WEB-BASED ELECTRONIC GATE PASS SYSTEM OF PSHS-SRC USING RADIO FREQUENCY IDENTIFICATION AND SHORT MESSAGING SERVICE APPLICATION PROGRAMMING INTERFACE

A RESEARCH PROJECT

Presented to the Faculty of
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Research 3

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ABSTRACT

Philippine Science High School – SOCCSKSARGEN Region Campus currently uses a paper system to keep track of the entry and exit of its students. When it was initially implemented, there were fewer students and the paper system was enough. But with the increasing number of students, the current system is vulnerable to error and falsification. An electronic system was developed to efficiently monitor students. Using WAMP, a web-based system was developed to allow students to fill out and process their forms faster. Then, after the forms are approved by their respective dorm managers, the students then will have to tap their RFID card on a reader to be able to leave the campus. They are also required to tap their RFID card on a different reader to enter the campus. The system provides more security and safety to the students because it sends SMS to parents when a student exits or enters the campus. The system was used and tested by the dorm staff and selected dormers. A survey was conducted using SUS, and the system scored an average of 87.6 for the students and 78.1 for the dorm staff. The score indicates the high satisfaction rating from the participants. Moreover, minor improvements can still be done to improve the electronic system including its implementation for the non-dormer students.

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LIST OF ACRONYMS

API	-	Application Processing Interface
GPRS	-	General Packet Radio Service
GSM	-	Global System for Mobile communications
GUI	-	Graphical User Interface
ID	-	Identification
LAN	-	Local Area Network
LCD	-	Liquid Crystal Display
LED	-	Light-emitting Diode
NFC	-	Near-field Communication
PC	-	Personal Computer
RFID	-	Radio Frequency Identification
SMS	-	Short Message Service
SQL	-	Structured Query Language
TTL	-	Time to Live
WAMP	-	Windows, Apache, MySQL, PHP

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Philippine Science High School SOCCSKARGEN Region System Campus (PSHS-SRC) relies on a basic paper system to keep track of its scholars. It was sufficient in the beginning. However, as the number of scholars studying in this campus grew, the system proved inefficient.

To keep up with the demand, the school needs to employ a system that is more secure and efficient. The current system is slow and relies on students submitting forms. Given the high human involvement, there is always a chance for loss of data. A new system must be developed in order to keep track of students' comings and goings. An electronic system is more suited for this, since it is able to generate a report automatically.

The proposed system will utilize RFID technology, given that its use is already well documented in various fields (Ahsan, Shah & Kingston, 2010) that involve tracking an establishment's resources. More specifically, it has been successfully used more than once in the tracking of students in some schools (Bertumen, Lorino & Nilles, 2016).

Radio Frequency Identification, often shortened to RFID, is a term that describes a system of identification (Bohn, 2008). It is based on storing and remotely retrieving information or data as it consists of RFID tag, RFID reader and back-end Database. RFID tags store unique identification information of objects and communicate the tags to allow remote retrieval of their ID.

Utilizing RFID technology in an electronic system is advantageous for numerous reasons (Akpinar & Kaptan, 2010), such as a wealth of journal resources for the system given that it's well-documented and there are systems in place similar to the proposed system; no extra power supply is needed (for passive RFID tags) since the power is supplied by the reader; and the possibility of real-time tracking.

1.2 Statement of the Problem

The gate pass system of PSHS – SRC is no longer secure for scholars; there is only a signed piece of paper and lax implementation preventing them from leaving the campus. According to the disciplinary officer of the campus, some students have been known to exploit the vulnerability of the current system in order to leave the campus unnoticed. A new system must be proposed that will aid the school administrators in facilitating the students by reducing repetitive tasks and human-made mistakes and to improve the students' security.

1.3 Objectives of the Study

The study generally aims to create an electronic gate pass system on PSHS-SRC.

The study specifically aims to:

1. create a web-based gate pass system in PSHS-SRC using HTML, CSS and JAVASCRIPT as front-end and PHP as back-end.
2. create a notification system that will send an SMS to notify the student's guardian when the student leaves or enters the campus using SMS API.

3. create a server that will make the system accessible through internet connection using port forwarding and WAMP.
4. create an organized and efficient system that is useful, user-friendly to all scholars, and can record whenever students leave or enter the campus by programming an RFID scanner and creating a database using MySQL.
5. gauge the performance of the system using a certified system usability scale (SUS).

1.4 Significance of the Study

Below are the beneficiaries of the study and significance of it:

1. Parents and dorm managers will be more informed about the entrance and exit of scholars.
2. Logging in and logging out will be more convenient, faster, better and safer.
3. Records about entrance and exit of scholars will be organized and exit of dormers.
4. Signing out and signing in using papers are somehow obsolete. PSHS-SRC needs to improve its systems and this is one of it, making the gate pass system automated and easier for all.

1.5 Scope and Limitations

The study is only applicable to dormers of PSHS - SRC. Since the study only tackled the entrance and exit of dormers inside PSHS – SRC. Forty-six dormers and four dorm staff from

PSHS-SRC were asked to test the system. The testing was be conducted in the span of two days on PSHS – SRC grounds.

After testing, survey questionnaires were given out to the dorm managers and students who participated in the testing. The usability of the system was measured using a System Usability Scale (SUS). The questionnaire was only concerned with the participants' satisfaction of the system's efficiency and effectiveness. The proposed system was developed within 182 days.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Radio Frequency Identification

Radio Frequency Identification, otherwise called RFID, is a dedicated short-range communication that uses radio waves to automatically identify people or objects (Haron et al, 2010). It is widely used in supply chain management, security, and tracking of objects and personnel. Simply put, RFID systems mark items with tags that emit messages readable by specialized RFID readers. Most tags store a series of numbers that allow the reader to identify the tagged object (Weinstein, 2005). Take for example, in the study of O'Hallaron and Glavin (2006); the researchers utilized an RFID system in order to keep track of patients and their biodata by assigning each patient with a unique number that was linked to a database. It was effective in monitoring the patients and efficient in retrieving information for each.

Moreover, SMS APIs have been commonly used as notification systems, particularly in healthcare (Mukund & Murray, 2010) and disaster notifications. Given that it can send bulk messages from a web browser, it is crucial to the development of this study's system. Using that feature, the system can send text messages to concerned parents and increase their children's safety.

2.3 SMS API Integration

A short message application programming interface (SMS API) allows you to integrate SMS services with a website, third-party application, mobile app or CRM. It used as an interface

used to make a reliable, open correlation between a website and the SMS service provider (SMS Gateway Philippines, 2019). There is no business which is untouched by the benefits of growing and leading SMS APIs. SMS APIs are incredibly fast and are used frequently in sending mass texts due to their remarkable cost-effectiveness (Tandon, 2012).

2.3 Local Area Network

Since the system will be utilized in separate locations, there should be a way for a database to be shared among its components. Data can be immediately accessed when it's stored on a LAN. This gives the management insight into what's happening across the system when it happens, leading to more effective and intelligent decision making. In addition to this, data backups done over a network can be centrally managed and scheduled, which makes them more reliable in the long run. They can also be saved to an off-site location, meaning that the backups are secure and safe from any downtime or other untoward incidents.

To do this, a local area network (LAN) will be implemented. A LAN is a collection of computers and peripherals interconnected within a limited geographical area. This area may be one building or one campus within a few kilometers. Out of different types of networks, LANs can be distinguished by its high speed and low error rate (Wijuntunga, 2000). The proposed system will only require a simple local area network, consisting of a server and a client.

2.4 Windows, Apache, MySQL, and PHP (WAMP)

The proposed system should be able to send and receive information through various devices. The most convenient way to do this is through a server, which will receive queries and handle them according to set conditions. For example, when a student fills out a form on their

device, the system must be capable of transferring that information to the correct database and retrieve the relevant information efficiently and quickly.

To set up a local server on Windows 10, this study will make use of WAMP. WAMP is a model of a web service stack, named as an acronym of the source of its four open-source components: Windows, Apache, MySQL, and PHP. It is a variation of the LAMP stack, differing only in the operating system they use; where LAMP utilizes Linux, WAMP uses the Windows platform (Rouse, 2008). Apache is used as the web server, MySQL is the WAMP's relational management system (RDBMS), and PHP is traditional language associated with WAMP, though its role could be played by other languages such as PERL and Python.

2.5 Agile Software Development

For the proposed system to keep up with dynamic demands, its development must ensure that it will be able to respond accordingly to each query. Agile Software Development is an umbrella term for a set of methods and practices based on the concept that since developers cannot fully anticipate every aspect of a project, the development will adjust accordingly to the requirements (Sacolick, 2018).

In comparison to the Waterfall Model, it is more efficient given that the Waterfall development process required a lengthy documentation process before any coding was done. This documentation became more of a hindrance as time went on since they required years of work and any changes that would have vastly improved the system became more difficult and expensive to correct (Houghey, 2009). Agile frameworks and development processes prioritize

delivering working software iteratively and promote leveraging feedback to improve the application and process is more suitable to today's world of operating smarter and faster.

2.6 RFID-SMS-Based Systems

While many studies have focused greatly on utilizing RFID as it is, there are certain studies like the studies of Vidyasagar, Balaji & Reddy (2015) and Farooq et al. (2014) that have interlinked Global System for Mobile Communication (GSM) and RFID, which means the designed systems of both studies can send an SMS or MMS.

RFID-GSM-based systems can be interlinked through programming an RFID reader like EM-18 to communicate to an ARM7 microcontroller serially using the line driver MAX 232 for verification. Then the microcontroller was programmed to communicate also to the GSM modem serially via MAX 232-line driver. The system will automatically send an SMS to people involved if some requirements of the system are not met (Vidyasagar, Balaji & Reddy, 2015).

Farooq et al. (2014) used an AT89C52 microcontroller in order to accomplish their study. This specific model was chosen due to its low power consumption, providing a highly flexible and cost-effective solution to many embedded control applications. Alongside this, the study also utilized a Nokia12i GSM mode, which offers advance GSM connectivity and supports various connections. Both studies succeeded in integrating the GSM and RFID, which shows that both components are able to work together in one system. However, in this case study, an SMS API will instead be used in order to increase efficiency.

CHAPTER 3

METHODOLOGY

The researchers simultaneously coded the UI, develop the database, and coded the Arduino-RFID after required materials were procured. The hardware and software were integrated after small units were coded. Then development of computer network between entrance and exit of the campus was commenced. Lastly, the researchers and participants tested the system; errors were fixed until the system was running smoothly. The figure below shows the summary of the methods to be performed.

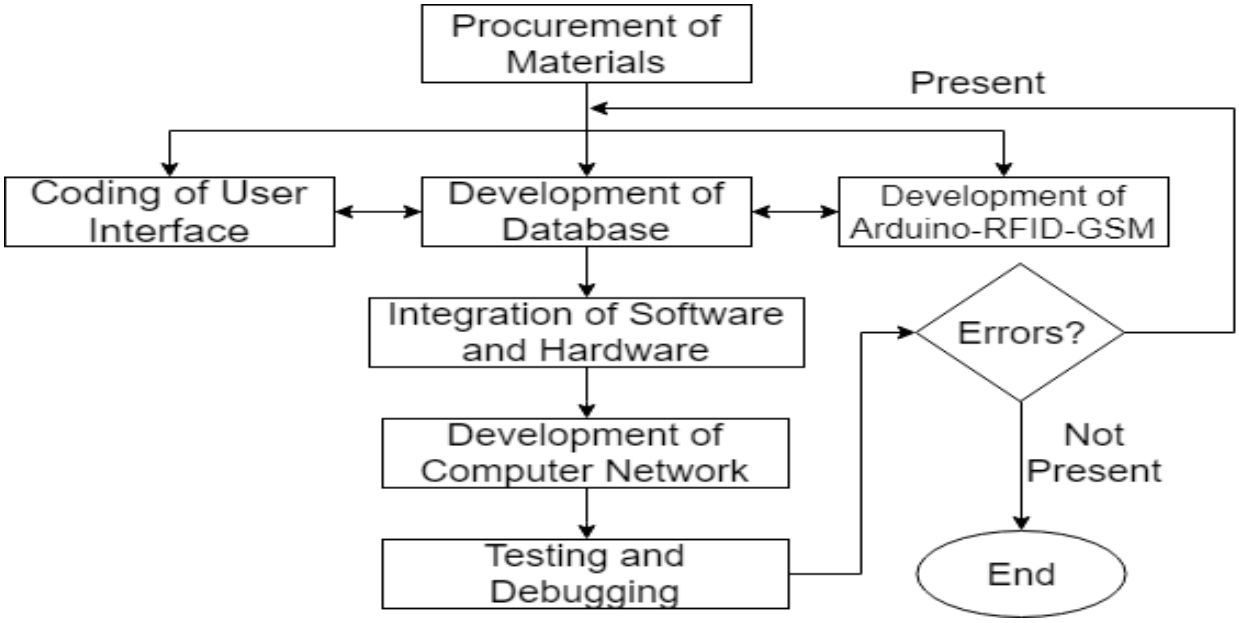

Figure 3.1 Flowchart of Methodology.

3.1 Procurement of Materials

The researchers ordered the materials (see Table 3.1) needed from different online shopping store like Lazada, Shoppee and E-gizmo for convenience, since most of the materials are not available from the nearby area.

Table 3.1 Materials needed with their corresponding price and source

Material	**Price w/ Shipping Fee**	**Source**
gizDuino Version 5.0 with ATmega328 (Arduino UNO Compatible Kit) w/ Free Case	P525.00	E-gizmo
MFRC-522 RFID NFC Reader with card and tag	P225.00	E-gizmo
SMS API Credits good for 1 month of testing	P500	Sephamore
Ugreen CAT6 RJ45 Connector Ethernet Patch Lan Cable 5m	P416.00	Ugreen

3.2 Agile Software Development Approach

Agile Software Development is an umbrella term for a set of methods and practices based on the values and principles expressed in the Agile Manifesto. Solutions evolve through collaboration between self-organizing, cross-functional teams utilizing the appropriate practices for their context (What is Agile Development?, n.d.). (see Figure 3.2).

Researchers followed the principles of Agile Software Development. Therefore, researchers first met as a group and started to think of a problem, which was the inefficient gate pass system. Then researchers planned on how to solve the problem. After the planning, each researcher designed his or her own system that can help solve the existing problem. Then researchers picked the best design to solve the problem and started developing the designed system. After development, researchers and participants tested the system if it works. After the

testing, researchers and participants evaluated the system if it meets their expected output and design. During the evaluation, researchers also determined the error and flaws of their system to do same thing all over again. Cycle ended when all requirements were met.

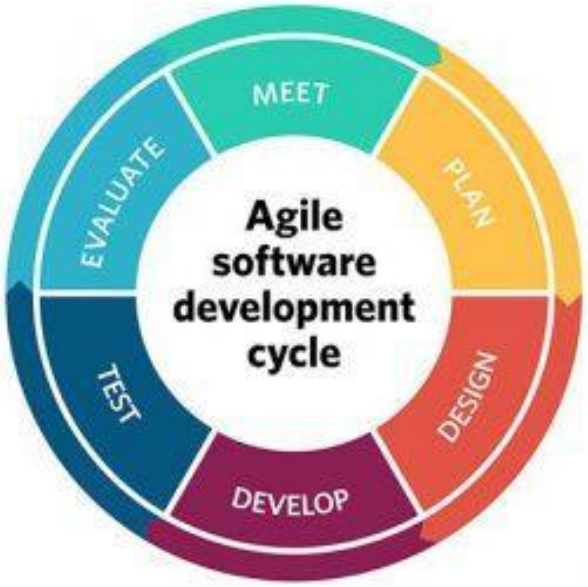

Figure 3.2 Agile software development cycle from 10 Key principles of Agile Software Development (2019).

3.3 Development of Database

Database was created through the data gathered from participants. Researchers give each participants a form for gathering information and information were added to the database. The information gathered were parallel to the variables in the table student_data in Figure 3.3. The researchers used MySQL 5.6.17, which was one of the relational management systems of WAMPServer v. 2.5. The ER diagram shows that the key that is being circulated around the database is the rfid data of each student.

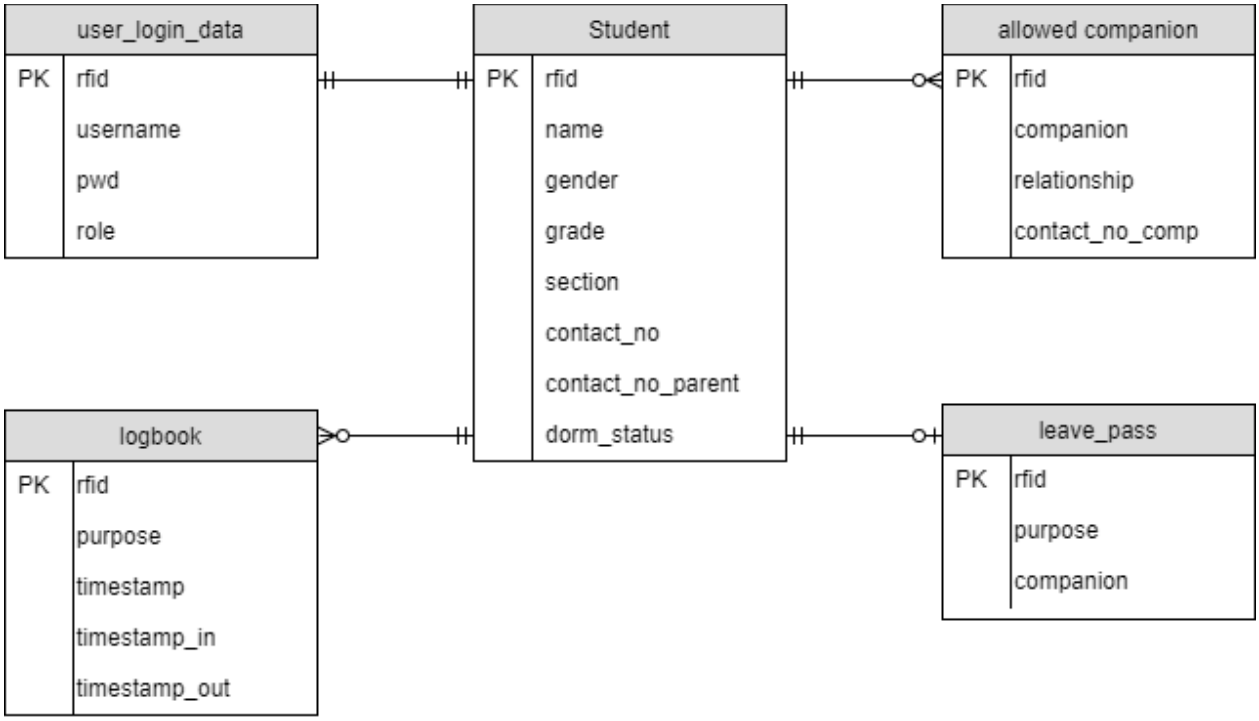

Figure 3.3 Entity Relationship (ER) Diagram of the project.

3.4 Development of Arduino-RFID

Arduino was used as a platform to send and receive data from RFID and GSM shields of Arduino. The researchers also imported the RFID library and SoftwareSerial library in order to read RFID cards/tags. (see Figure 3.4).

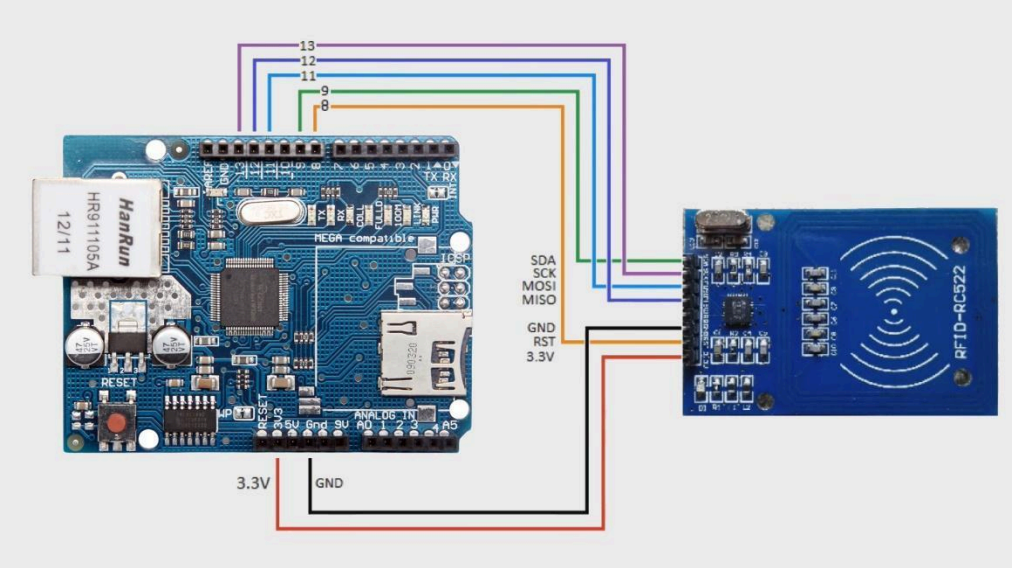

Figure 3.4 Circuit of Arduino and RFID module from Arduino UNO + Ethernet + RFID (2014).

Name	Type	Description
SDA	Input	Synchronizes data
SCK	Input	Synchronizes data
MOSI	Input	Sends data
MISO	Output	Receives data
RST	Input	Restarts program
Gnd	-	Ground
5V	Input	Power input

The table below shows the circuit's serial names with their types and descriptions between Arduino and RFID module.

Table 3.2 Serial connections descriptions

3.5 Development of SMS API

Semaphore was used as third-party system to send SMS to participants and participant's guardian. The text message can be modified in the PHP code and PHP will send a JSON file to

the website via running CURL on the command prompt where Semaphore will send the SMS and will return a JSON containing the status of the request.

3.6 Coding of User Interface

HTML5 and CSS3 was used as the main programming language for programming front-end design or the interface since PHP 5.5.12 will be used as the back-end language and PHP is always associated with HTML and CSS. (See Appendix B).

3.7 Integration of Software and Hardware

RFID was integrated through connecting the RFID to one of the USB port of the server. It was connected to the system using a third-party open-source software called CoolTerm from Robert Meier. It creates a txt file that will generate everything the serial monitor of Arduino prints. Then each line will be verified by the PHP code and it will evaluate each RFID number.

Figure 3.5 RFID and PC diagram made using Draw.io.

The system works every time the RFID reader will detect a RFID card, the Arduino will send the number of the card to the program. The program will then identify the owner of the ID and outputs the student's information. The program will then send the students' parents number back to Arduino, and the Arduino will send a SMS message to the parent. (see Figure 3.6 and Figure 3.7).

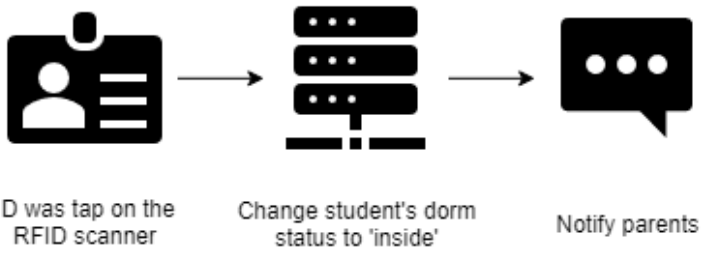

Figure 3.6 Workflow diagram of the system (Exit) made using Draw.io.

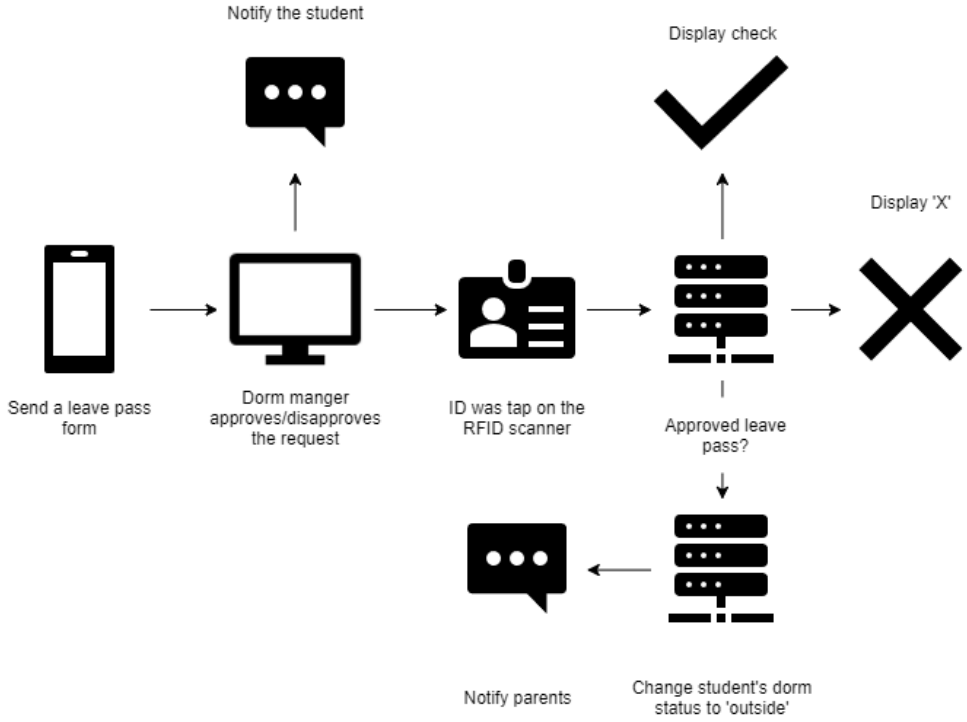

Figure 3.7 Workflow diagram of the system (Entrance) made using Draw.io.

3.8 Development of Computer Network

A personal computer was put inside the guard house and served as the main server. Apache 2.4.9 was used as the web server since it is part of WAMP and it was much easier to interlink it to other languages and to the database. The personal computer was connected via

LAN using Ethernet cables. Through this, other PC can access the program just by entering the link from the browser and get access by logging in to the system to view all the records.

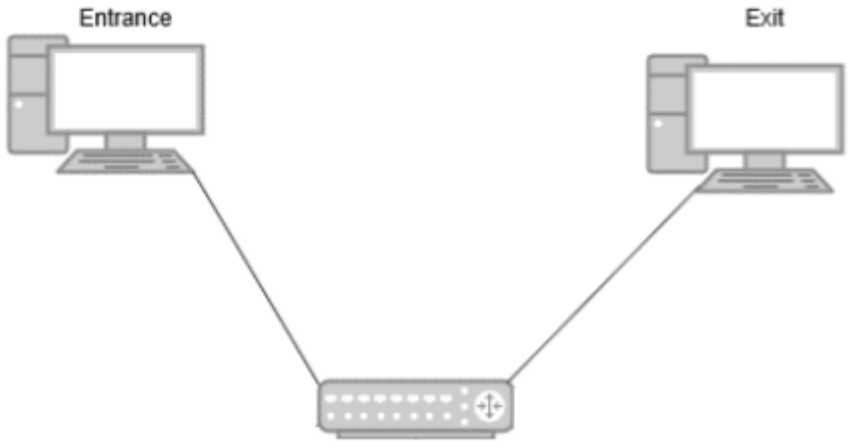

Figure 3.8 Network diagram of the proposed system made using Draw.io.

3.9 Testing and Debugging

Traditional shift-left testing was used to test the capabilities of the system. Traditional shift-left focuses on Unit Testing and Integration Testing.

3.9.1 Unit Testing

Each modules of the system were tested. Both researchers and participants are required to do this. Buttons were tested if it works accordingly to the system. Each page was accessed and see if there were any errors. Each error was reported to the researchers for debugging.

3.9.2 Integration Testing

The system was tested and see if all modules are well-integrated to other modules. Researchers and participants tested all pages and see if they worked to other pages as well. They

tested if the data from pages in PHP shows the data in the database. They also tested if the RFID works well to the rest of the modules. Errors were reported to the researchers and fixed immediately.

3.10 System Requirements

Computers used operate through the operating system of windows since the system will use WAMP and WAMP requires the operating system to be windows. Windows's version can be anything from Windows XP up to the latest since the languages that were used are only compatible to these versions of windows. The system required the installation of WAMP in the server. WAMP was used since it has the 4 components that are needed in the system, Windows, Apache, MySQL and PHP.

The software requirements for mobile phones to access the system was to have a browser installed in it. Lastly, to access the system, a computer or mobile phone should be connected through internet.

3.11 Conduct of Usability Survey

An evaluation will be conducted in order to solicit the usefulness and ease of use of the proposed system. The respondents will be from various backgrounds but chosen from two groups of school students: interns and externs. To evaluate the system, a questionnaire will be administered that will be designed based on System Usability Scale (SUS). The respondents will have to fill up the questionnaire once they have completed experiencing with the system. 10 statements/items will be prepared altogether for both categories and for both types of respondents. Researchers will have to rank between one (1) to five (5) for each statement in the

questionnaire given. One (1) means strongly disagree while five (5) represents strongly agree. (See Apendix A.1)

CHAPTER 4

RESULTS AND DISCUSSION

This chapter reports the findings of the study based upon the methodology applied to gather information. The results chapter states the findings of the research, arranged in a logical sequence without bias or interpretation.

4.1 Graphical User Interface (Front-end)

The system was successfully made using HTML, CSS and JAVASCRIPT as the main front-end languages. It displayed the pages needed to the system. Every page was well-integrated and connected to the other pages and no major error showed after development. It can be accessed through PC (See Appendix B) and through mobile phones (See Appendix C).

4.2 Database and Back-end

Using PHP as the back-end language was also a success. It showed the correct information gathered in the database. It was integrated to the front-end and it displayed the information and data properly to the front-end side.

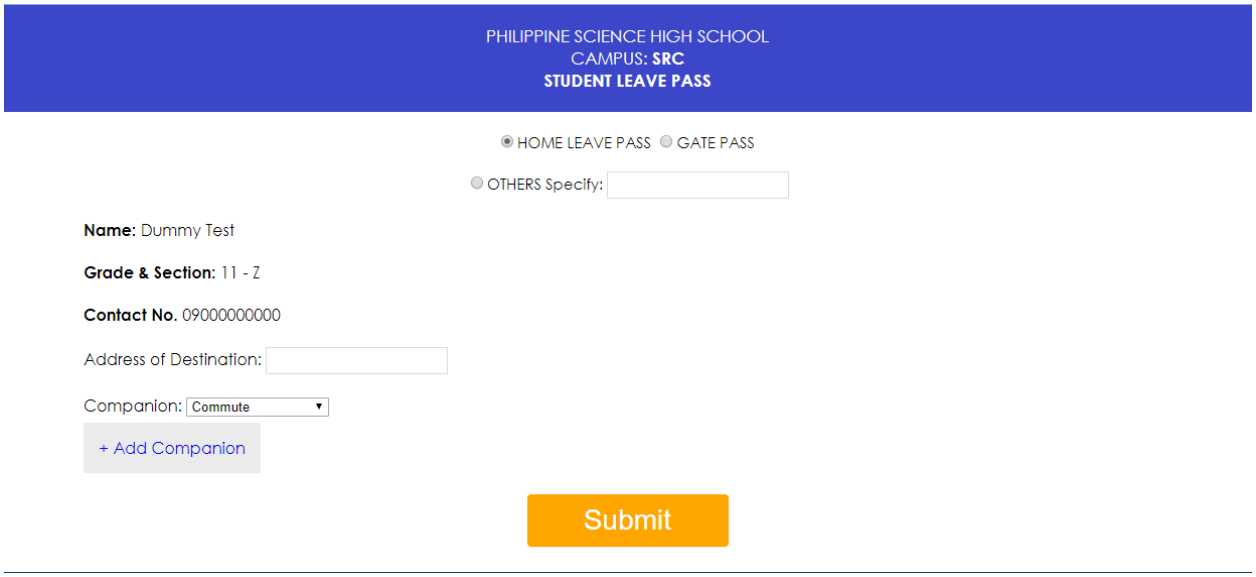

Figure 4.1 Screenshot of the web-based leave pass form.

As shown in Figure 4.1 the name displayed was accessed through using the query "SELECT * FROM student_data WHERE rfid = 'rfid'", which selects the student where the rfid in the user_login_data matches the student_data. With that, it displays the name, grade & section and contact number that contains the rfid in the user_login_data.

4.4 RFID Integration

The use of the third-party app CoolTerm helped the system gather data from the Arduino serial monitor. The text file made by CoolTerm (See Appendix D.1) and prints new line for each RFID read by Arduino. The "ABCDEFG" in every new RFID was added to prevent RFID stay too long as the current RFID in the file. See Appendix B.9 for how the system prints and accessed the text file of CoolTerm.

4.2 SMS API Integration

The SMS API that requests the third-party app (Semaphore) was used and was successfully integrated to the system. It sent JSON file to Semaphore, Semaphore access the JSON, and then Semaphore sends the message. It sent the messages needed for the students and messages that was for guardians or parents. No error occurred after development regarding the SMS API.

For students, a message notifying that the leave pass request was approved is sent to their personal phone number. A sample screenshot of the SMS is shown in Figure 4.3. Meanwhile, Figure 4.4 shows the sample message sent to the parents. The parents will receive the message notifying them that their child is in or out of the campus with the corresponding time.

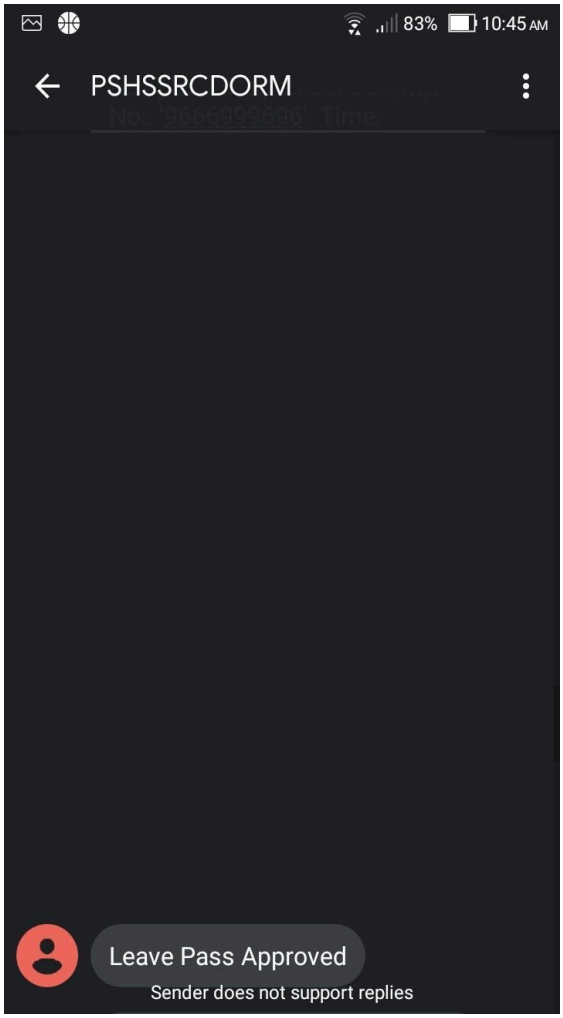

Figure 4.2 Approved leave pass SMS for dormers.

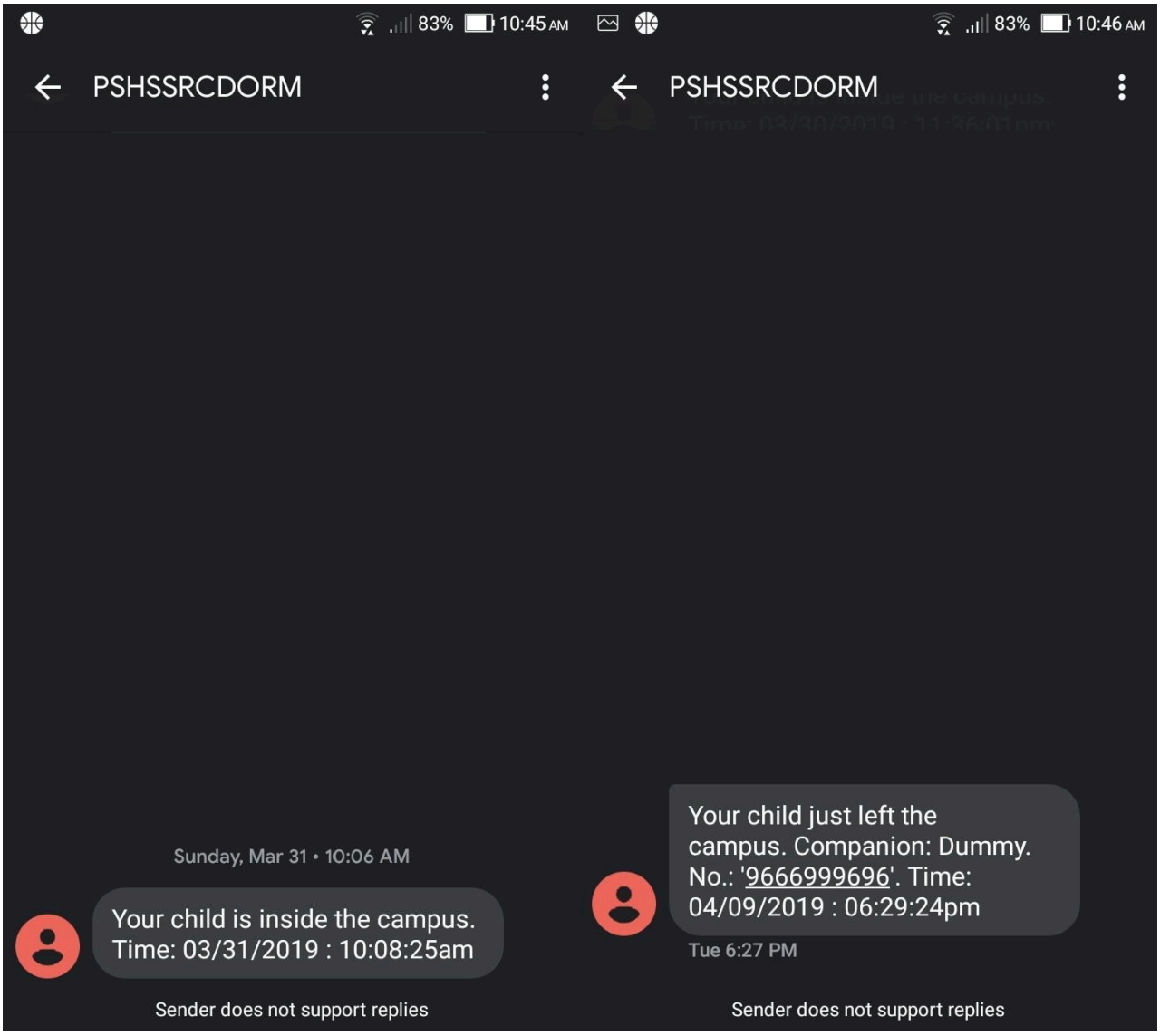

Figure 4.2 Dormer exit SMS for parents and guardians (A) and Dormer entry SMS for parents and guardians (B).

4.3 Server

The WAMP made the system accessible to the testers through localhost, because WAMP offers Apache as one of its open-sources and Apache accepts the requests of the users and sends

the response to that request. It was already accessible to the testers by just connecting to the same network as the server, but to make it accessible through using mobile internet connection, port forwarding was used. The port forwarding made the system accessible anywhere, because the IP address of a router was used as the IP address of the system.

4.4 System Usability Scale

All the respondents (*n = 50*) gave the system an acceptable score (See Appendix E). The student participants have an average SUS score of 87.55 while the dorm staffs have an average SUS score of 78.125. A score above 70 generally means that the system's usability is efficient, effective, and satisfactory (Affairs, 2019).

In Figure 4.6 it shows the breakdown for the student participants' responses can be seen. The majority (46%), where *n* = 46, gave the system an excellent score. Only 17% of the student participants gave the system a perfect 100. It implies that some students are already satisfied with the system and feel that there is no further improvement needed.

However, in the breakdown of the dorm managers responses as seen in Figure 4.6 (Graph B) shows the overall score was lower when compared to the student participants. Out of the 4 participants, three have given it a score between 73 and 84 (Good) which means the system is satisfactory but needs a little improvement while scores 85 up to 100 means that the system is effective to the point that it is what the users imagined on how it will work.

A B

Figure 4.4 Breakdown of student participants' responses to SUS (A) and dorm manager participants' responses (B).

CHAPTER 5

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

With the growing population of PSHS-SRC, developing a system that will aid the school administrators in facilitating the students by reducing repetitive tasks and human-made mistakes and to improve the students' security is essential. In accordance to the goals and objectives of the study, the researchers were able to successfully create a web-based gate pass system in PSHS-SRC using HTML, CSS and JAVASCRIPT as front-end and PHP as back-end that also sends an SMS to the student's guardian when the student leaves or enters the campus using SMS API. Also, a server was created using port forwarding and WAMP that makes the system accessible through internet connection making an organized and more efficient system that is useful and user-friendly to all scholars that can record the comings and goings of scholars by programming an RFID scanner and creating a database using MySQL.

The SUS scores showed that those who used the system were satisfied with its performance; this signifies that the created system fulfilled its purpose well. However, due to the small sample size, this result might not be an accurate representation of the user's experience. It is recommended that future versions of this system increase the scope of users; from only the dormers to including the externs. Additionally, the system's efficiency will be increased if high-frequency, long-range RFID scanners are used, since it will be able to scan multiple cards at a time. Because of the system's agile software development method, more features may be added in the future in order to meet the demands of upcoming users.

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APPENDICES

APPENDIX A

SYSTEM USABILITY SCALE

System Usability Scale

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently	1	2	3	4	5
2. I found the system unnecessarily complex	1	2	3	4	5
3. I thought the system was easy to use	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5
5. I found the various functions in this system were well integrated	1	2	3	4	5
6. I thought there was too much inconsistency in this system	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly	1	2	3	4	5
8. I found the system very cumbersome to use	1	2	3	4	5
9. I felt very confident using the system	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system	1	2	3	4	5

Figure A.1 System Usability Scale by John Brooke.

APPENDIX B

SYSTEM PICTURES (COMPUTER DISPLAY)

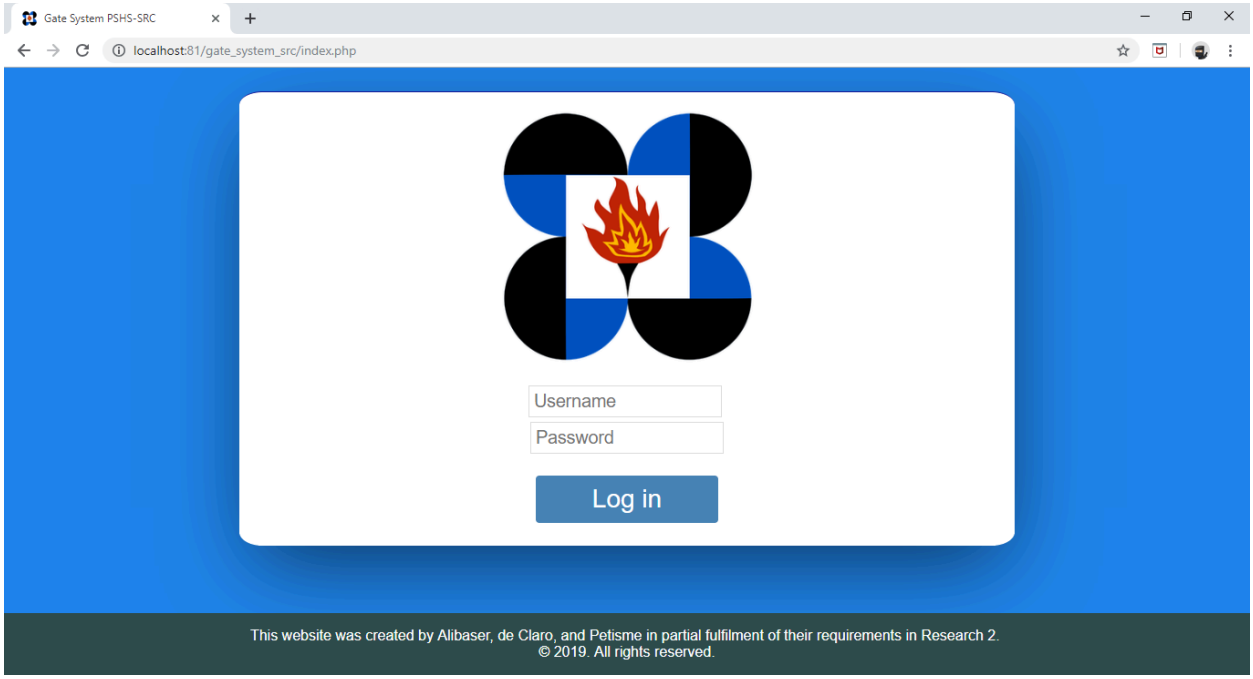

Figure B.1 Log-in page.

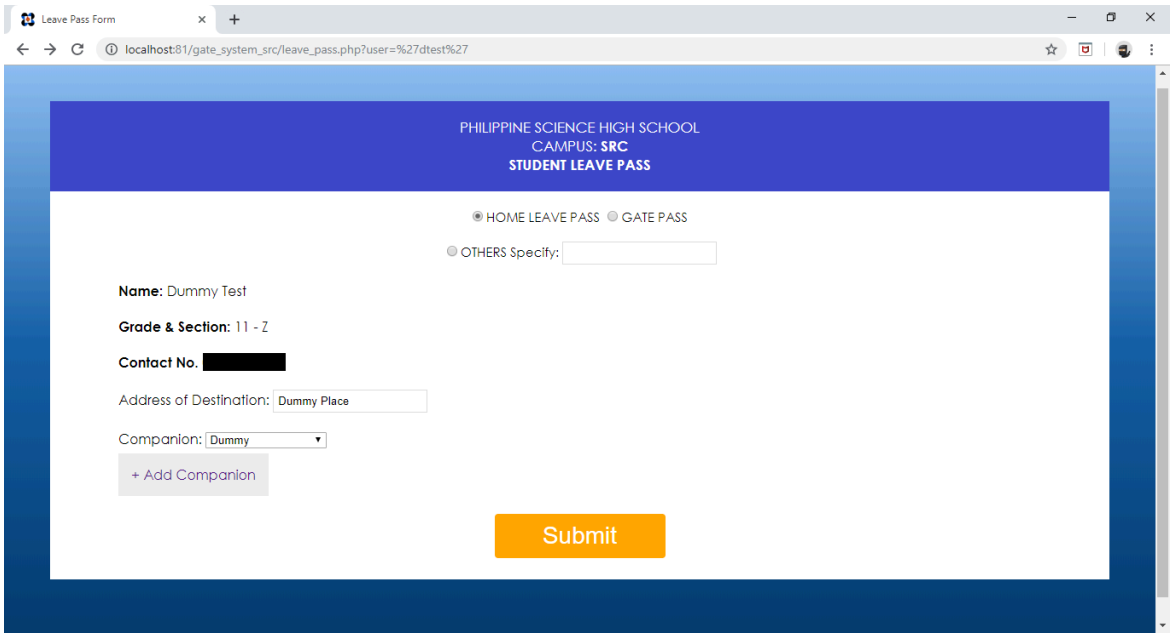

Figure B.2 Leave pass form page.

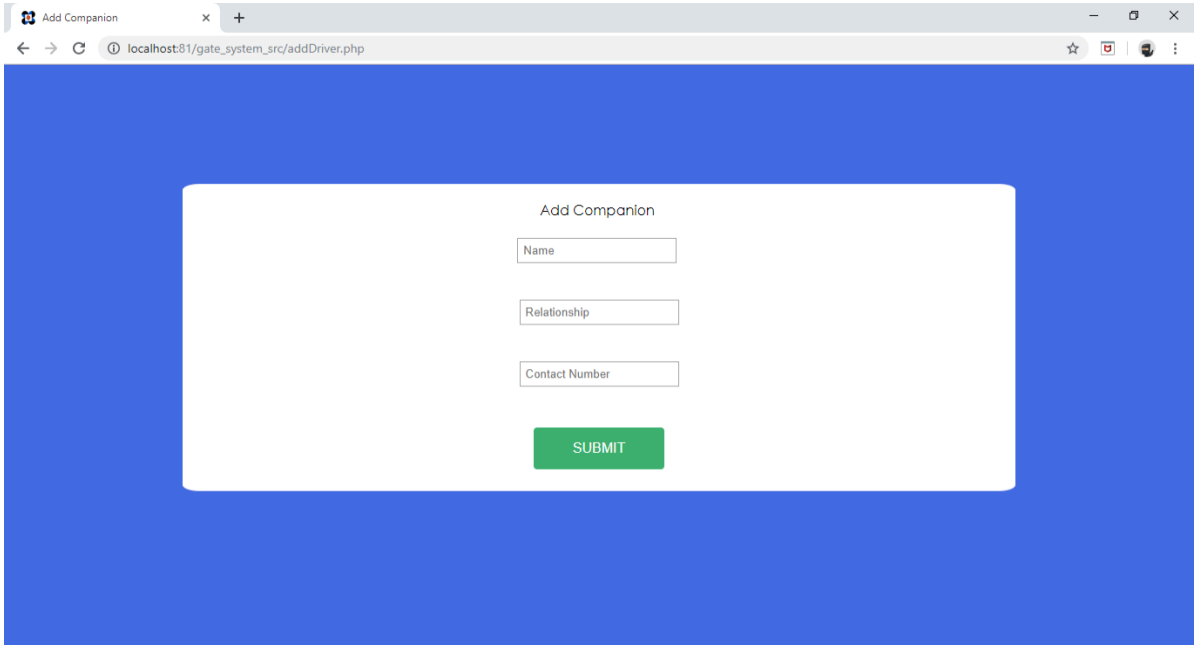

Figure B.3 Add companion page.

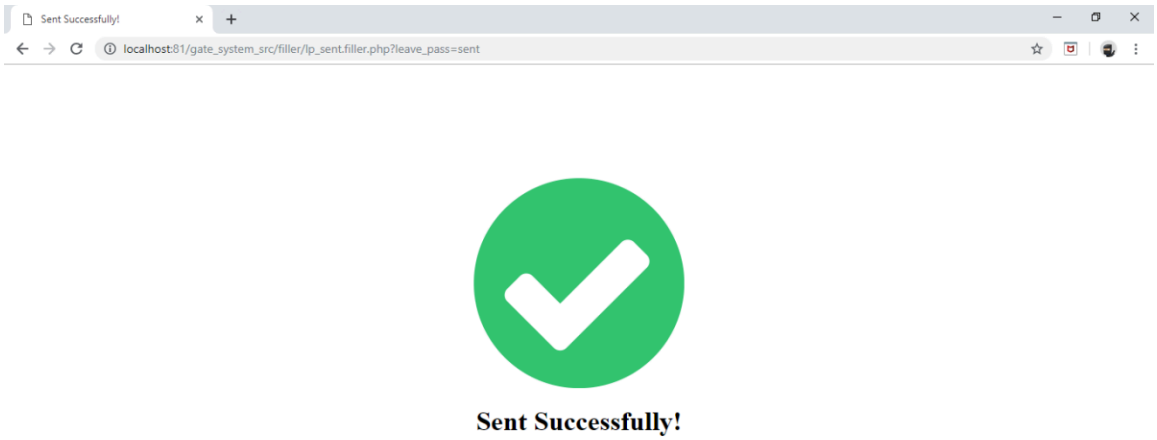

Figure B.4 Sent successfully page.

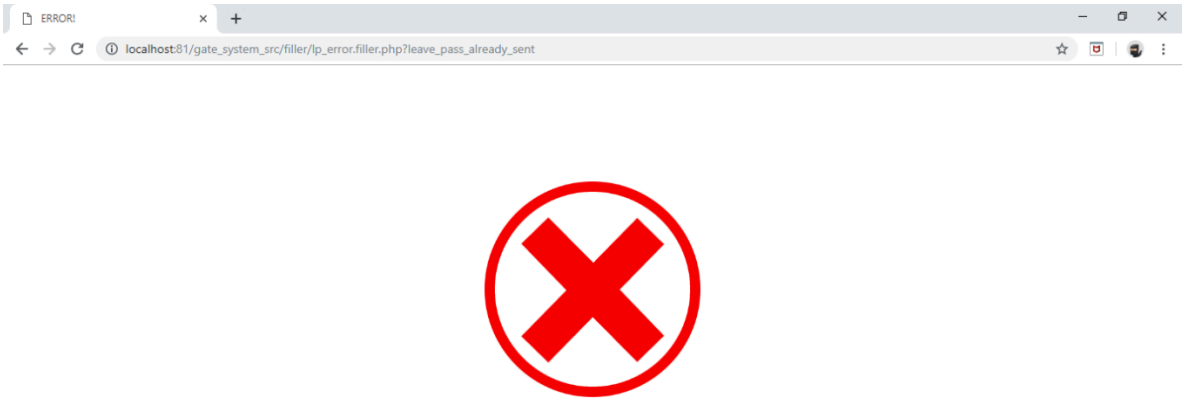

Figure B.5 Sent error page.

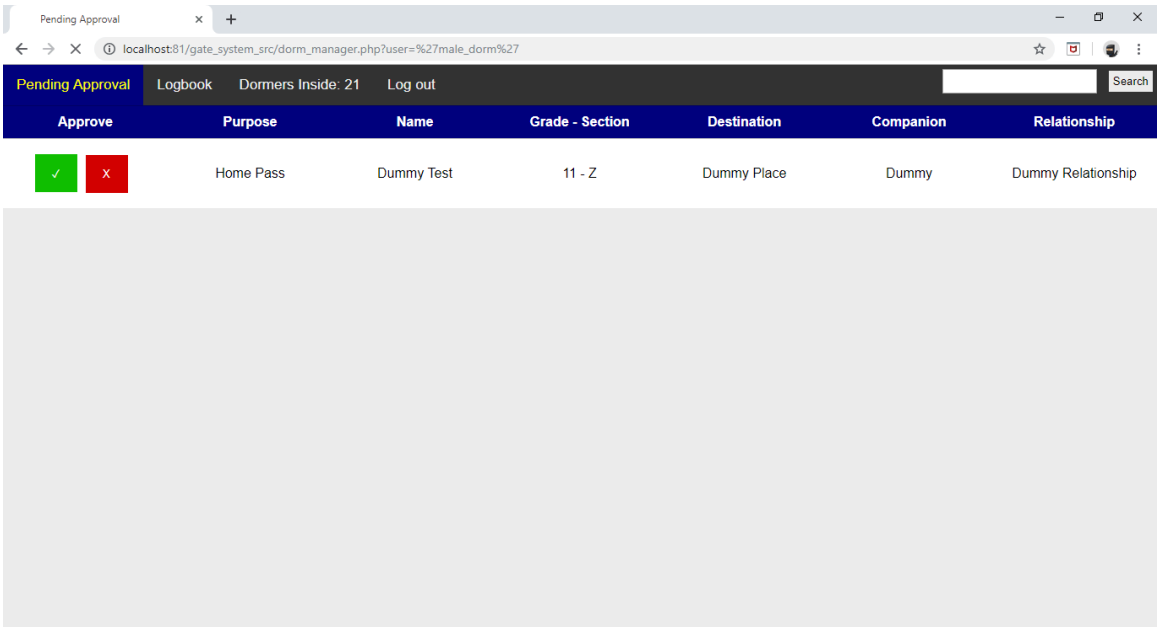

Figure B.6 Pending leave pass approval page.

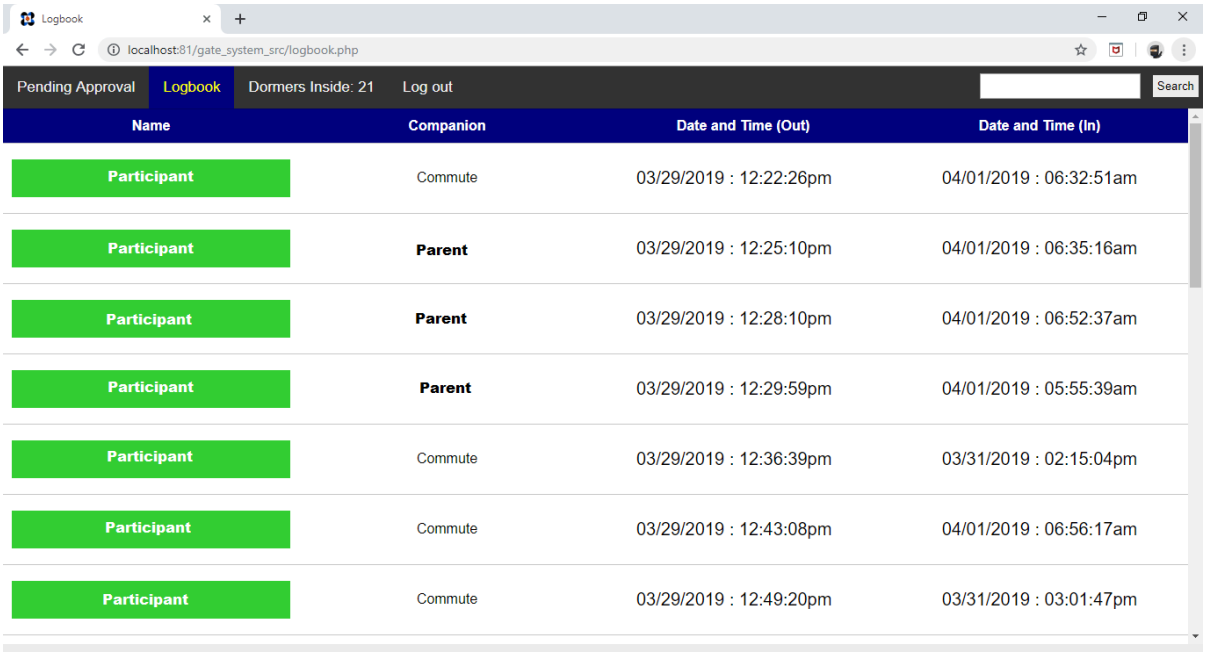

Figure B.7 Logbook page.

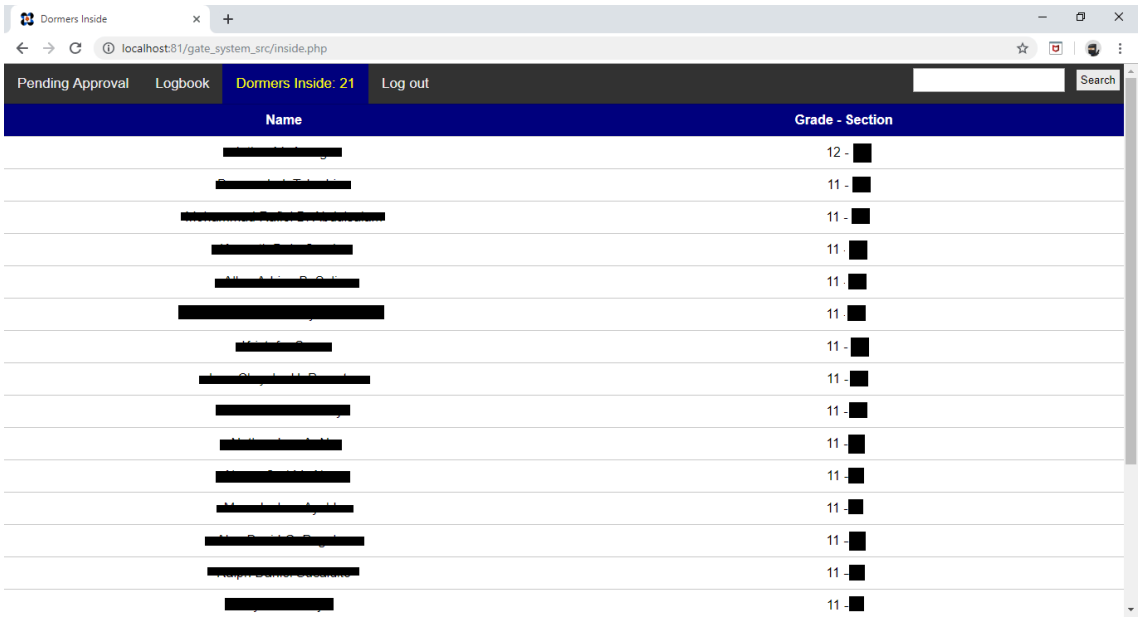

Figure B.8 List of dormers inside page.

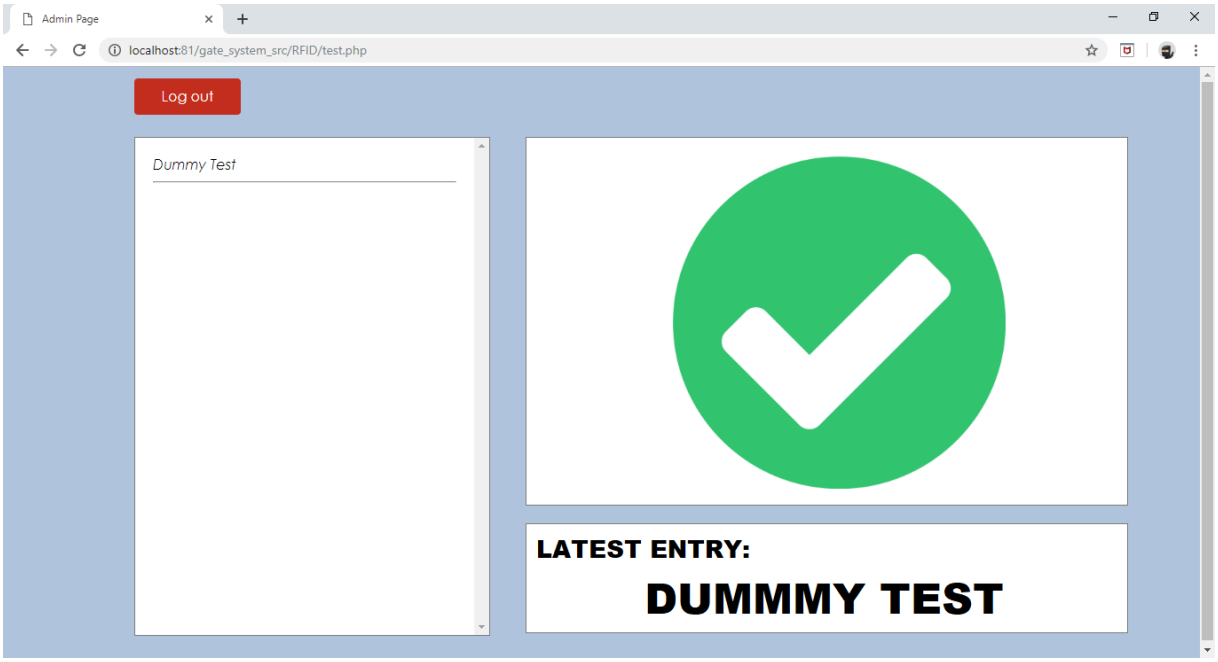

Figure B.9 RFID card checker page.

APPENDIX C

SYSTEM PICTURES (MOBILE DISPLAY)

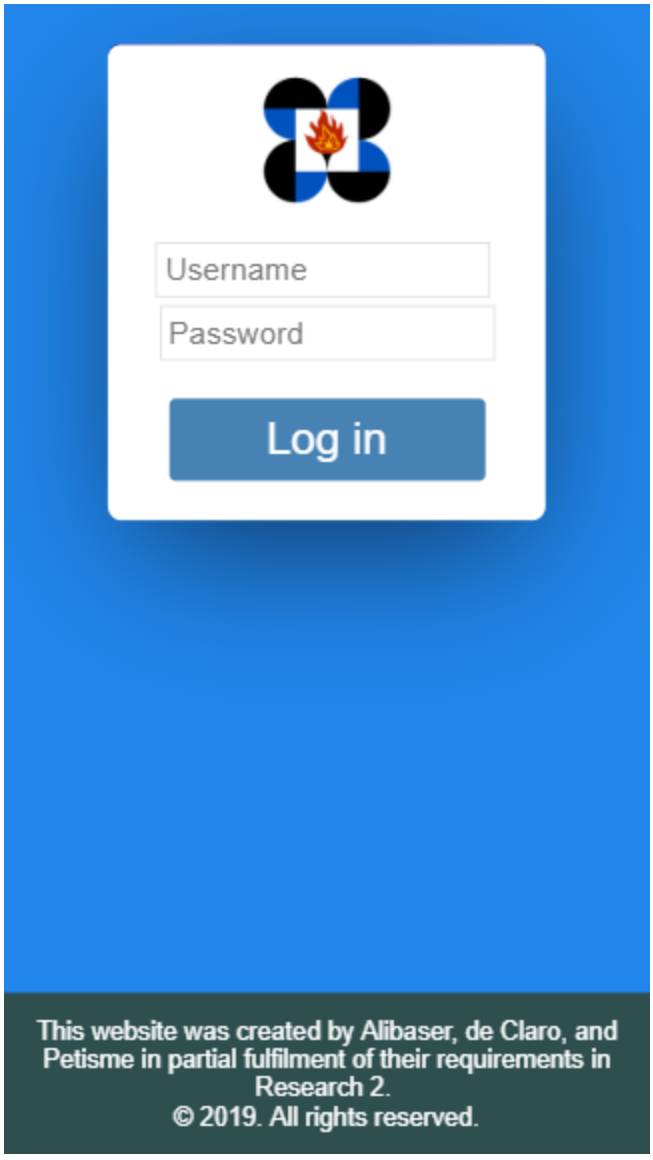

Figure C.1 Log-in page for mobile.

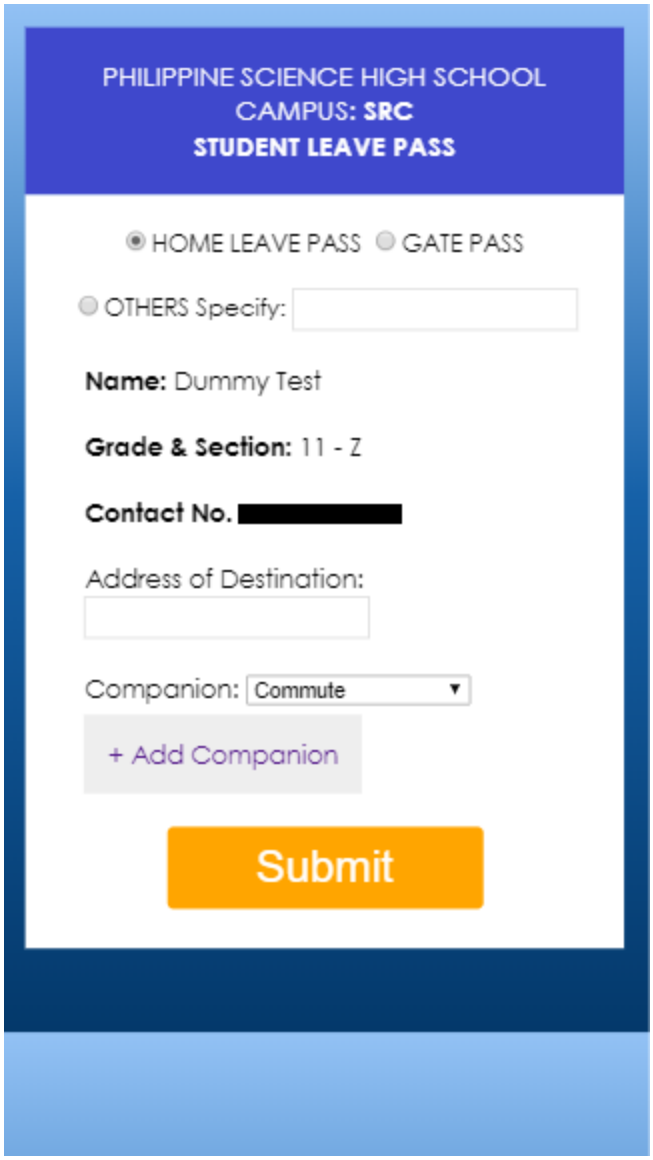

Figure C.2 Leave pass form page for mobile.

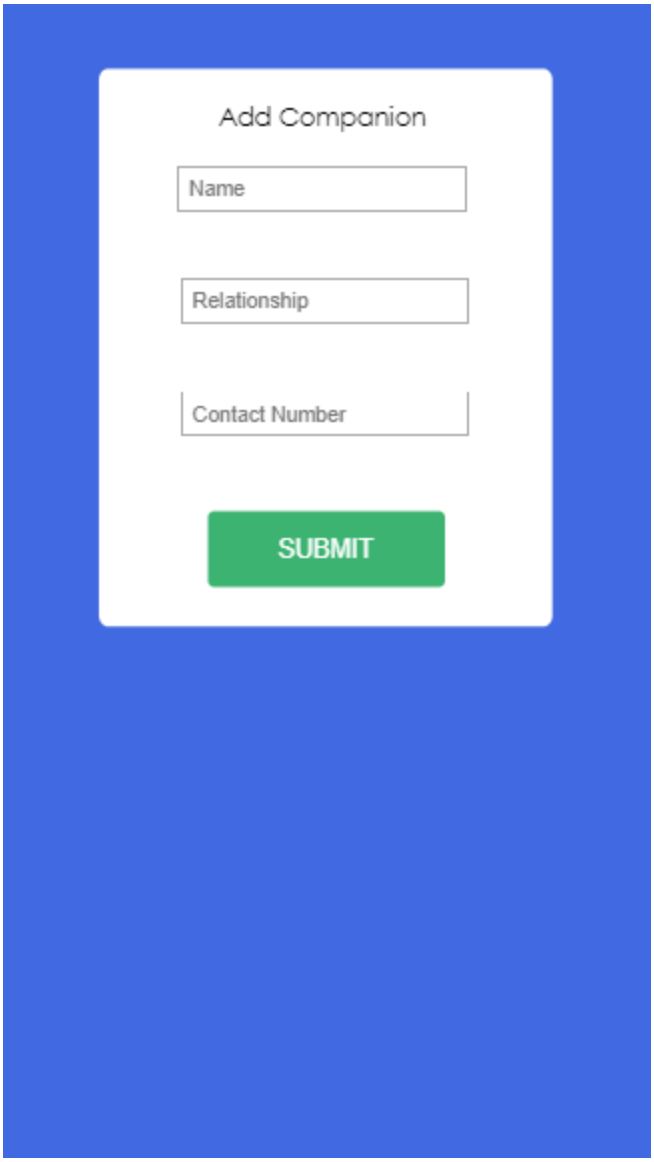

Figure C.3 Add companion page for mobile.

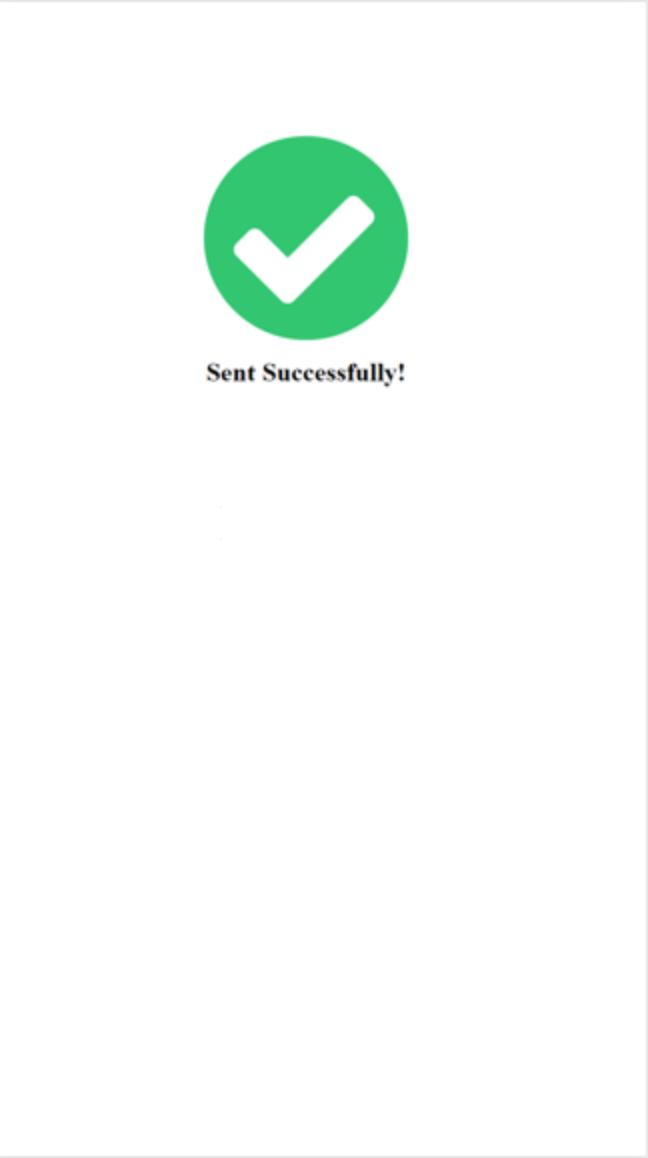

Figure C.4 Sent successful page for mobile.

Figure C.5 Sent error page for mobile.

APPENDIX D

CoolTerm Output

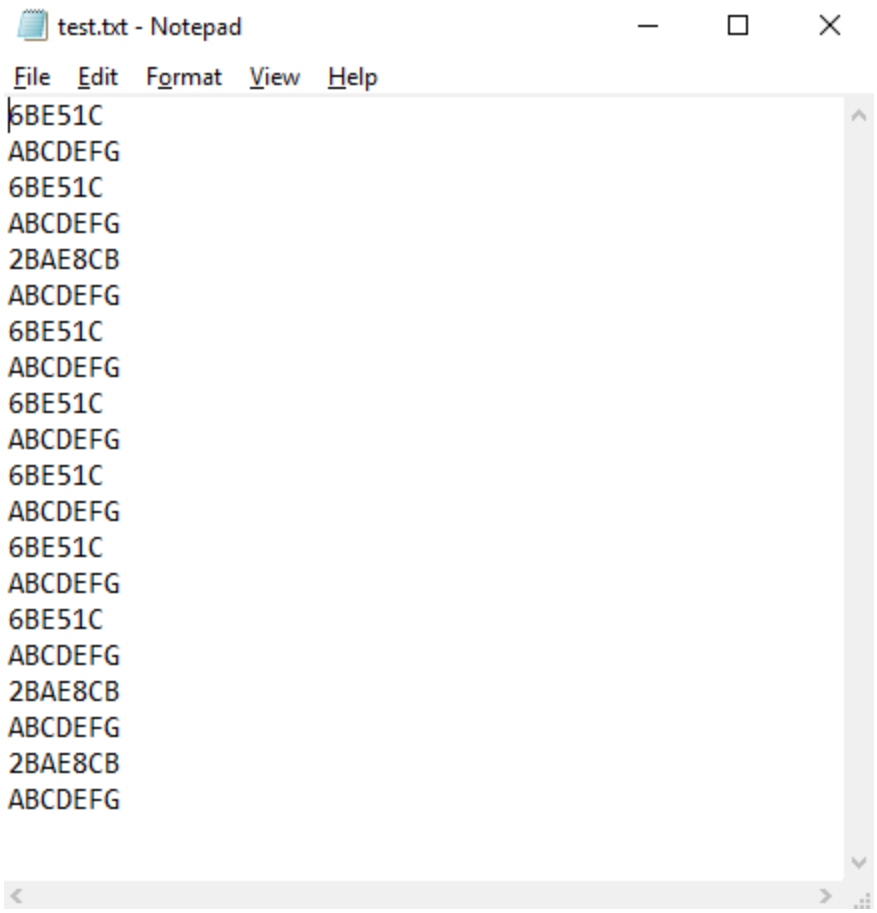

Figure D.1 CoolTerm's generated text file.

APPENDIX E

SUS RAW DATA

Table D.1 Dormer participants' scores for each question and their calculated SUS score

Participant	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	***Score***
A	4	2	5	1	4	2	5	1	4	1	87.5
B	5	1	5	1	5	1	5	1	5	1	100
C	5	2	5	1	4	2	5	2	5	2	87.5
D	5	1	5	1	5	1	5	1	5	1	100
E	5	3	4	1	4	2	5	2	4	3	77.5
F	5	2	4	2	5	2	5	2	3	2	80
G	5	1	5	2	5	1	5	2	5	1	95
H	4	3	4	1	4	2	4	2	4	2	75
I	4	2	4	1	4	2	4	2	5	2	80
J	5	1	5	1	5	1	5	1	5	3	95
K	5	2	5	2	5	2	5	2	5	3	85
L	5	2	4	5	5	1	5	2	5	2	80
M	4	2	4	2	4	3	5	1	4	3	75
N	5	2	4	1	5	3	4	2	4	3	77.5
O	5	1	5	1	5	1	5	1	5	1	100
P	4	2	5	1	4	2	5	2	4	2	82.5
Q	5	2	5	2	5	2	5	2	5	2	87.5
R	4	1	5	1	4	1	5	2	4	1	90
S	4	3	4	1	4	1	5	2	4	1	82.5
T	5	3	5	1	5	3	5	1	4	1	87.5
U	5	2	5	4	4	1	5	1	4	5	75
V	5	1	5	5	5	1	5	1	5	1	90
W	4	2	5	2	4	3	4	1	4	1	80
X	5	1	5	1	5	1	5	1	5	1	100
Y	5	1	5	1	5	1	5	1	5	1	100
Z	4	2	4	2	4	2	5	2	4	2	77.5
AA	3	2	4	1	5	1	5	2	4	2	82.5
AB	5	2	5	1	5	2	5	2	4	2	87.5
AC	5	1	5	1	4	2	5	1	4	1	92.5
AD	3	1	5	1	3	4	5	1	5	1	82.5
AE	5	1	5	1	5	1	5	1	5	2	97.5

Table D.2 Dormer participants' scores for each question and their calculated SUS score (continued)

AF	5	1	5	1	5	1	5	1	5	1	100
AG	5	1	5	1	5	1	5	1	5	1	100
AH	5	2	5	2	5	2	5	2	5	2	87.5
AI	5	1	5	1	5	1	5	1	5	1	100
AJ	5	1	5	2	4	2	5	2	4	2	85
AK	5	2	5	1	5	1	5	1	4	1	95
AL	4	3	4	1	4	2	5	3	3	1	75
AM	4	1	4	1	5	1	4	1	4	2	87.5
AN	4	2	3	2	4	1	4	2	4	2	75
AO	5	2	5	1	4	2	5	1	5	1	92.5
AP	5	2	4	2	4	2	4	1	5	2	82.5
AQ	4	1	5	1	5	1	5	1	4	1	95
AR	4	1	5	1	4	2	5	1	3	2	85
AS	5	2	5	1	5	1	3	1	5	1	92.5
AT	4	2	4	1	4	1	5	1	4	2	85
										AVG:	87.55

Table D.3 Dorm staff participants' scores for each question and their calculated SUS score

Participant	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	***Score***
A	5	2	4	4	5	1	5	1	5	5	77.5
B	4	2	4	2	4	1	4	2	3	2	75
C	4	3	4	2	4	1	4	1	3	2	75
D	5	2	4	2	5	1	3	1	4	1	85
										AVG:	78.125

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Experiences

- NOI.PH 2017

CERTIFICATE OF AUTHENTIC AUTHORSHIP

We hereby declare that this submission is our own work, to the best of our knowledge, it contains no materials previously published or written by another author person, nor material which, to a substantial extent, has been accepted as requirement of any other course at PSHS-SRC or any other educational institution, except where due acknowledge is made in the manuscript. Any contribution made to the research by others, with whom we have worked at PSHS-SRC or elsewhere, is explicitly acknowledged in the manuscript.

We also declare that the intellectual content of this manuscript is the product of our own work, except to the extent that has assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.

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