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The Design and Implementation of Taxi/Bus Transportation Management System. (A Case Study of University of Agriculture, Makurdi)

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Abstract
When the transportation system of any educational institution is effective, it positively contributes to effective learning; saves cost and generate revenue to the authorities. This is the desire of every institutions of learning although a number of constraints usually make it not attainable. The transportation system presently operated by the University of Agriculture, Makurdi was studied and found to be cumbersome, exploitative and fall short in all standard of a good transportation system. Therefore this paper seeks to present the results of the research carried out to design and implement a new computer-based solution for the management of the transport system within the institution. The research methodology adoption in the design of the system is the Use Case and Activity Diagram. MySQL was used to create the database used by the system. The coding of the new transportation system was done using Microsoft Visual Basic 6.0 and the test implementation shows remarkable improvement in routes schedules and drivers registration. The system is capable of generating substantial fund for management through registration fees at the same time reducing the cost of transportation by students and staff within the University.

I. Introduction

The movement of people, goods and services from one place to another is very important in human existence. This movement is called Transportation and could be carried out by means of trekking, use of animals such as donkeys and horses, cars, buses etc. Transport demand in most Nigerian cities has increased significantly due to increase in population as a result of both natural increase and migration from rural areas and smaller towns. Fast growth of Nigerian's population like other developing countries has triggered a greater need for organized public transport system.

According to [1],Automation of Bus transport has been gaining more importance because they provide accurate information of buses like reservation, fare charges, route information, bus information from anywhere and anytime. Bus automation covers all aspects of Bus and Taxi transportation and is made up of six modules based on the functionalities of the system namely, Information System Module (ISM), Reservation System Module (RSM), Administrative Management System Module (AMSM), Fleet Management System Module (FMSM), Warehouse Module (WM) and Financial Module (FM). These modules have been designed to build up an integrated system to cover various aspects of Automated Bus Transport Management System. They provide information about the Bus enquiries, Buses schedules, Buses fares, Buses ticket reservation, Buses time table enquiry. Based on the study by [1], the Information Management System module is expected to provide detailed information about the Bus transport system namely vehicle registration, route, reservation, cancellation, fares etc. The Taxi/Bus information system that is developed will provided commuters' access to information, which would allow them choose the optimal route and at the same time effectively manage time. We will therefore develop a point-to-point guide which would provide the following:

- Timing/Frequency of the various Taxi/buses.
- Taxi/Buses connecting various places of interest to the commuters.

Also,[2]in his work developed an Intelligent Campus Bus Identification, Monitoring and Management System using Radio Frequency Identification (RFID) and sensing technologies. A theoretical framework and interface algorithm utilizing RFID and communication technologies, i.e. Global Positioning System (GPS), General Packet Radio Service (GPRS) and Geographic Information System (GIS), were developed for a prototype. The interface algorithm in the control center is able to analyze the location of the bus, information about the driver and the status of the bus, and whether it follows the schedule.

Taxi management is not only an issue of transportation, but also an issue of supply chain. The daily taxi supply and customer demand are very dynamic and unpredictable.

CabLink advocates its world's first and largest automated taxi dispatch facility by integrating Interactive Voice Response (IVR) and Global Positioning Systems (GPS). CabLink also brings obvious financial benefits to both the company and the drivers. The charge for on-call service is S$4, of which 50 cents goes to the company; the remaining S$3.5 will be deposited into the driver's account. Through CabLink booking, drivers' fare collection has reached S$100m per year in total, and drivers' booking fee collection has achieved S$30m-S$32m per year[3].

The University of Agriculture Makurdi (UniAgric)is a densely populated institution with a large landmark with lecture halls and other academic and administrative structures widely dispersed. The institution is made up of the North and South core because of the distance apart. This makes movement within the campus to be tedious and cumbersome. Students and lecturers often resolve to commercial transportation within and outside the institution. This makes the transport business in the institution although lucrative but highly unorganized. With so many taxi/Bus to manage and various routes to connect, the task of managing the transportation system of the institution becomes extremely important. The System that is developed is an integrated electronic management system that will help in minimizing the errorsthat are mostly caused by human mistake. The system is developed as a solution for the transfer of operations from the current manual practices to a more systematic andcomputerized method. The system is focused on taxi/bus Management Module which will comprisetaxi/bus registration and taxi/bus routes allocation.

II. Material And Methods

The method used to model the system is the Use Case Diagram and Entity-Relationship (ER)diagram.Mysqlwas used for the Database implementation and Java programming language was employed

in the coding of the system.

A. System Design

According to [4], system design is the process or art of defining the architecture, component, modules, interface, and for system to satisfy specified requirement. The system Architecture creates the blue-print for the design with necessary specification for the hardware, software; people and data resources. In many cases, multiple architectures are evaluated before one is selected.

B. Database Implementation

The database of this application was implemented withMySQL. MySQL is a database application with which one can create database files using the relational model. With this model you can create tables, store and manipulate data within the tables as required. Relationship can also be established to create communication among them.

C. Unified Modelling Language (UML) Models of the Proposed System

The Unified Modelling Language (UML) is a standardized general-purpose modelling language in the field of object-oriented software engineering. The standard is managed, and was created, by the Object Management Group (OMG). It was first added to the list of OMG adopted technologies in 1997, and has since become the industry standard for modelling software-intensive systems[5]. UML includes a set of graphic notation and techniques to create visual models of object-oriented software-intensive systems. According to the [6], UML represents a collection of engineering practices that has proven successful in the modelling of large and complex software systems. It uses mostly graphical notations to represent the design of software systems, and as a result, visually aids in the communication of project designs, the exploration of potential designs and in the validation of the resulting design. Although, UML offers different groups of diagrams which were used to model a system but Use Case and Activity Diagrams were used in this system. UML combines techniques from data modelling (entity relationship diagrams), business modelling (work flows), object modelling, and component modelling. It can be used with all processes throughout the software development life cycle, and across different implementation technologies. Use case diagrams are done in the early phase of a software development project and they recommend how it should be possible to use the final system. Use cases are a good way to express the functional requirements of a software system as they are intuitive and easy to understand and can be used in negotiations with non-programmers. Furthermore, the use case diagram is designed to graphically capture and depict the interactions and functionality between the system and its users. The use case diagram for this system is shown in Figure 3.

D. Activity Diagram

Activity diagram describes the business and operational step-by-step workflows of components in a system. It shows the overall flow of control detailing the sequence of activities from a start point to the finish point displaying the many decision paths that exist in the progression of events contained in the activity. They may be used to detail situations where parallel processing may occur in the execution of some activities. Activity diagram for the system is shown in figure 3.2 Before a user accesses the system, he/she must provide the system with valid user credentials (username and password), the user is authenticated, authorized and access to the appropriate resources for the user is granted; if the user credentials are not valid is thrown back to the login interface to provide valid ones. The resources giving to the user are based on their respective roles specified in the Fig. 3.

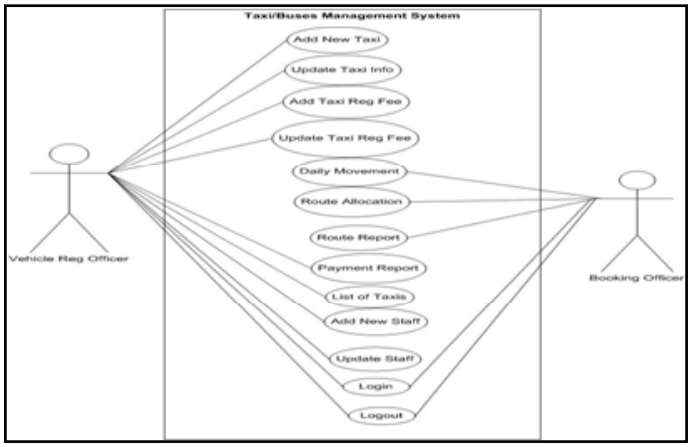

Fig.3: Use Case Diagram for Taxi/Bus management system.

Fig. 3 is the Use Case Diagram for the proposed taxi/bus management system for Uniagric commercial vehicle. The system consist of two actors the registration officer and booking officer. The registration officer is responsible for recording of new taxi/ buses, drivers/staff and updating of all other records assigned to him. The booking officer on the other hand assigns routes to taxi/ buses for daily movement.

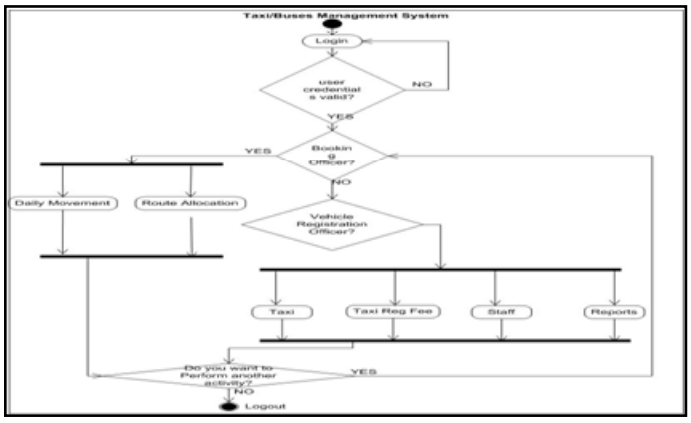

Fig. 4: Activity Diagram for the proposed system.

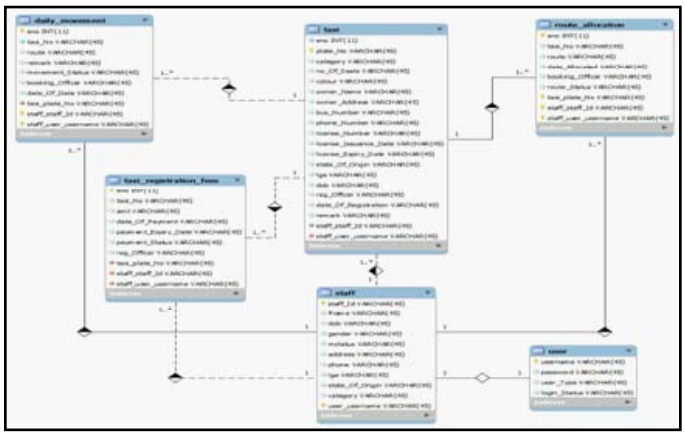

Fig. 5: E-R Data model for the proposed system.

E. System Specification

The minimum hardware and software needed to effectively use

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the system is given below

1. Hardware requirement

- System unit
- Monitor (VDU)
- Uninterrupted power supply (UPS)
- RAM (64)
- CD Rom
- Hard disk capacity of 40GB
- Printer

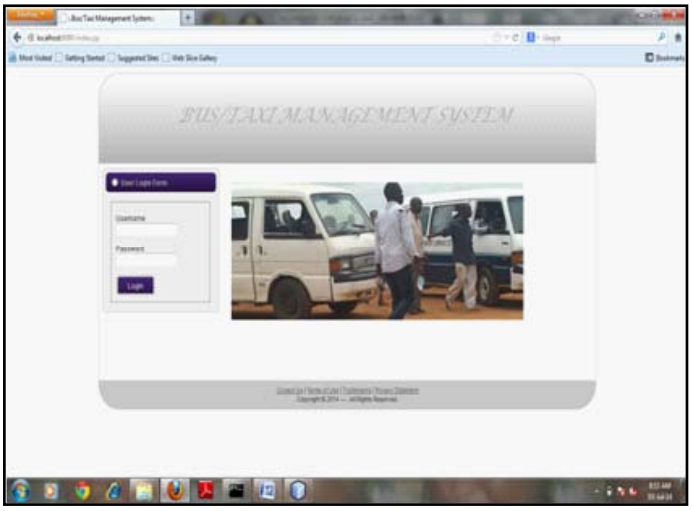
2. Software Requirement

- Window XP operating system
- Microsoft access
- Microsoft visual basic

III. Result And Discussions

Program Input Display

The frist dialog box to appear on system implementation is shown in Fig. 6. It displays the welcome screen and provide a log on authentication for valid users



.Fig. 6: Login frame for the taxi/bus management system.

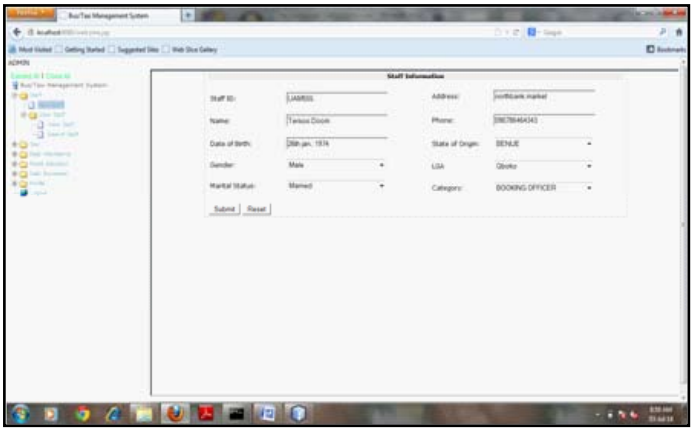


Fig.7: Staff/Students Registration interface

Fig. 7 enables all the Staff and students to be registered as valid users of the system. Any person not registered cannot use the taxi/bus.

Fig. 8: Search Interface

Fig. 8 enables a valid user to search for available Taxi/Bus for a given route and to pick up a space.

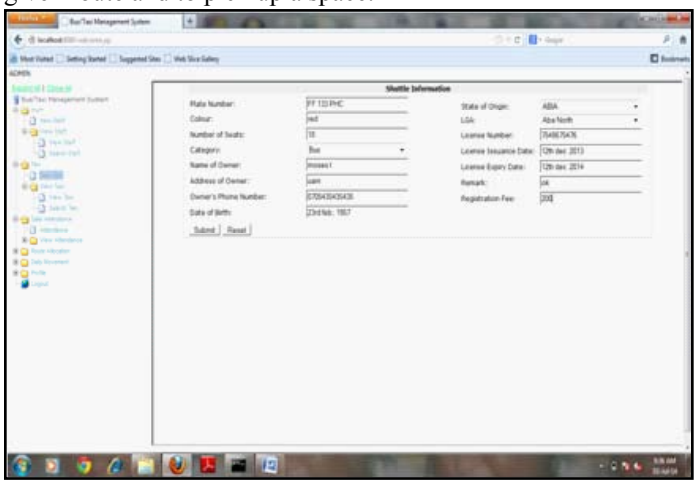


Fig.9: Registration interface for a taxi/bus

Fig. 9 enables taxi/Bus owners to be registered as operators in the system. Any Taxi/Bus not registered cannot operate with the campus

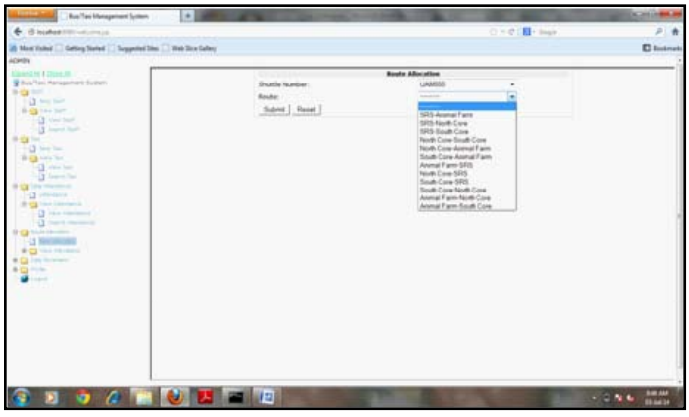


Fig. 10: Route allocation interface.

Fig 10 shows the menu that enables Management to allocate routes on a daily basis to vehicle to ply. the vehicle number is used as key for allocation.

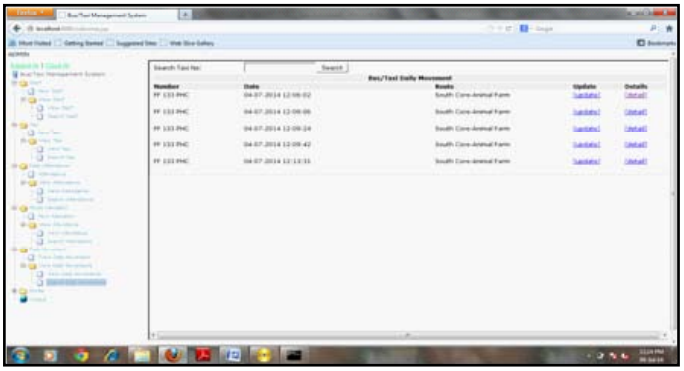


Fig. 11: Daily movement for vehicle

Figure 11 display the daily movement control for vehicles. At a glance, it enables management and other users to be able to know the current routes that taxis/Buses plying.

IV. Conclusion

This research focuses on the Taxi/bus Management System on UniAgric. The focus of this work is to provide an effective system that ensures instant and secured access to data that the user needs in other to make effective bookings for taxi/bus and for the institution to be able to have control the management of the transportation system for profit generation. To actualize this, J2EE programming language was used to code the logic and MYSQL was used to design the database.The above designed system focuses mostly on staff, driver and shuttles (taxis/buses) registrations and the allocation of routes to this shuttles, as well as keeping track of the movement of this shuttles. The system alsoensures that it keep track of the number of times taxis/buses can move on a particular route in a day in other to allow for fair and equal distribution of services among the taxis/buses on service for that day.

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