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Design and Optimization of Bus Booking System using Dijkstra's algorithm

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Abstract:

It is very clear that people spend so much time in a bus station or park due to the fact that some empty buses will be wasting time in a particular station, while commuters will wait for the bus in another station of the same transport company. This is a web-based application that will manage the scheduling of buses in all bus terminals of a transport company. With this software, an administrator can manage bus station or terminals departure time, routes, vehicle type and driver including the cashier(s) for the terminals. Passengers will also be able to view schedules and make plans for a trip. This project was borne out of the need to enable bus transport companies to manage their bus schedules to avoid scarcity of buses in some terminals where they are needed whereas at other bus stations of the same transport company there are empty buses. Different scheduling algorithms can be adopted for bus scheduling system but Dijkstra algorithm was chosen to enable us to determine the shortest route to a bus station where there is bus scarcity. This aim is achieved through the use of object-oriented methodology. PHP and JavaScript are the programming languages harnessed while HTML and CSS are used for the user interface.

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1.0 INTRODUCTION

Timetabling and vehicle booking is the premise of security and capability in various vehicle adventures. It is essential to consider the explorers go solicitation to meet both the social and financial advantages for transport venture. Urban communities in Nigeria experience expanding development in populace per annum. The vehicle business in Nigeria has not had the option to keep up pace with expanding request and is ending up being a delay different areas of our economy. Transport organizations or travel offices must consider the degree of traveler request that changes by time, day of the week, season, climate conditions, and so on. To this end, Scheduling is portrayed by Merriam (2018) as "Drawing up an arrangement of assignments to be practiced and times when they will be cultivated or a composed or printed rundown of things and times when they will be finished or a rundown of times when transports, trains, airplane, and so forth. Leave or show up". With the above portrayal, we can describe transport planning as a course of action to make an especially capable timetable by joining movements and courses so running cost is limited and all business standards and organization necessities are fulfilled. Prepares and transports are the most significant kind of urban and rustic traveler transport the world over. Populace development, moving portability designs and a higher focus on natural issues are changing the essence of open vehicle today (IRU, 2018). Regardless of whether short or long separations, open transports, cabs, and prepares are the absolute most secure, most easy to use, modest and comprehensive methods for transport. In this manner, the advantage of booking can't be undermined as it helps in following the advancement of work been done and makes for the earlier planning of unforeseen issues. Transport calendars can be alluded to as blocking, which includes doling out vehicles to cover the excursions related with a specific timetable which additionally implies making a timetable for administration. The accompanying procedure which incorporates the daily schedule of transport planning was additionally recognized: as a pullout from the terminal, grouping of excursions from the timetable, any dead-head trips and a draw in back to the station. By and large, transport planning is an approach to diminish or limit the time or potentially separation that vehicles spend outside of income administration.

2.0 DIJKSTRA'S ALGORITHM

Dijkstra's algorithm is one algorithm used for discovering the shortest path from a starting node to a target node in a weighted graph. The algorithm generates a tree of shortest routes to all other points in the chart from the starting vertex i.e. the source. Dijkstra's algorithm released in 1959 and named after its creator Dutch computer scientist Edsger Dijkstra, can be added to a weighted graph. The graph can be either directed or undirected. One stipulation to use the algorithm is that the graph must have a non-negative weight on each edge. Dijkstra's algorithm discovers the shortest path tree from a single source node by constructing a set of nodes with a minimum range from the

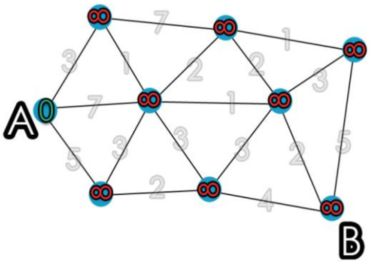


Figure 1: A weighted graph

2.1 GRAPH

A chart is a portrayal of associated esteems in a multidimensional space. Diagram esteems are called hubs and their associations are called edges. Chart might be "coordinated" (traversal between hubs can just occur one way) or "undirected" (either course might be navigated from hub to hub). Diagrams can be helpful for examining the different associations between singular units of information (Abiy et al, 2018). The chart has the accompanying: Vertices, or hubs, indicated in the calculation by u or v; Weighted edges that interface two hubs: (u, v) signifies an edge, and (u, v) means its weight. In the chart on the right, the weight for each edge is written in dark. This is finished by instating three qualities: a. Dist. a variety of good ways from the source hub s to every hub in the diagram, introduced the accompanying way: dist(s) = 0; and for every single other hub ,v, dist (v) =α This is done toward the start on the grounds that as the calculation continues, the dist from the source to every hub v in the chart will be recalculated and concluded when the briefest separation to v is found. b. Q, a line of all hubs in the diagram. Toward the finish of the calculation's advancement Q will be vacant. c. S, a vacant set, to show which hubs the calculation has visited. Toward the finish of the calculation's run, will contain all the hubs of the chart. The calculation continues as follows: 1.While Q can't, pop the hub v, that can't in S, from Q with the littlest dist (v). In the primary run, source hub will be picked on the grounds that dist(s) was instated to 0. In the following run, the following hub with the littlest dist esteem is picked. 2. Add hub v to S , to show that v has been visited 3.Update dist estimations of contiguous hubs of the present hub v as follows: for each new neighboring hub i. if dist(v) + weight(u,v) < dist(u), there is another negligible separation found for , so update dist(u) to the new insignificant separation esteem; ii.Otherwise, no updates are made to dist (u). The calculation has visited all hubs in the diagram and found the littlest separation to every hub. Dist currently contains the most brief way tree from source s. We step through Dijkstra's calculation on the chart utilized in fig the calculation above: Initialize distances according to the algorithm.

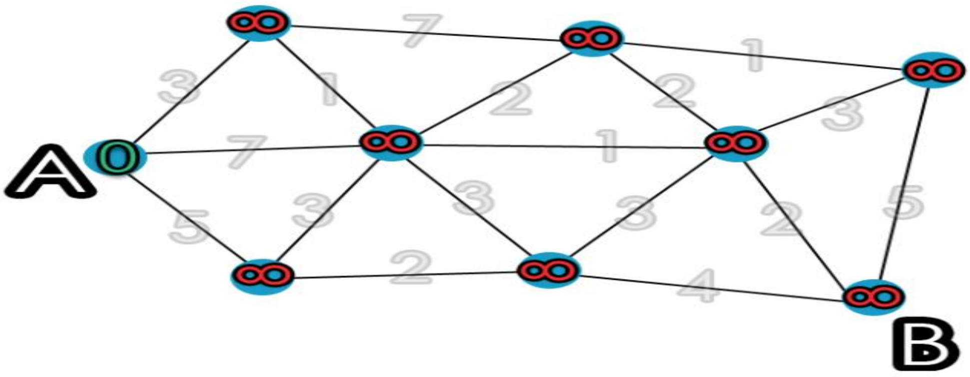


Figure 2: weighted graph to determine the shortest distance from node A to B

Pick first node and calculate distances to adjacent nodes.

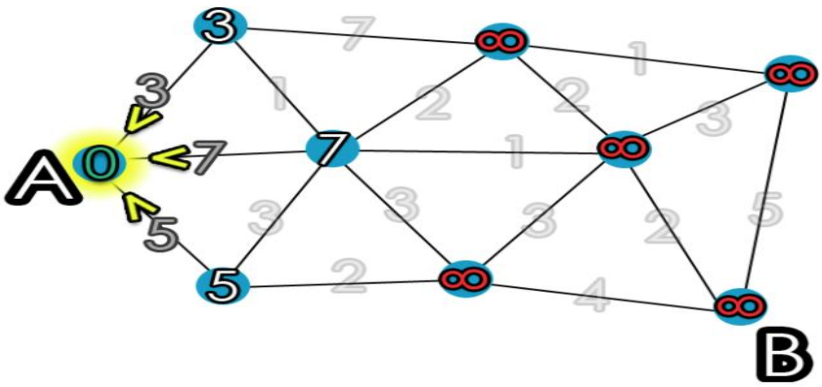


Figure 2.1: first step to determine shortest distance

Pick next node with minimal distance; repeat adjacent node distance calculations.

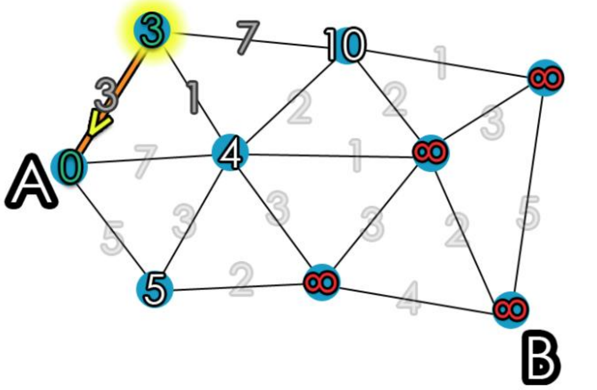


Figure 2.2: second stage to determine shortest distance

Final result of shortest-path tree (Abiy et al, 2018).

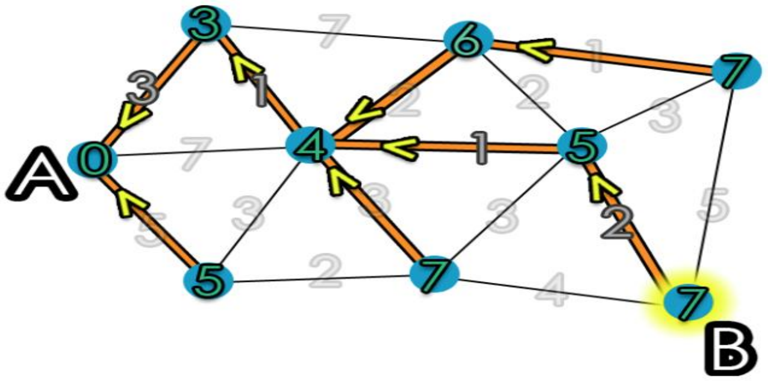


Figure 2.3: weighted graph showing the shortest distance from node A to B

However, Dijkstra's algorithm in this project will be harnessed to determine the closest bus station from which buses will be requested given the list of and as well tell the closest route from the requesting station to the source station.

2.1.1 Advantages of Dijkstra's Algorithm over Other Routing Algorithm

1.Once a vertex is produced/known, the price of the shortest route to that node is known. 2.While a vertex is not yet known, another shorter route to it may still be discovered. 3.The shortest route can be discovered by following the backward pointers stored. 4.It is straight forward and very simple to comprehend.

2.2 Technologies Used

The following are the technologies used in the development of the system, they includes:

PHP

PHP is a server-side scripting language that is commonly used to build dynamic web applications. PHP as a hypertext pre-processor is very common due to its versatile platform. For example, PHP can be integrated into an HTML source file instead of calling an internal data processing file. It is an open-source language and has different characteristics linked to object-oriented design. PHP's use is still in the strong run. Some of the contemporary options for PHP could be CFML, Ruby on Rails, Perl, Go, Python with Django, Express.js, AngularJS, Node.js, ASP and JSP.7, this system makes use of PHP. The characteristic features of PHP include: 1. PHP can generate dynamic content processed by PHP or fetch from the backend. 2. PHP can generate, open, read, write, delete and close server files. 3. PHP can receive form data from Hypertext-Markup Language (HTML). 4. PHP utilizes database drivers to add, delete, modify information in your database; It can be used to authenticate and authorize users. 5. PHP may encrypt information. 6. PHP can be embedded inside HTML unlike other server-side scripting languages like ASP.NET which necessarily needs to encapsulate or output the HTML. PHP runs on various operating systems (Windows, Linux, Unix, Mac OS X). 7. PHP is compatible with just about every server used today (Apache, IIS, etc.). 8. PHP supports a broad variety of databases. 9. it's free. PHP sample code fragment that adds a terminal to the bus company:

```
Public function add ()
  {
    $terminal = $this->Terminals->newEntity();
    if ($this->request->is('post')) {
      $terminal = $this->Terminals->patchEntity($terminal, $this->request->getData());
      if ($this->Terminals->save($terminal)) {
        $this->Flash->success(__('The terminal has been saved.'));
        return $this->redirect(['action' => 'index']);
      }
      $this->Flash->error(__('The terminal could not be saved. Please, try again.'));
    }
    $this->set(compact('terminal'));
    $this->set('_serialize', ['terminal']);
  }
```

JAVASCRIPT

JavaScript is a programming language utilized in HTML pages and is the customer side scripting language utilized right now. Designed at Netscape Corporation (LiveScript) in

1995, JavaScript has nothing to do with Java. JavaScript programs are controlled by a mediator coordinated into the internet browser of the client (not on the server). JavaScript can be embedded into reports by utilizing the SCRIPT tag. You can have any number of contents while Scripts can be set in the HEAD or in the BODY
– Scripts run before the page is shown in the HEAD
– Contents run as the page is shown in the BODY.
The HEAD is the perfect spot to characterize capacities and factors utilized by contents inside the BODY (Morin, 2011).

HTML

Hypertext markup language (HTML) is used to specify whether your web content should be acknowledged as a heading, image, paragraph, list, link, multimedia player, form, or one of many other available elements or even a new element that you define. An HTML file is a text file containing tiny markup tags. The markup tags inform the web browser how to show the page, and any HTML file must have an extension of html. The HTML language comprises of forms, cascading style sheet (CSS) and HTML elements. The forms were used to collect passenger's information e.g. Manifest. The cascading style sheet was used to format the presentation of the output. It adjusts the sizes and fonts of the window display area. HTML is just a format that informs a computer how to show a web page. The documents themselves are plain text files with unique "tags" or codes used by a web browser to interpret and show data on your computer screen. The HTML elements comprise of a sequence of elements in this form.

```
<p align="center"><b><font face="Times New Roman" color="#000000">
<marquee><?php echo "CLICK ON THE MENU ABOVE TO LOGIN";?>
</marquee></font></b></td>
```

This code fragment aligns a scrolling marquee on the screen that directs a user on the login page.

APACHE WEB SERVER

The Apache Web server has been the most prevalent and commonly used Web server in the last century, it is an open source, BSD-like license that takes into account both business and non-business uses of Apache developer society with a variety of backgrounds and an open development process in the context of technical advantages. Apache server features include: 1. Modular architecture: Apache users can readily add features or tailor Apache to their particular setting. 2. Portable: Apache operates on almost all UNIX (and Linux) flavors, Windows, BeOS, mainframes.

PHPMYADMIN

PhpMyAdmin is a free software tool which handles the administration of MySQL over the Web, it is written in PHP. PhpMyAdmin promotes a range of MySQL and MariaDB activities. Frequently used activities such as handling databases, tables, columns, relationships, indexes, users, permissions, etc. can be done through the user interface. This does not preclude the ability to directly execute SQL statements.

CODE IGNITER

Code Igniter is an open-source framework based on PHP for the creation of vibrant web applications. Code Igniter's development environment is very user-friendly and the key system utilizes very small operating space. Developing a web project by composing a code from scratch could be very time-consuming. Code Igniter has an integrated library that includes sets of a pre-coded customizing framework and while in the design phase, the developer can use it to create a system in a simple setting in their desired sector of a project. The platform of Code Igniter is noteworthy since it does not require any setup to function. The enormous library sets provide a lot of customization and liberty choices when using relevant programming rules (Pandey, 2016).

2.3. REVIEW OF RELATED LITERATURE

A bus scheduling system (BSS) is not a new concept in use as it has been implemented for different bus stations around the globe. However, in Nigeria and most developing countries, bus scheduling is basically done manually i.e. the manager picks which bus to include on the traveling queue and the bus is then assigned to passengers. In turn, a passenger goes to a bus station and books for a ticket and is manually issued a ticket which is a slip containing his name, seat number, destination and amount paid. This may be done online or offline. Different publications have also been published on this subject as a consequence of comprehensive studies over the past decades. Several model approaches, as well as specific solving strategies have been provided for the issue and its extensions. These are discussed below based on the benefits of public bus transport, the need for customer satisfaction, bus scheduling and other online bus systems. According to, Najib et al, (2016) Conducted a survey to determine the reasons for traffic congestion in Lebanon and discovered that the reasons are simply as a result of a high number of private cars and the absent of a good transportation code. While the later can be solved only by the government the former can be reduced by providing a good public transport system. The study tried to investigate the problems associated with the transport system in Lebanon. The problems were highlighted as: Accidents, Traffic congestion, Noise and Air pollution. In Wirasingle and liu (1995) Addresses schedule design for a bus route with one intermediate bus stop also known as time point. The authors tried to minimize passenger waiting time, the delay time for through passengers, delay/early penalty and total operation cost. It used a schedule based holding control strategy to achieve this. According to, Yan et al, (2012) shows that time control point strategy, which is bus arrival time at each of its time control point (i.e. bus stop) on the bus route. The strategy was chosen because it is the type used by most bus companies in China and Singapore. This type of control involves using the expected bus arrival time at bus stops to determine when a bus will arrive at its final destination. Meanwhile, there are other conditions which could slow a driver down such as traffic congestion thereby making it impossible to get to the bus stop as scheduled. Notwithstanding, the driver could also arrive earlier than scheduled to the bus stop on some days when there is little or no traffic congestion. For this reason, slack time was introduced to control uncertainties. A Monte Carlo simulation model-based solution was designed to develop a reliable bus route schedule. According to Zhou et al, (2013), proposed implementation of a crowd-participation bus arrival time forecast scheme using cellular signals. The scheme bridges the gap between customers questioning about the arrival time of the bus and customers ready to share data, providing them real-time bus data, regardless of any bus company. A querying user sends the server the bus stop and path of concern. A sharing customer sends the server a series of a cell tower. The server then matches the sequence of cell towers to the bus route and predicts the arrival time of the bus. According to Bojan et al, (2014) Proposed an intelligent transport system composed of three parts: a sensor system, a surveillance system, and a display system. A sensor system gets information from a global positioning system (GPS) and near-field communication (NFC), temperature and moisture sensors. The surveillance scheme extracts significant information from the raw data collected from the sensor scheme and gives it to the bus driver. The presentation framework shows transportation and travel-related information at the bus stop to commuters. In Adaelu et al, (2014) suggested a wireless sensor network with which the bus information system can provide customers with the current bus position and estimated bus arrival times. Bus nodes, router nodes, bus stop nodes, and concentrators are part of the network. According to Xu et al, (2015) Studied GPS, Remote Sensing (RS) and Geographic Information System (GIS) methods and suggested using them all to depict the real-time status of each bus and bus arrival time on maps. According to Jolin et al, (2014) introduced an intelligent public transport system composed of bus modules fitted with a GPS receiver, digital speedometer, telecommunications modem, and other server modules, bus stop modules and client applications. The system supplied customers with data about the present place of buses approaching the bus stop. Asaadi et al, (2012) proposed a web-based system that allows a customer to check the ticket availability and search for the most possible prices. The system is always available online, but the basic benefits of the system is in its ability to allow the customers to search and choose his/her seat position and ticket payment procedure. They collected data to define the new application's demands. The paper's range includes customer services to book bus tickets and daily management work for the business.

3.0 DESIGN OF THE PROPOSED SYSTEM

The proposed system is an optimized bus booking application. Booking as it pertains to passengers and Scheduling as it pertains to the management of the day to day activities and resources of the bus station to ensure customer satisfaction and reduce operational cost. Analysis has shown that most people prefer to travel by bus due to its proximity and affordability, but the poor services provided by these bus companies tends to dispel passengers who wish to travel by bus. For this reason, the system has been designed using Dijkstar's Algorithm. Dijkstra algorithm is used to calculate the distance between each bus terminals of the bus station with excess of buses from the requesting terminal. At the end it produces a list of bus terminals from which buses can be requested from in order of their closeness to the requesting terminal. Hence, it suggests the bus terminal from which request is made. The design tool used in this work is Unified Modeling Language (UML). The UML is a standard graphical notation for describing software analysis and designs. It has symbols to assist in describing and documenting every part of the application development process.

3.1 SYSTEM ARCHITECTURE

The architecture of the system design is 3-tier. The tiers are the presentation tier, middle tier, and data tier. The presentation tier is the user interface and it is designed using languages like HTML, CSS, and JavaScript. It basically interfaces with the user and allows him to interact with the system through the use of input forms. The middle tier connects the presentation tier and the data tier together. The middle tier is also called business logic. It was designed using PHP and it runs on the xampp server. The data tier is the last part of the system that is responsible for storing the data, i.e. the database. MYSQL database was used while PhpMyAdmin is the database management system used. SQL (Structured Query Language) will be used to create, control and manipulate the data and structures in the database. The Figure below shows the system architecture.

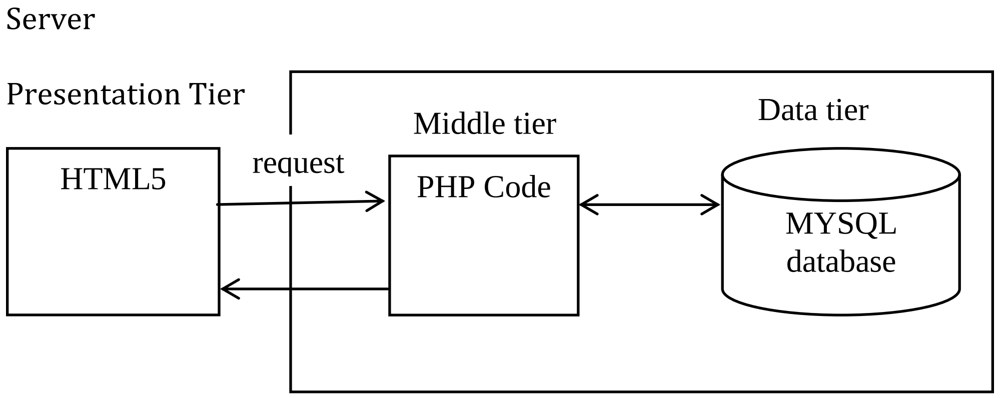


Figure 3: system architecture

3.2 ALGORITHM DESIGN

Given a graph entry from the graph table in the database a transformation algorithm is used to transform the graph data type into a JSON object. The transformation algorithm is given below

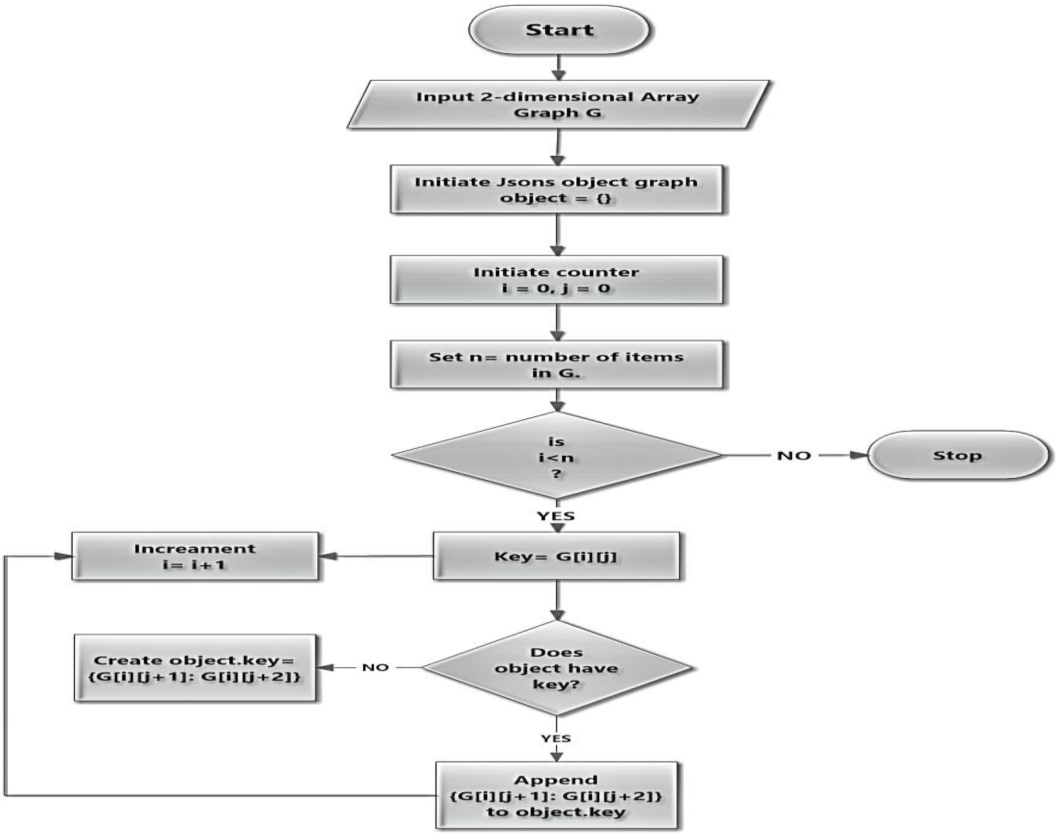

Start
Input 2-dimensional Array Graph G
Initiate Jsons object graph object = {}
Initiate counter i = 0, j = 0
Set n= number of items in G.
is i<n ?
NO
Stop
YES
Increament i= i+1
Key= G[i][j]
Create object.key= {G[i][j+1]: G[i][j+2]}
NO
Does object have key?
YES
Append {G[i][j+1]: G[i][j+2]} to object.key

Figure 3.1: algorithm to transform table entry to a graph data type

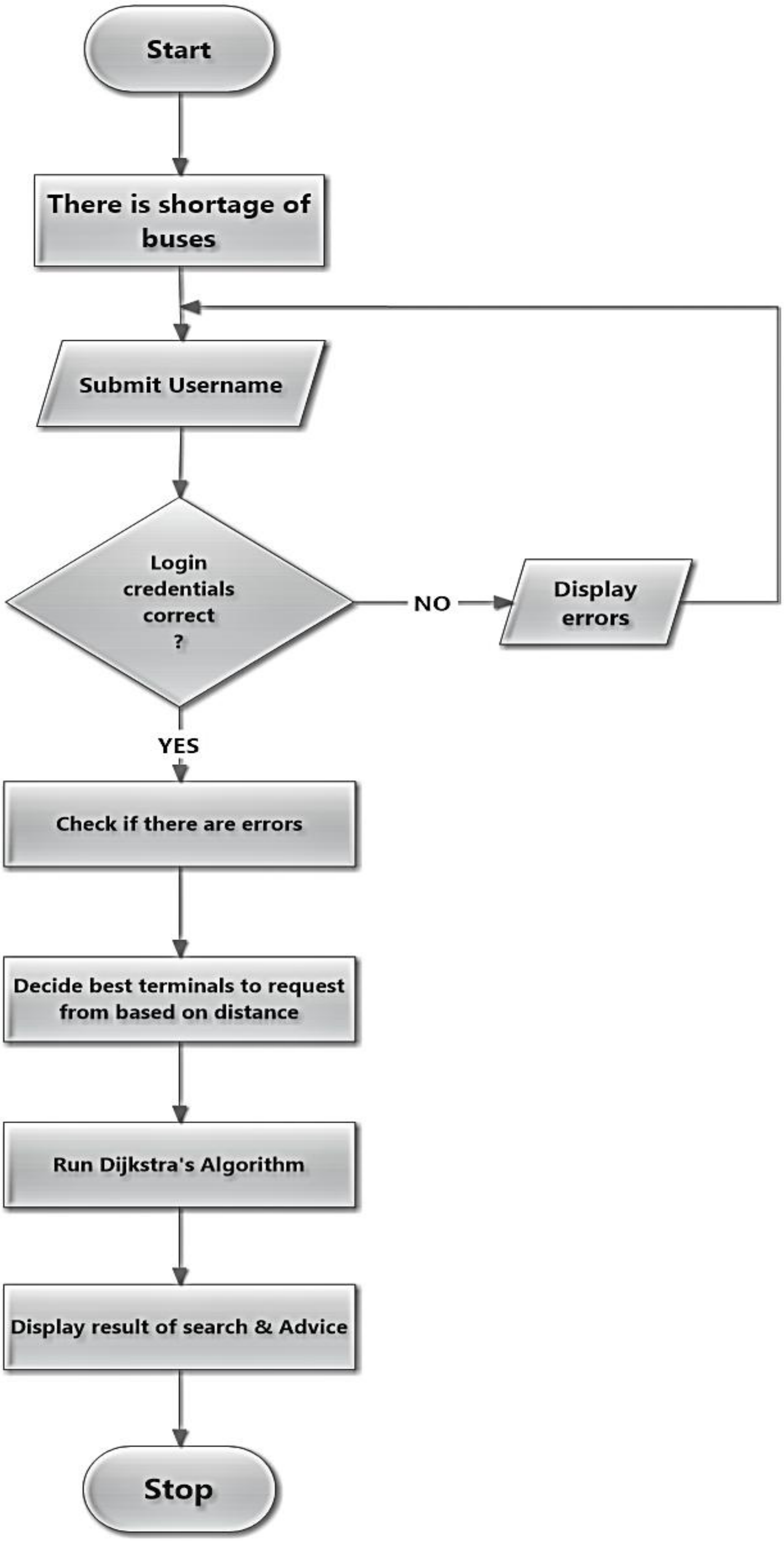
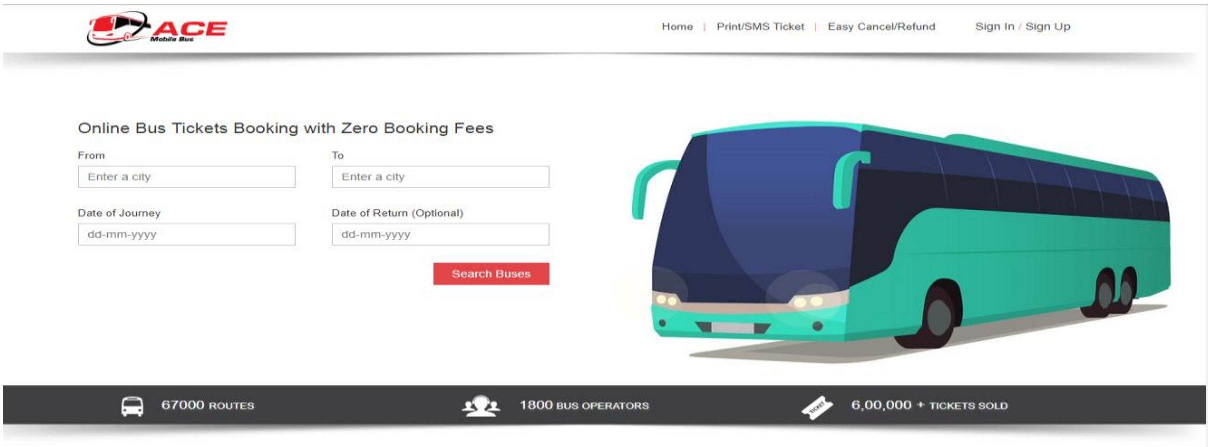

Start
There is shortage of buses
Submit Username
Login credentials correct ?
NO
Display errors
YES
Check if there are errors
Decide best terminals to request from based on distance
Run Dijkstra's Algorithm
Display result of search & Advice
Stop

Figure 3.2: algorithm to request buses

4.0 Results and Discussions

The system was tested at every stage of its development in other to detect and remove errors. During the development, parallel testing was conducted to check the correspondences between the manual output report and automated report. Though the presentation format of the automated report slightly varies, there is uniform information.

Integration of modules: Some modules were found to work better when they were independent than when they were integrated together. The performance of the software was tested in different web browsers. It was found to perform better with a Mozilla Firefox browser. The query language was used and tested to know its ability to generate different kinds of report. It was found out that the input data structure in the database design must correspond to the user's input. Eg Entering a bus route with space in between as in "JOS CITY" in the route input table would not generate the adequate report if the table design structure does not have space in between. Again, the character length specified in the design table must be used in the character data entry. The cascading style sheet was tested by changing the settings until a suitable rendering was achieved. The higher the parameters value the more visible and suitable outlook it presents. The system was run on local host at the end of the implementation and it was found to work well. The figure's below is an illustration of the output (result) displayed of online bus booking.



Online Bus Tickets Booking with Zero Booking Fees

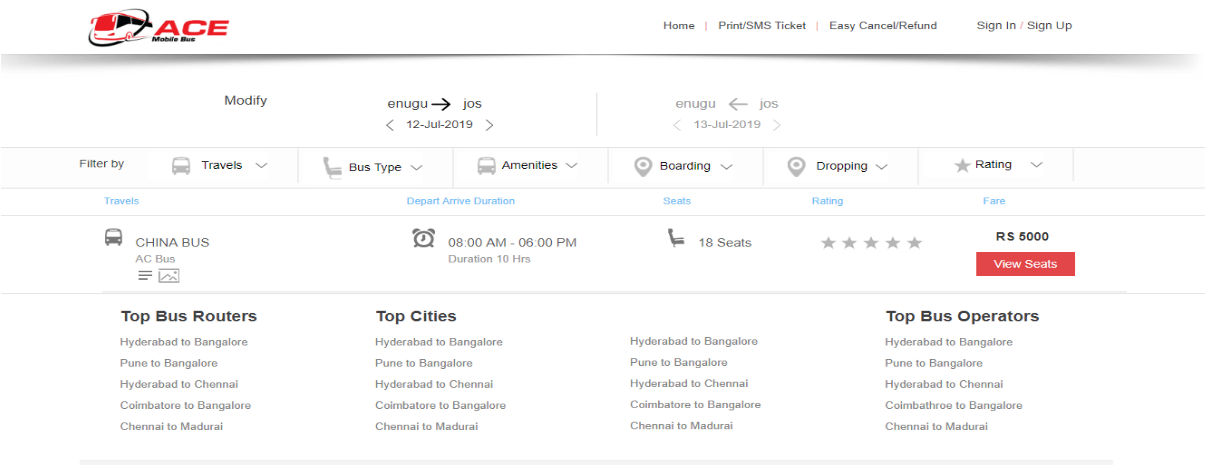
From: Enter a city

To: Enter a city

Date of Journey: dd-mm-yyyy

Date of Return (Optional): dd-mm-yyyy

Figure 4: The Screen Shot of the Homepage



enugu → jos
‹ 12-Jul-2019 ›

enugu ← jos
‹ 13-Jul-2019 ›

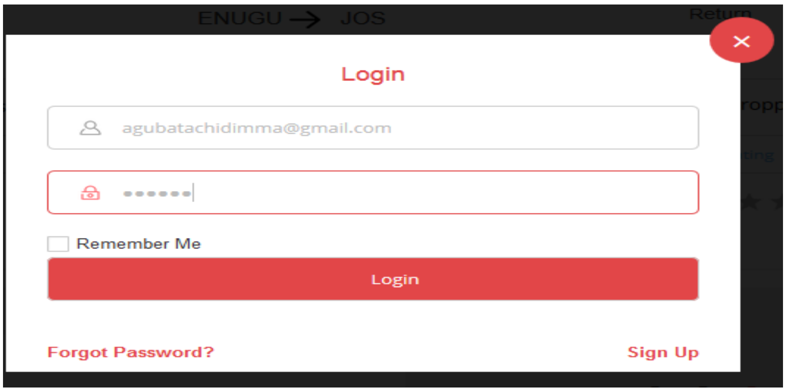
Travels	Depart Arrive Duration	Seats	Rating	Fare
CHINA BUS AC Bus	08:00 AM - 06:00 PM Duration 10 Hrs	18 Seats	★★★★★	RS 5000

Top Bus Routers
Hyderabad to Bangalore
Pune to Bangalore
Hyderabad to Chennai
Coimbatore to Bangalore
Chennai to Madurai

Top Cities
Hyderabad to Bangalore
Pune to Bangalore
Hyderabad to Chennai
Coimbatore to Bangalore
Chennai to Madurai

Hyderabad to Bangalore
Pune to Bangalore
Hyderabad to Chennai
Coimbatore to Bangalore
Chennai to Madurai

Top Bus Operators
Hyderabad to Bangalore
Pune to Bangalore
Hyderabad to Chennai
Coimbathroe to Bangalore
Chennai to Madurai



ENUGU → JOS

Login

agubatachidimma@gmail.com

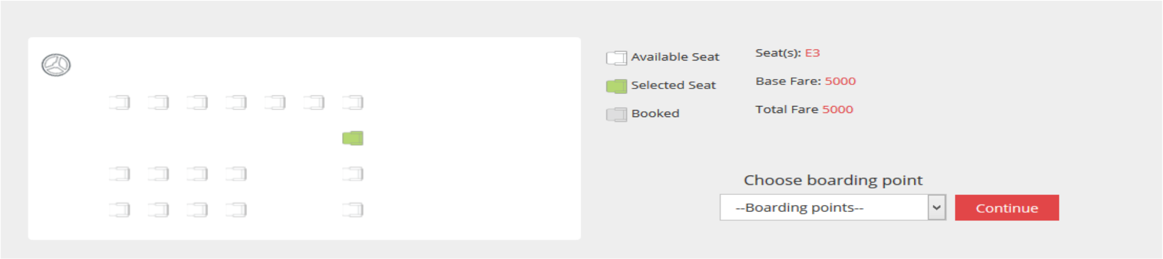
●●●●●●

□ Remember Me

Login

Forgot Password? Sign Up

Figure 4.1: The Screen Shot of the Passenger Login



□ Available Seat

🟩 Selected Seat

▨ Booked

Seat(s): E3

Base Fare: 5000

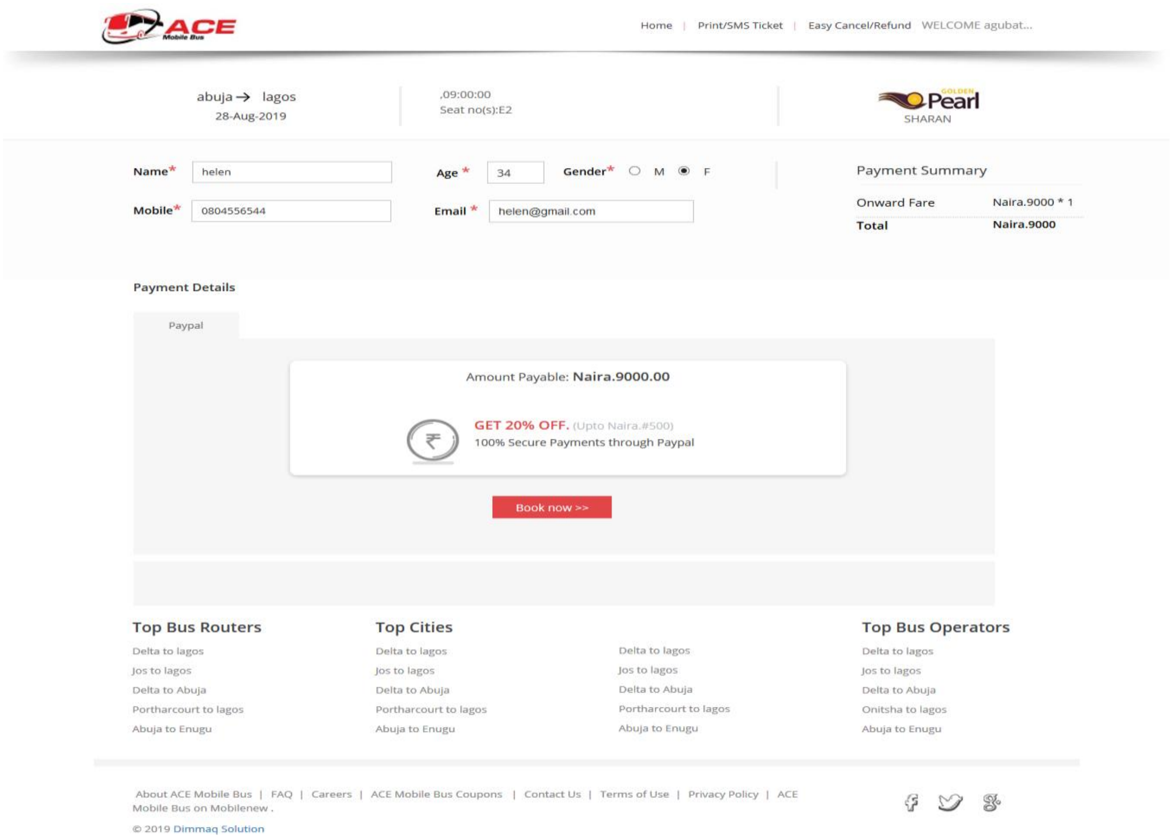
Total Fare 5000

Choose boarding point

--Boarding points--

Continue

Figure 4.2: The Screen Shot of the select seat



ACE Mobile Bus
Home | Print/SMS Ticket | Easy Cancel/Refund WELCOME agubat...

abuja → lagos
28-Aug-2019

,09:00:00
Seat no(s):E2

SHARAN

Name* helen

Age * 34

Gender* ○ M ● F

Mobile* 0804556544

Email * helen@gmail.com

Payment Summary

Onward Fare	Naira.9000 * 1
Total	Naira.9000

Payment Details

Paypal

Amount Payable: **Naira.9000.00**

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100% Secure Payments through Paypal

Book now >>

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Jos to lagos
Delta to Abuja
Portharcourt to lagos
Abuja to Enugu

Top Cities

Delta to lagos
Jos to lagos
Delta to Abuja
Portharcourt to lagos
Abuja to Enugu

Delta to lagos
Jos to lagos
Delta to Abuja
Portharcourt to lagos
Abuja to Enugu

Top Bus Operators

Delta to lagos
Jos to lagos
Delta to Abuja
Onitsha to lagos
Abuja to Enugu

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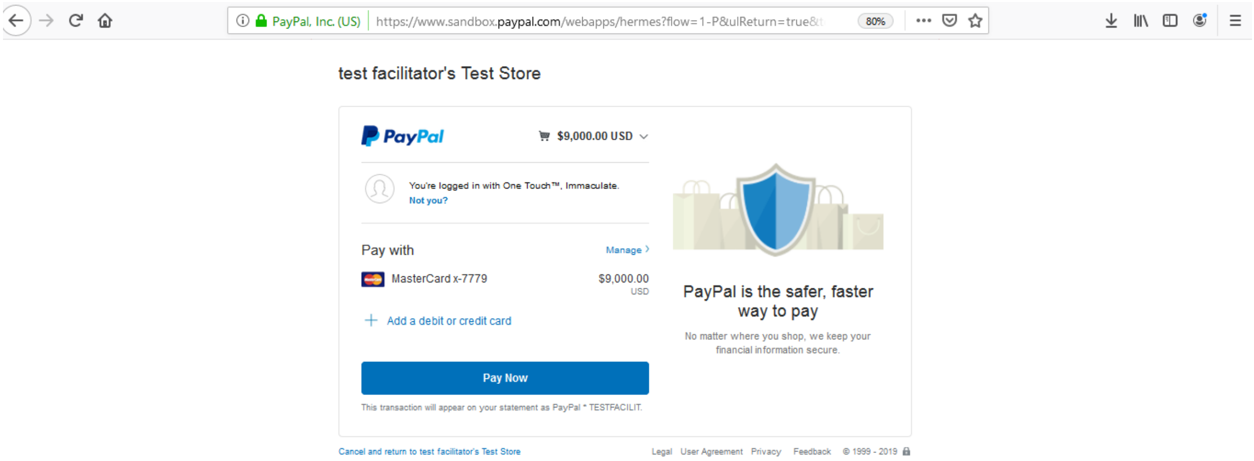
Figure 4.3: The Screen Shot of the User manifest



PayPal, Inc. (US) | https://www.sandbox.paypal.com/webapps/hermes?flow=1-P&ulReturn=true&t
80%

test facilitator's Test Store

PayPal $9,000.00 USD

You're logged in with One Touch™, Immaculate.
Not you?

Pay with Manage

MasterCard x-7779 $9,000.00 USD

+ Add a debit or credit card

Pay Now

This transaction will appear on your statement as PayPal * TESTFACILIT.

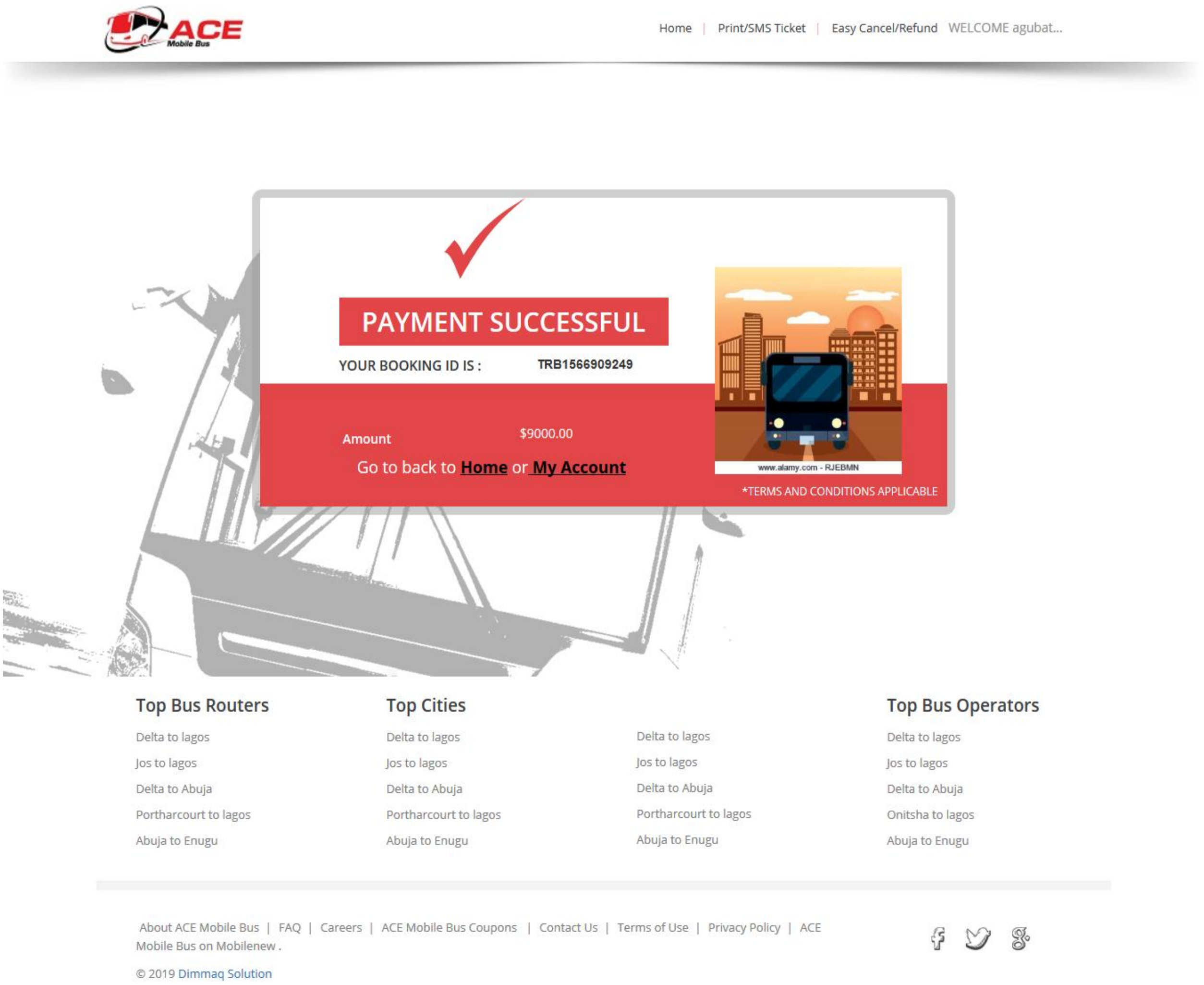
PayPal is the safer, faster way to pay

No matter where you shop, we keep your financial information secure.

Cancel and return to test facilitator's Test Store

Legal User Agreement Privacy Feedback © 1999 - 2019

Figure 4.4: Figure 4.6: The Screen Shot of the Payment page



Home | Print/SMS Ticket | Easy Cancel/Refund WELCOME agubat...

PAYMENT SUCCESSFUL

YOUR BOOKING ID IS : TRB1566909249

Amount $9000.00

Go to back to Home or My Account

*TERMS AND CONDITIONS APPLICABLE

Top Bus Routers
Delta to lagos
Jos to lagos
Delta to Abuja
Portharcourt to lagos
Abuja to Enugu

Top Cities
Delta to lagos
Jos to lagos
Delta to Abuja
Portharcourt to lagos
Abuja to Enugu

Delta to lagos
Jos to lagos
Delta to Abuja
Portharcourt to lagos
Abuja to Enugu

Top Bus Operators
Delta to lagos
Jos to lagos
Delta to Abuja
Onitsha to lagos
Abuja to Enugu

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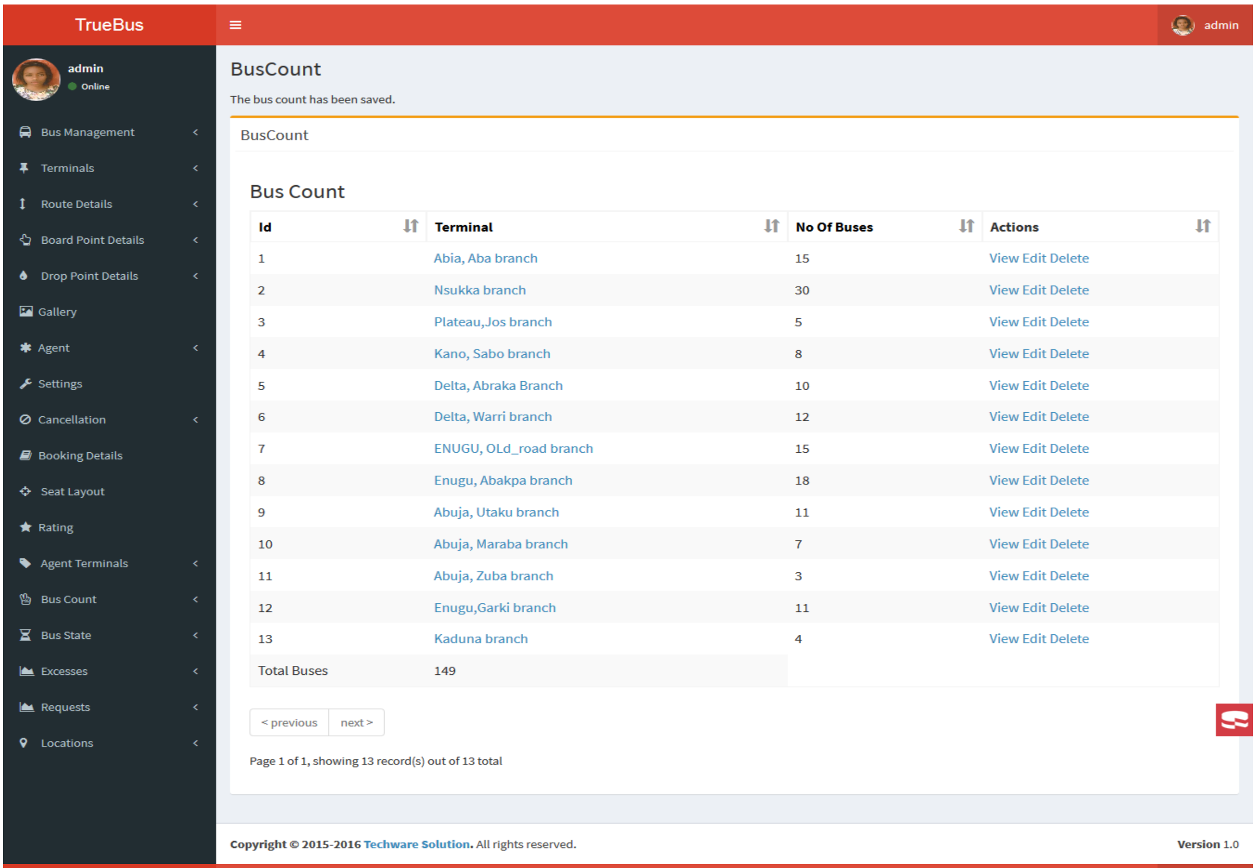
Figure 4.5: The Screen Shot of the Ticket page



BusCount

The bus count has been saved.

BusCount

Bus Count

Id	Terminal	No Of Buses	Actions
1	Abia, Aba branch	15	View Edit Delete
2	Nsukka branch	30	View Edit Delete
3	Plateau,Jos branch	5	View Edit Delete
4	Kano, Sabo branch	8	View Edit Delete
5	Delta, Abraka Branch	10	View Edit Delete
6	Delta, Warri branch	12	View Edit Delete
7	ENUGU, OLd_road branch	15	View Edit Delete
8	Enugu, Abakpa branch	18	View Edit Delete
9	Abuja, Utaku branch	11	View Edit Delete
10	Abuja, Maraba branch	7	View Edit Delete
11	Abuja, Zuba branch	3	View Edit Delete
12	Enugu,Garki branch	11	View Edit Delete
13	Kaduna branch	4	View Edit Delete
Total Buses	149		

< previous next >

Page 1 of 1, showing 13 record(s) out of 13 total

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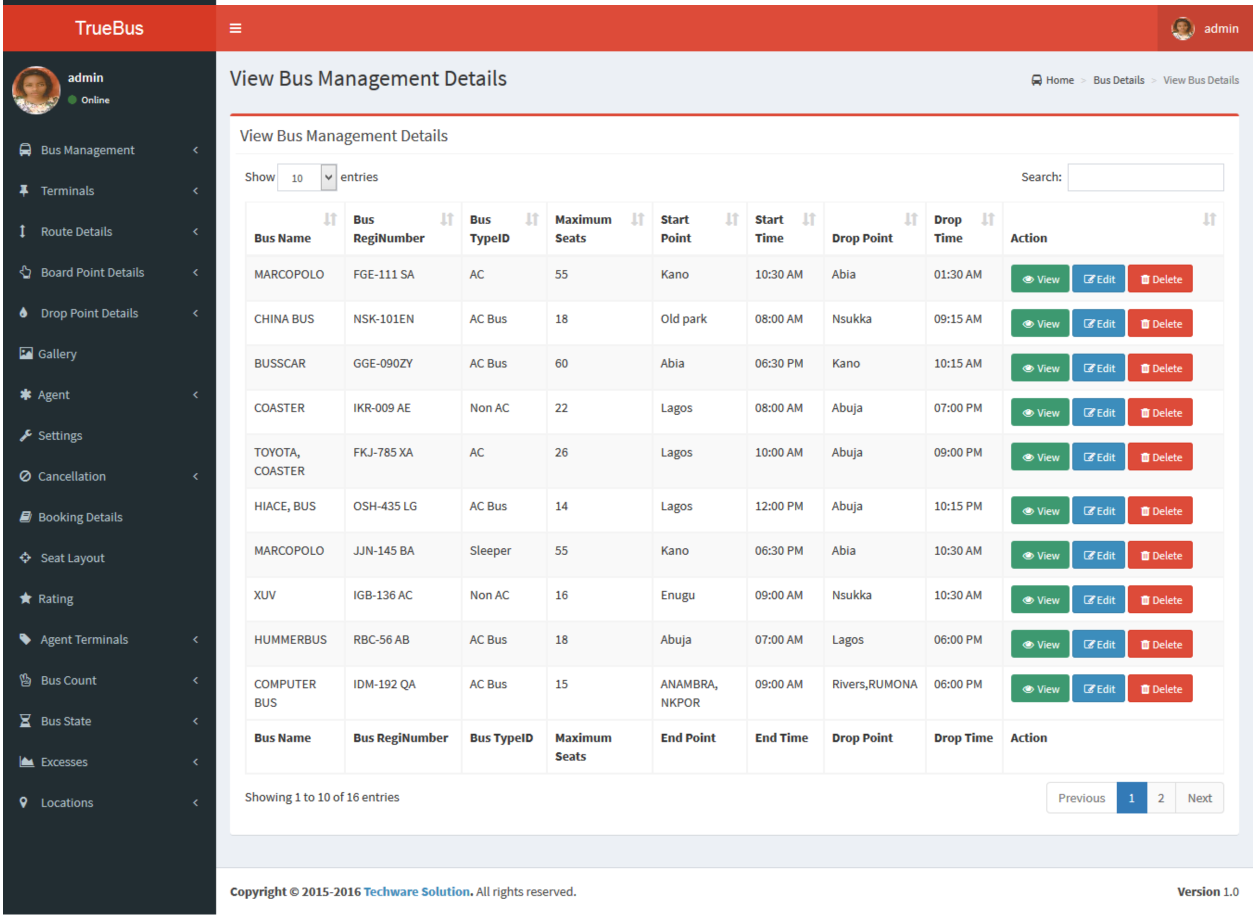

View Bus Management Details

View Bus Management Details

Show 10 entries Search:

Bus Name	Bus RegiNumber	Bus TypeID	Maximum Seats	Start Point	Start Time	Drop Point	Drop Time	Action
MARCOPOLO	FGE-111 SA	AC	55	Kano	10:30 AM	Abia	01:30 AM	View Edit Delete
CHINA BUS	NSK-101EN	AC Bus	18	Old park	08:00 AM	Nsukka	09:15 AM	View Edit Delete
BUSSCAR	GGE-090ZY	AC Bus	60	Abia	06:30 PM	Kano	10:15 AM	View Edit Delete
COASTER	IKR-009 AE	Non AC	22	Lagos	08:00 AM	Abuja	07:00 PM	View Edit Delete
TOYOTA, COASTER	FKJ-785 XA	AC	26	Lagos	10:00 AM	Abuja	09:00 PM	View Edit Delete
HIACE, BUS	OSH-435 LG	AC Bus	14	Lagos	12:00 PM	Abuja	10:15 PM	View Edit Delete
MARCOPOLO	JJN-145 BA	Sleeper	55	Kano	06:30 PM	Abia	10:30 AM	View Edit Delete
XUV	IGB-136 AC	Non AC	16	Enugu	09:00 AM	Nsukka	10:30 AM	View Edit Delete
HUMMERBUS	RBC-56 AB	AC Bus	18	Abuja	07:00 AM	Lagos	06:00 PM	View Edit Delete
COMPUTER BUS	IDM-192 QA	AC Bus	15	ANAMBRA, NKPOR	09:00 AM	Rivers,RUMONA	06:00 PM	View Edit Delete
Bus Name	Bus RegiNumber	Bus TypeID	Maximum Seats	End Point	End Time	Drop Point	Drop Time	Action

Showing 1 to 10 of 16 entries

Previous 1 2 Next

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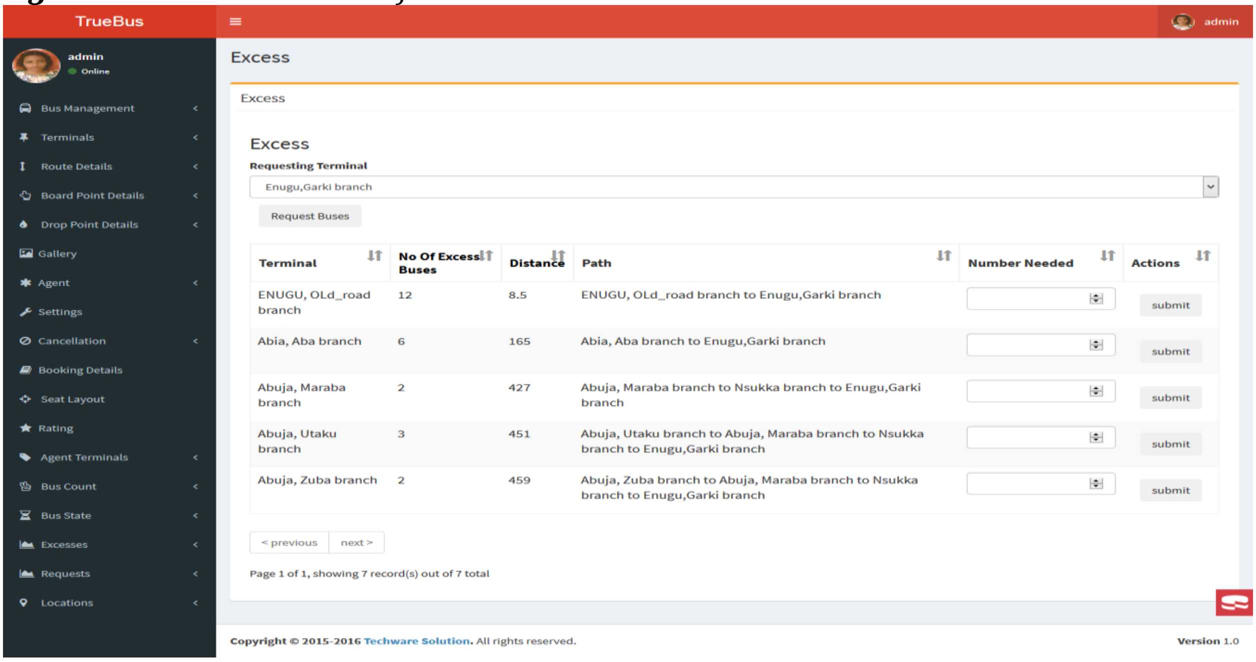
Figure 4.6: Figure 4.8: The Screen Shot of the bus management

Figure 4.7: *The Screen Shot of the Bus count.*



Excess

Excess

Excess

Requesting Terminal

Enugu,Garki branch

Request Buses

Terminal	No Of Excess Buses	Distance	Path	Number Needed	Actions
ENUGU, OLd_road branch	12	8.5	ENUGU, OLd_road branch to Enugu,Garki branch		submit
Abia, Aba branch	6	165	Abia, Aba branch to Enugu,Garki branch		submit
Abuja, Maraba branch	2	427	Abuja, Maraba branch to Nsukka branch to Enugu,Garki branch		submit
Abuja, Utaku branch	3	451	Abuja, Utaku branch to Abuja, Maraba branch to Nsukka branch to Enugu,Garki branch		submit
Abuja, Zuba branch	2	459	Abuja, Zuba branch to Abuja, Maraba branch to Nsukka branch to Enugu,Garki branch		submit

< previous next >

Page 1 of 1, showing 7 record(s) out of 7 total

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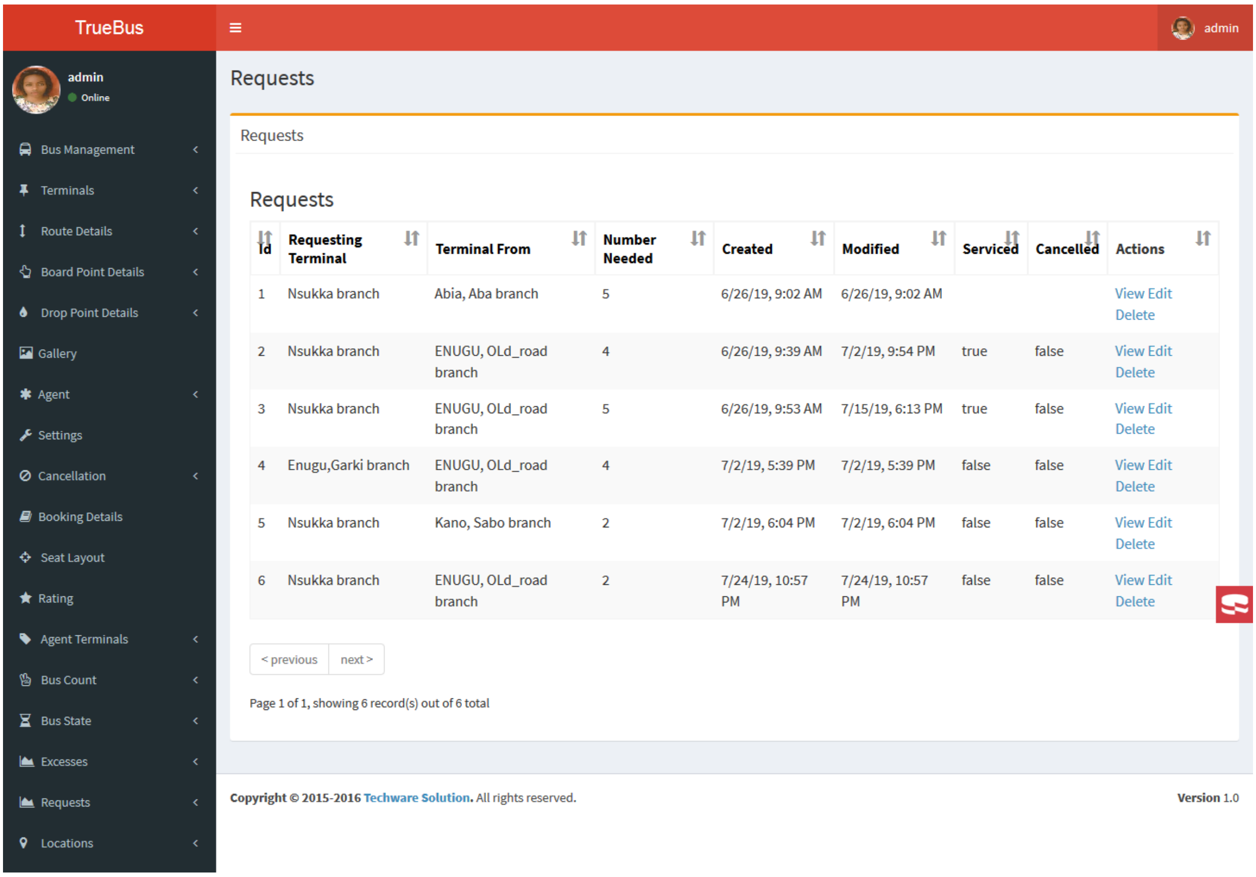
Figure 4.8: The Screen Shot of the Excess bus



Requests

Requests

Requests

Id	Requesting Terminal	Terminal From	Number Needed	Created	Modified	Serviced	Cancelled	Actions
1	Nsukka branch	Abia, Aba branch	5	6/26/19, 9:02 AM	6/26/19, 9:02 AM			View Edit Delete
2	Nsukka branch	ENUGU, OLd_road branch	4	6/26/19, 9:39 AM	7/2/19, 9:54 PM	true	false	View Edit Delete
3	Nsukka branch	ENUGU, OLd_road branch	5	6/26/19, 9:53 AM	7/15/19, 6:13 PM	true	false	View Edit Delete
4	Enugu,Garki branch	ENUGU, OLd_road branch	4	7/2/19, 5:39 PM	7/2/19, 5:39 PM	false	false	View Edit Delete
5	Nsukka branch	Kano, Sabo branch	2	7/2/19, 6:04 PM	7/2/19, 6:04 PM	false	false	View Edit Delete
6	Nsukka branch	ENUGU, OLd_road branch	2	7/24/19, 10:57 PM	7/24/19, 10:57 PM	false	false	View Edit Delete

< previous next >

Page 1 of 1, showing 6 record(s) out of 6 total

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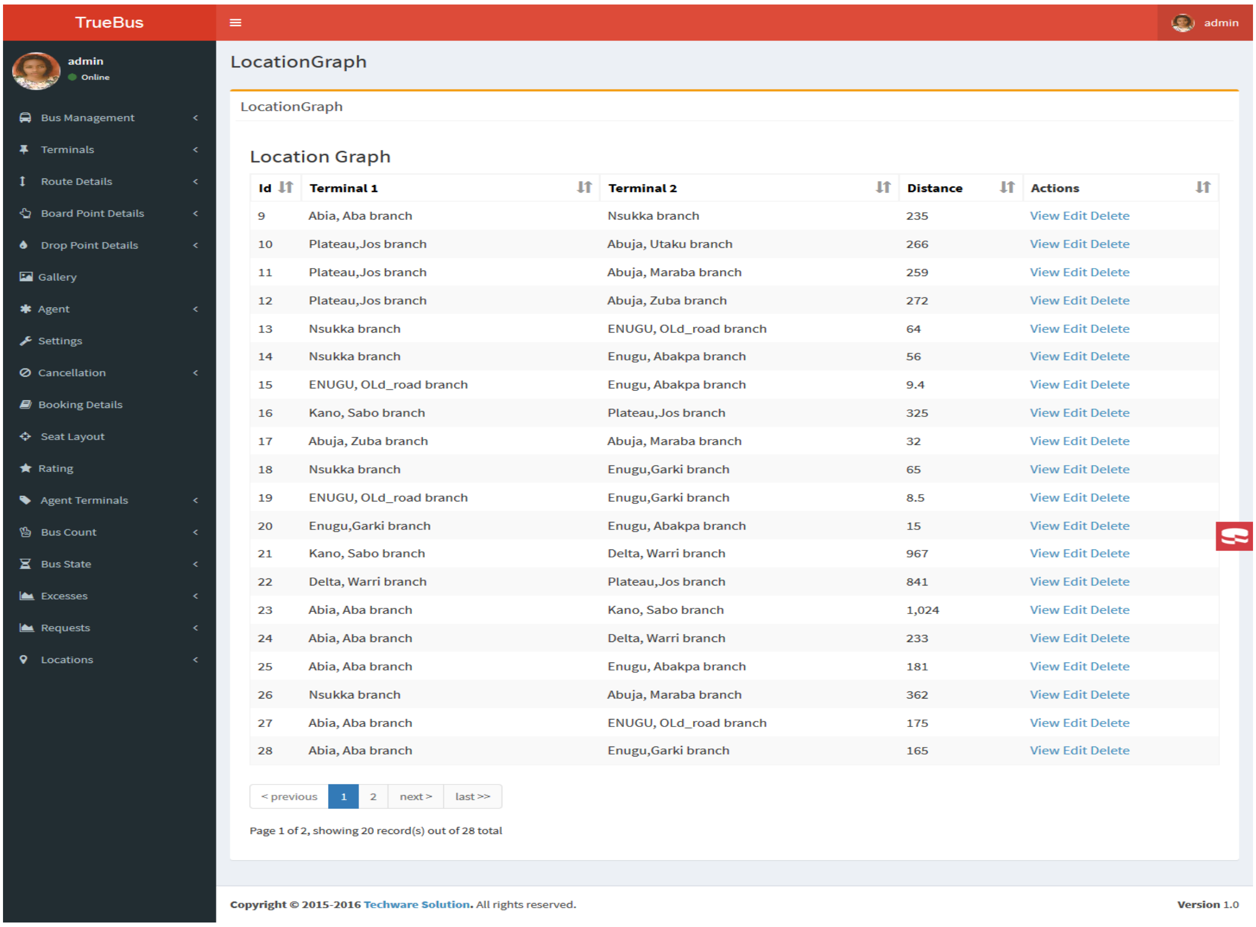
Figure 4.9: The Screen Shot of the Request Bus



LocationGraph

LocationGraph

Location Graph

Id	Terminal 1	Terminal 2	Distance	Actions
9	Abia, Aba branch	Nsukka branch	235	View Edit Delete
10	Plateau,Jos branch	Abuja, Utaku branch	266	View Edit Delete
11	Plateau,Jos branch	Abuja, Maraba branch	259	View Edit Delete
12	Plateau,Jos branch	Abuja, Zuba branch	272	View Edit Delete
13	Nsukka branch	ENUGU, OLd_road branch	64	View Edit Delete
14	Nsukka branch	Enugu, Abakpa branch	56	View Edit Delete
15	ENUGU, OLd_road branch	Enugu, Abakpa branch	9.4	View Edit Delete
16	Kano, Sabo branch	Plateau,Jos branch	325	View Edit Delete
17	Abuja, Zuba branch	Abuja, Maraba branch	32	View Edit Delete
18	Nsukka branch	Enugu,Garki branch	65	View Edit Delete
19	ENUGU, OLd_road branch	Enugu,Garki branch	8.5	View Edit Delete
20	Enugu,Garki branch	Enugu, Abakpa branch	15	View Edit Delete
21	Kano, Sabo branch	Delta, Warri branch	967	View Edit Delete
22	Delta, Warri branch	Plateau,Jos branch	841	View Edit Delete
23	Abia, Aba branch	Kano, Sabo branch	1,024	View Edit Delete
24	Abia, Aba branch	Delta, Warri branch	233	View Edit Delete
25	Abia, Aba branch	Enugu, Abakpa branch	181	View Edit Delete
26	Nsukka branch	Abuja, Maraba branch	362	View Edit Delete
27	Abia, Aba branch	ENUGU, OLd_road branch	175	View Edit Delete
28	Abia, Aba branch	Enugu,Garki branch	165	View Edit Delete

< previous 1 2 next > last >>

Page 1 of 2, showing 20 record(s) out of 28 total

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Figure 4.10: The Screen Shot of the Location Graph

5.0 CONCLUSION

This project was carried out in a bid to reduce the amount of time spent by commuters in the bus station following the fact that most travelers prefer to go by land using bus as it is considered more affordable. To this end, the reasons for the long wait in the bus stations were considered to be as a result of bus shortage or better still mismanagement and inability of the bus information system to advise them on the resources they have. However, the reasons behind this wait were accessed and the lessons learned forth with, thus advised the choice of the algorithm used by the researcher hence the conclusion. This system is a web-based application that will manage the scheduling of buses in all bus terminals of a transport company. With this software, an administrator can manage bus station or terminals departure time, routes, vehicle type and driver including the cashier(s) for the terminals.

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