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RESEARCH ARTICLE

Smart Card Implementation in Road Transportation

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ABSTRACT

Public Transportation systems have been developed and formed independently from one another although they are within the same regional province where the corollary of such development is tremendously experienced. This report, which presented the barriers to Integrated Smart Card Fare Collection System [ISFCS] implementation and the possible solutions to these barriers as well as it describe the benefits and risks of the systems. The ISFCS played a major role in improvement process of multi-model and multi-operator coordination within public transportation industry and bridging the gaps with the aim to provide a customer focused and streamlined and integrated public transport Fare Collection system. The customer information and fare collection data are the two main aspects of transportation that have the potential to encourage integration of multi- model operator.

Keywords— Public Transportation systems, Integrated Smart Card Fare Collection System

INTRODUCTION

The public transportation industry could become more competitive and viable if it continues to enhance in services and operations. Therefore, the Kuala Lumpur population would be likely to consider public transports more frequently when choosing traveling options. The public transport operators could improve their services by being innovative and proposing something different and new using latest technologies for their current service levels. In regards to this, Integrated Smart Card Fare Collection System could mean for one of the possible technology solution. When transportation implementation is feasible, innovative Fare Collection services could be offered to improve the attractiveness of Public Transport.

EXISTING SYSTEM

In the conventional system, Printed papers like tokens are used as tickets or bus pass. So the conductor will collect money from each passenger for the purpose of issuing tickets as well as bus passes like 50.rs type. College students need to carry ID card along with bus Pass whenever they want to make a journey to college. Passengers/students who holds bus pass need to get punch from the conductor after entering into the bus. The conductor should note the details like number of tickets sold etc. in the sheet. The details should be updated after reaching every stage. The existing system presents the route map of big data relying on cloud computing to make urban traffic and transportation smarter by mining and pattern visualization. Although most of these technologies already commercialized, to be or not to be cloud is still a problem for organizations because of the top issues like security and privacy.

PROPOSED SYSTEM

In the real world implementation it is necessary that the application must be kept up-to-date with the android application. In this proposed system using RFID (price for particular destination) for fare transaction. The project is implemented using RFID (Radio Frequency Identifier) technology. RFID smart card is used for bus pass and ticketing purpose. First the users should do the smart card registration. Then, they are requested to visit the bus depo with registered ID to get smart card. The user details will be fetched from database by depo staff and those details will be stored in the smart card through burner kit for accessing user details. Smart card recharge will be done at the bus depo for the purpose of monthly renewals.

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Knowledge on the System

The operators involved in the new integrated Fare Collection services must agree to incorporate all technical requirements as well as non-technical in order to ensure that transportation is well suited for multi-operators and multimodal setting. A promotional campaign should be conducted to encourage consumers to use new Fare Collection services.

Cost of System

The operators must agree upon transportation system using RFID technology standards and procedures, and then procure it jointly in order to reduce cost funding. The true costs of transportation system must be clearly defined during the planning of transportation implementation to ensure the participating operators have sufficient funding.

HARDWARE DESCRIPTION

Arduino Microcontroller

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources. The 4WD Arduino Compatible Basic Mecanum Robot includes a microcontroller board based on the Arduino 168. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 8 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Arduino section on the ME 2011 web site, covers more on interfacing the Arduino to the real world.

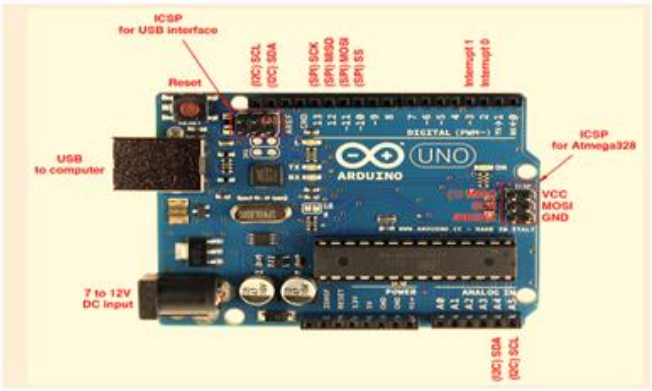

Figure 1: Arduino microcontroller

Rfid Reader

RFID stands for Radio Frequency Identification. RFID is one member in the family of Automatic Identification and Data Capture (AIDC) technologies and is a fast and reliable means of identifying objects. There are two main components: The Interrogator (RFID Reader) which transmits and receives the signal and the Transponder (tag) that is attached to the object. An RFID tag is composed of a miniscule microchip and antenna. RFID tags can be passive or active and come in a wide variety of sizes, shapes, and forms. Communication between the RFID Reader and tags occurs wirelessly and therefore does not require a line of sight between the devices. An RFID Reader can read through most anything with the exception of conductive materials like water and metal, but with modifications and positioning, even these can be overcome.

Figure 2: RFID Reader

Rfid Tag

A Radio Frequency Identification Tag (RFID tag) is an electronic tag that exchanges data with a RFID reader through radio waves. Most RFID tags are made up of at least two main parts. The first is an an antenna, which receives radio frequency (RF) waves. The second is an integrated circuit (IC), which is used for processing and storing data, as well as modulating and demodulating the radio waves received/sent by the antenna. A RFID tag is also known as a RFID chip.

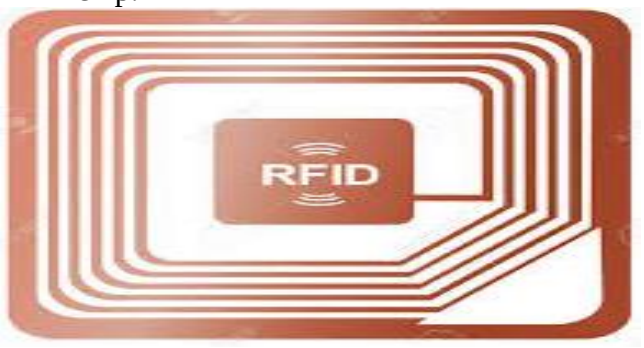

Figure 3: RFID tags

LCD 16x2

LCD display is used to display the data for user reference. A liquid-crystal display (LCD) is a flat

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panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. Each crystal, therefore, is like a shutter, either allowing light to pass through or blocking the light.

Figure 4: 16x2 LCD

Bluetooth

Non-proprietary (open) standard for wireless digital data communication over short distances (10 meters/30 feet). A radio-frequency (RF) based technology, Bluetooth aims to connect virtually every type of electronic device computers, keyboards, monitors, printers, personal digital assistants, headphones, microphones, mobile phones, video cameras, etc. across walls and barriers without wires. It operates at a frequency of 2.45 GHz to give the current maximum data transfer rate of 1 megabits per second (up to 700 kilobits per second in practice, or more than 10 times the speed of a 56K modem), and employs 'channel hopping' techniques to reduce electromagnetic interference (EMI).

SOFTWARE DESCRIPTION

Arduino Software (IDE)

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Block Diagram

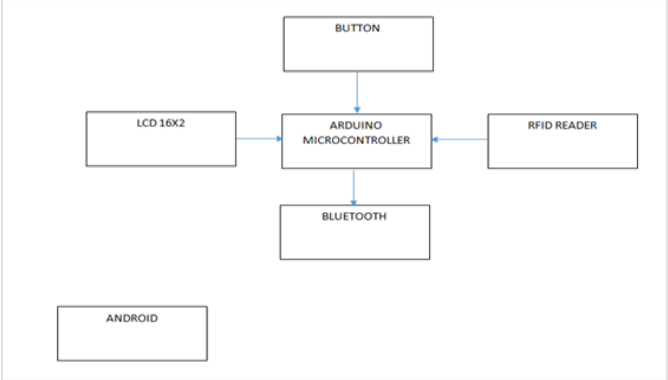

Figure 5: Block diagram

DETAILED DESIGN

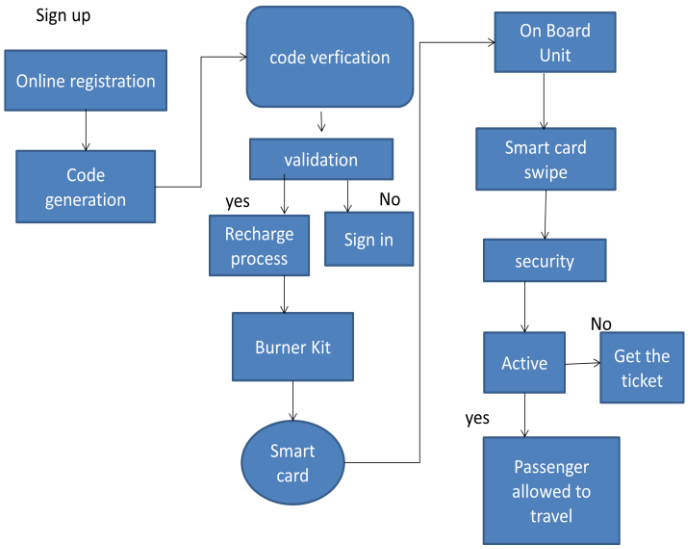

Figure 6: Architecture Diagram

MODULE DESCRIPTION

Online Registration of User

The user must do the registration by filling the online registration form .During registration, they have to provide their details and OTP [One Time Password] for preventing duplicate registration .At the end of the registration, the smart card system will provide a unique code for the registered user .The generated code will be used at the bus depo for getting RFID smart card as well as for recharge process.

Admin Validation

The Admin in the bus depo will validate the unique code given by the user. If the code is valid, the user details like college name, bus routes etc are stored in the database. After that, those details are fetched and stored in RFID smart card which will be issued to the passenger.

User Recharge process

Once the RFID smart card gets expired, the users are requested to visit the bus depo and to provide their unique code to the admin for recharge purpose. If the unique code is valid, on the spot recharge will be done by admin.

Passenger Module

Once passenger received the RFID smart card, they can use the smart card system. The passengers are requested to wave their RFID smart card in front of the device after entered into the bus. RFID reader in the device will senses the card and displays the status and details of the card holder in the LCD display. If the card is valid, the passengers are allowed to travel otherwise they are not allowed to travel.

UML DIAGRAMS

Use Case Diagram

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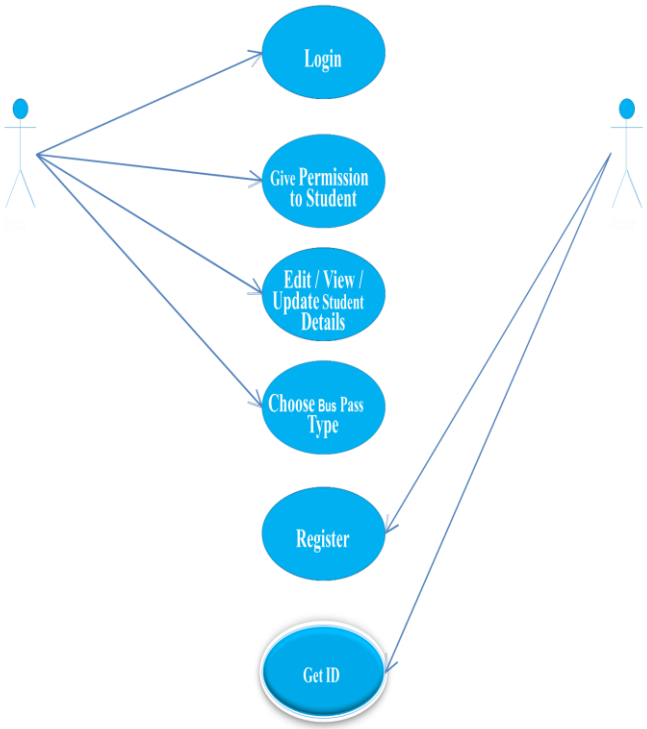

Figure7: UML Use case diagram for smart card implementation in road transportation

The main purpose of a use case diagram is to show what system functions are performed for which actors. Use Case diagram of our system is shown in fig 7.

Class Diagram

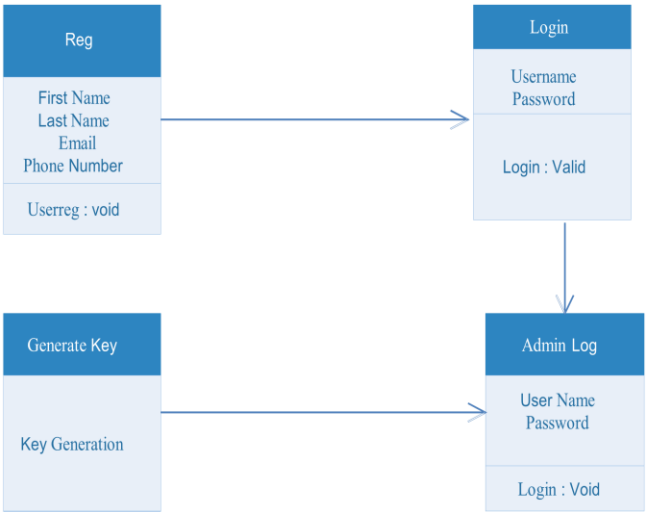

Figure 8: UML Class diagram for smart card implementation in road transportation

A **class diagram** is an illustration of the relationships and source code dependencies among **classes** in the Unified Modeling Language (UML). In this context, a **class** defines the methods and variables in an object, which is a specific entity in a program or the unit of code representing that entity. Class diagram of our system is shown in fig 7.

Sequence Diagram

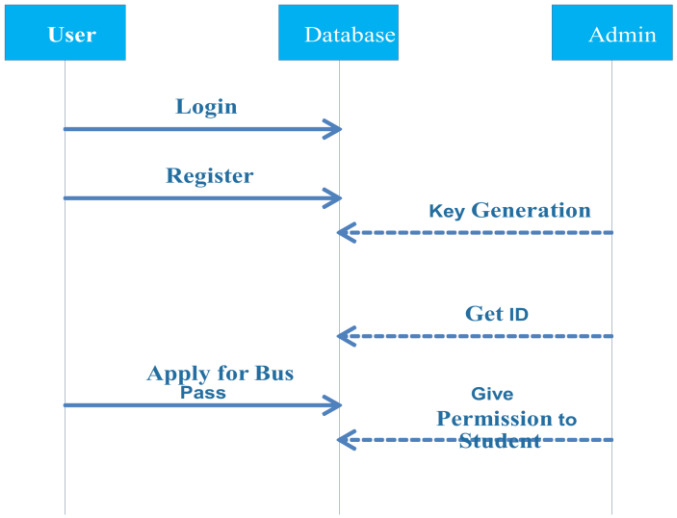

Figure 8: UML Sequence diagram for smart card implementation in road transportation

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams. Class diagram of our system is shown in fig 8.

SCREENSHOTS

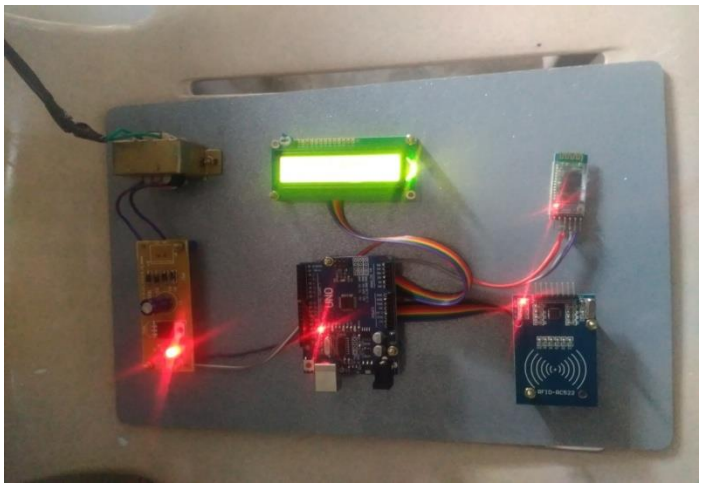

Figure 9: Setup Board

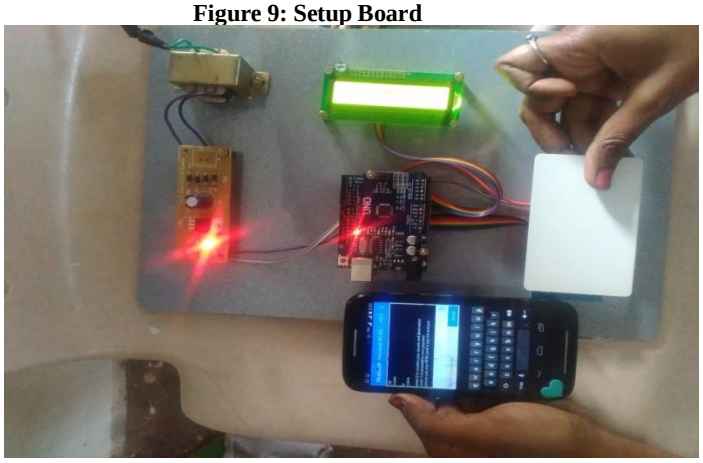

Figure 10: Swipe Invalid Card

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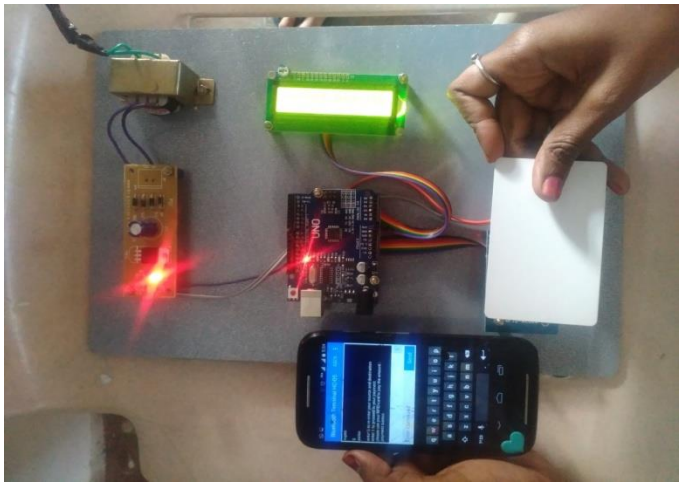


Figure 11: Swipe Valid Card

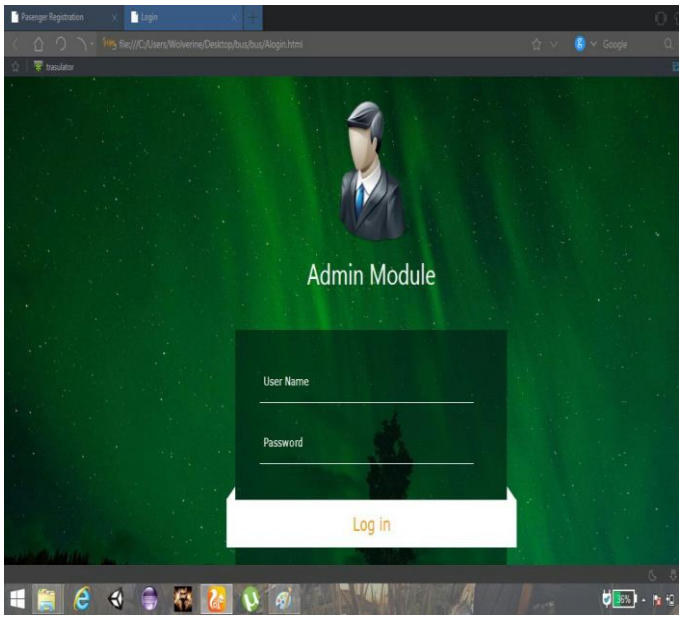


Figure 12: Admin login

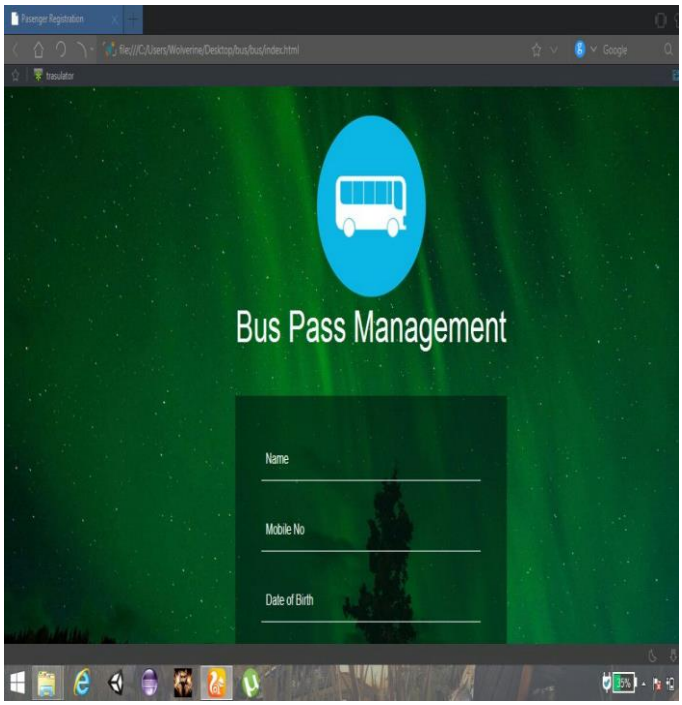
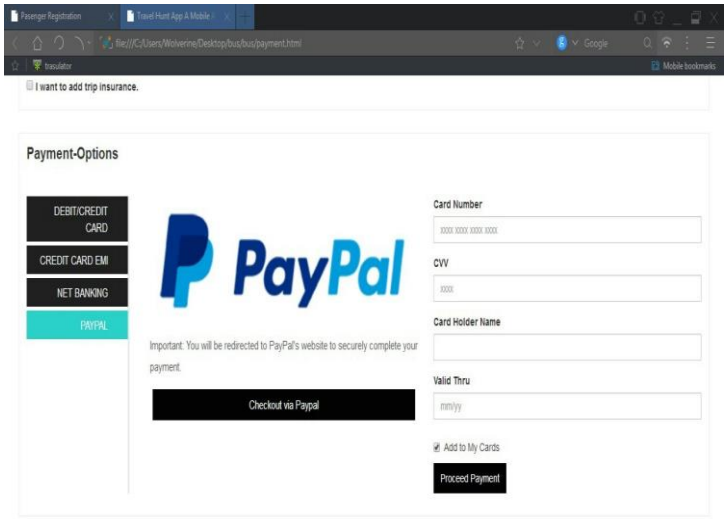


Figure 13: Passenger registration



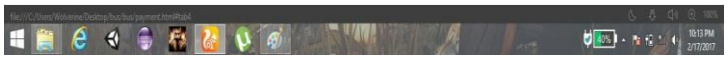


Figure 14: Smart Card Recharge

CONCLUSION

The finding implied that public acceptance of transportation may vary depending on ridership of each operator where the successful implementation would depend on operators' abilities to identify market populations, partner with other mode operators, non transportation agencies and local authorities to capture the markets.

FUTURE ENHANCEMENT

In order to further enhance the system .This system can be implemented for ticket issuing purpose by sensing the card holder details through RFID reader and detecting amount from the card for their journey. The recharge feature will be included in mobile through bank account synchronization for topping their smart card.

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