15011	A15011 Muhammad Ali 017-116744567			01-12-2018		23:30		
FA15011 Mugen Chua 011-1216744567 AT 3897 02-12-2018 03:30								

Figure 3.12: Interface of manually access page

6. Registration

This page is for those who will do registration for the first time for accessing the system and who will do check in and check out activity on campus

Automated Barrier GRTE 1 System						
REGISTI	RATION	Logout				
Name : Matrik ID : Gender : Hp Num : Vehicle Num : Vehicle Name :	CONFIRM Yes No					

Figure 3.13: Interface of registration for user.

3.2.4 Gantt Charts and Tasks

The Gantt chart follows together with the development of the application. An organized list is very important to ensure that the process of develop of develop the project success. The phases in the development of the application is done based on the planned Gantt chart.

	θ	Task Mode 💌	Task Name	Duration 👻	Start 👻	Finish 👻	Predeces	Pr January 2018 Anril 2018 July 2018 Ortobar 2018 January 201	٥
1	-		Planning	18 days	Mon 2/12/18	Wed 3/7/18			-
2		*	Title Selection	5 days	Mon 2/12/18	Fri 2/16/18		I. I	
3		*	Determine Problem,Scope,Goal and Objective	5 days	Mon 2/19/18	Fri 2/23/18	2		
4		*	Research on Barrier Gate System	8 days	Mon 2/26/18	Wed 3/7/18	3		
5		*	Requirment & Analysis	24 days	Thu 3/8/18	Tue 4/10/18	1		
6		*	Analyze Existing Barrier Gate application	9 days	Thu 3/8/18	Tue 3/20/18	4	*	
7		*	Research on Automated Barrier Gate System	10 days	Fri 3/23/18	Thu 4/5/18			
8		*	Decide development software and hardware	5 days	Thu 4/5/18	Wed 4/11/18			
9		*	Design	19 days	Thu 4/12/18 🔻	Tue 5/8/18	5	kan,	
10		*	Design Web Application Content	5 days	Thu 4/5/18	Wed 4/11/18		I III	
11		*	Design User Interface	4 days	Thu 4/12/18	Tue 4/17/18			
12		*	Design Physical and Logical design	5 days	Wed 4/18/18	Tue 4/24/18			
13		*	Design Use Case and Context diagram	5 days	Wed 4/25/18	Tue 5/1/18		•	
14		*	Development	137 days	Wed 5/9/18	Thu 11/15/18	10		
15		*	Create Interactive Web Interface	14 days	Tue 4/17/18	Fri 5/4/18	9		
16		*	Create Content for the Website	22 days	Wed 9/19/18	Thu 10/18/18			
17		*	Install the hardware of the project.	10 days	Wed 9/19/18	Tue 10/2/18	16	, and the second se	
18		*	Programming	75 days	Fri 10/19/18	Thu 1/31/19	17	• • • • • • • • • • • • • • • • • • •	
19		*	Integration web application with Arduino UNO	16 days	Fri 11/2/18	Fri 11/23/18	18	(Junior)	
20		*	Testing	12 days	Fri 11/16/18	Mon 12/3/18	15	••••	
21		*	User Acceptance Test	12 days	Mon 3/11/19	Tue 3/26/19			

Figure 3.14: Gantt Chart of the project

CHAPTER 4

IMPLEMENTATION

4.1 Introduction

The implementation, testing and result for Automated Barrier Gate System by using RFID will be explained in this section. Other than that, this segment will have three major parts which are the implementation on information, the testing and moreover result discussion. The system is then reproduced in based of the client fulfilment where arbitrary individuals will be used the application to check whether the application being created is easy to use and meets the goal splendidly.

Moreover, in this project there will be a website implementation for view the recorded data in database. Laptop is the main source for implement the web application. The majority of data information will be send to the database and ready to be view using website through localhost. By using PHP and CSS and also Arduino language will be utilized to code on Arduino MEGA.

4.2 Implementation of Requirement

The figures of the application will be appeared in the following part which are the interfaces that has been planned. This application has two users where they are the normal user who will carry out tasks like checkin and check-out where they will utilizing their id card to scan and cross the obstruction entryway. While the other user would be where the administrator could alter the data, add the details and delete them as well as also has the authority to view the registered users and their details. Both the users must be enrolled to guarantee that there is permitted to utilize the system. At that point the administrator can download the document which is spared the check-in and check-out information.

4.2.1 Hardware Implementation

The hardware utilized as a part of this system are Arduino MEGA and RFID reader. At the first, Arduino MEGA and Ethernet Shield should be connected together and the RFID reader, serve motor, LED lamp and jumper will be connected with Arduino MEGA. Figure 4.1 demonstrates the Arduino MEGA and the RFID reader which will be associated in the best approach to guarantee that the Arduino MEGA will have the capacity to gather the information from the RFID reader. Ensure that every one of the parts are effectively connected. Before begin coding, main power supply is on to ensure all the hardware tools is on and the USB cable from PC to Arduino MEGA are associated. From that point onward, the hardware is prepared to code. While uploading process is done, open the serial screen to demonstrate the system procedure. Figure 4.2 shows the connection between Arduino MEGA and Ethernet Shield. Figure 4.3 displays the current system on prototype.



Figure 4.1: Connection between Arduino MEGA and the RFID reader



Figure 4.2: Connection between Arduino MEGA and Ethernet Shield



Figure 4.3: Current system on prototype

4.2.1.1 RFID Reader Implementation (Record Attendance)

The RFID reader will distinguish the NFC tag by touching the student matric card at the RFID reader module. Every one of the card have its own particular remarkable id. RFID reader will gather the one of a unique ID and also there will be user's name, matric ID and vehicle plate number. If the card is not valid "ACCESS DENIED" will be displayed by the system and also that mean the user have not registered yet. If the card is valid "ACCESS GRANTED" will showed and the information of the user will be collected and allowed the user to do a process. When the user scan the ID card at the reader, the data information will be send to database for recorded.



Figure 4.4: Output from the card ID detection (ACCESS DENIED and ACCESS GRANTED).

4.2.1.2 **RFID** Reader Implementation (Register card ID)

Actually the RFID reader in this project does not developed due to the time constraints that had during the develop time. But we can do suggest that in future work can do add a register ID card section at first starting of system. In this project already did a coding inside the Arduino MEGA. So that, in RFID card also will be have a details that already put inside Arduino MEGA. From this, when the user scan the ID card with the RFID reader there will verification process will begin between the card and Arduino MEGA. If the data is matched, user is allowed to enter the entryway. Then, the details of user will be send to database and saved. If wants to use this system there can do buy the ID card and straight way can change the command inside the coding section with the details that need to consider.

4.2.2 Software Implementation

Once hardware implementation is done. The software implementation which is next phase that will be continue onwards. Automated Barrier Gate System by Using RFID will be developed. This system is required an admin to handle the registration part because of need to register directly to main coding part that will be in Arduino MEGA. The admin only can view the saved database in system and also can do edit, add or delete the information that not needed anymore. The interface of this system is developed by using Visual Studio 2017 software, PHP and CSS is used in this interface. The following figures below show the interface of web application.

4.2.2.1 Login Page

Figure 4.5 displays the login page of this website. The login page is only for admin. The admin must log in with the username and password that has been registered. If the admin log in with wrong username and password there will be a pop up message to notify the admin 'Password and Username are not correct. Please try again'. PHP encoding has been used.



Figure 4.5: Interface of login page

4.2.2.2 Home Page

The home page is after login page once the admin key in the correct username and password. Once in home page interface, there are 2 buttons for the purpose of linking to the registration interface, view information interface. The other two buttons which are manual button is for manually open the barrier gate to allowing others to pass by and other one is logout button to logout from the system.



Figure 4.6: Interface of homepage

4.2.2.3 View Information Interface

The view information interface basically is the information providing page where it displays the history of access time of those who has scanned. It also consists two buttons that are linked to other interface page. If admin wants to logout from this site, can press the 'Logout' button at top right corner of the page and if press the 'Home Page' button at top right corner of the page then the page will be back to homepage. Admin can do the save copy of this history details by pressing the 'Export to PDF" button at bottom right corner of the page. If wants to view the history of access then have to click the 'Check IN and Check OUT' button to show the stored data. In this data included user ID, vehicle number, event is time of access, name of user and status either check in or check out.

•			ViewInformationPag	e	- • ×				
	AUTOMATED BARRIER GATE SYSTEM								
Vie	ew Information				Home Page Logout				
		Check	IN and Check OUT						
	User_ID	Car_Reg_Num	Event	Name	Status				
•	KBB16007	CCC2222	12/7/2018 4:55 PM						
	KBB16007	CCC2222	12/7/2018 4:58 PM						
	KBC16018	CCA2122	12/10/2018 12:34 PM	Abu	IN				
	KBC16018	CCA2122	12/10/2018 11:52 PM	Abu	IN				
	KBB16007	CCC1111	12/11/2018 2:31 AM	Ali	OUT				
					Export to PDF				
1									

Figure 4.7: Interface of view information

4.2.2.5 Registration Interface

This registration interface is for user who will do the registration for the first time for accessing the system and to have a permissions to check in and check out activity on campus. Therefore, the user have to give the details which including name, matric ID, gender, hand phone number, vehicle type and vehicle number to do registration process. Then, the admin only will change the command in the Arduino to scan with a RFID card to do matching to have an authorization.

			Registrati	onPage		- 🗆 ×
	VUTO	MATE S	D BAI	RRIER M	GATE	
Registrati	ion					Iome Page Logout
	Name: Matrik ID:					
	Gender Hp Num:	01X00000000X	~			
	Vehicle Type:			-		
				Se	arch	
	MatrikID	Name	Gender	HpNum	VehicleType	VehicleNumber
► F	CCA2122	Abu	Male	01543678	Car	KBC16018
	CCC1111	Ali	Male	0173245667	Bike	KBB16007
					Save Upo	late Delete

Figure 4.8: Interface of registration page

4.3 Testing and Result Discussion

Testing of the system is done based on the objective of the development of the application and furthermore to discover if there are any bugs or issues in the created application.

Moreover, the database will be analysed in this stage. The records need to pass effectively between the interfaces and the database. The majority of the mistake that happen should be solved in the path for the system function properly.

The system has been tested by the client and the client are required to finish the acceptance test. The test is imperative for demonstrate that the system is done dependent on the requirement.

4.3.1 User Acceptance Test Form

The User Acceptance Test involves a client which are selected to test the application and system. Figure 4.9 displays a user acceptance test form.

Project Name: Automated Barrier Gate System by using RFID

Client Name: Sekolah Sukan Malaysa Pahang

Testing Period:

No	Test Scope	Expected Result	Pass/Fail
1	RFID reader detection card.	RFID reader able to	
		detect the card.	
2	Login into Automated Barrier Gate	Admin able to login	
	System website.	successfully.	
3	View the user's details information.	Data that being enter	
		has saved in the	
		database correctly.	
4	Arduino MEGA send data to the	Data being saved into	
	localhost database	the database properly.	
5	Can view the users' access history	Data has been	
	information.	correctly saved	
		according to the time	
		and date in database.	

I am satisfied with the system that was presented and the project are ready to the next phase.

Verified by developer,

Approved by client,

) Date:

(

)

Date:

(

CHAPTER 5

CONCLUSION

5.1 Introduction

This section of chapter is about the conclusion of the entire procedure that have been finished amid the improvement of automated barrier gate system by using RFID. It additionally outlines the accomplishments of the goal, the adequacy of the methodology that been utilized. Aside from that, the details regarding the limitations and approaches to conquer it. There are additionally future works will be clarified in this section for the future upgrade of the project.

5.2 Research Constraints

The constraints in this project are:

1. Network Coverage

In this project, network coverage is too sensitive for this system. Because the system is network dependent and network congestion can reduce the reliability of the system. If the network is public network then the system will running slowly and the server will be failed. 2. Hardware constraint

Arduino UNO is used in this project for developing the system. There are many problems occur during do connecting database with MySQL. The Arduino would not take some character types. So that need changed to Arduino MEGA and Ethernet Shield added to be connecting to MySQL database. It is took one week more to get a new hardware from shop.

5.3 Future Work

All of the objective in chapter 1 have been achieved. However, the enhancement in the future project still needed. The following criteria can be included in the future work such as:

- The sensor by sensor system should be added like smart tag toll. It makes too easy for the users and can reduce the time of waiting at the entrance.
- To have a better registration procedure for those first time users. At the same time have to provide the RFID tag.
- 3. To have a verification process between the data stored and the RFID card data.

5.4 Conclusion

In conclusion, by using this system, students and staffs will be able to overcome their problem which is the guard will be check the coming vehicle by one by one for clarification either they are real people from SSMP or not. Automated barrier gate system by using RFID is design to fulfil their user needs. Although this prototype turned out to be exactly the same as what have been design and there is still a lot of scope can be improve in the future works.

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