BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

FINAL YEAR PROJECT

TITLE: AUTOMATIC VEHICLE REFUELING WITH ELECTRONIC PAYMENT SYSTEM.

BY

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A final year project report submitted to the Department of Computer Engineering in Partial Fulfillment of the Requirements for the Award of a Bachelor's Degree in Computer Engineering of Busitema University

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ACKNOWLEDGEMENT

DECLARATION

I **KAYESU RITAH** Reg. No BU/UG/2014/2000 hereby declare that this project report is my original work except where explicit citation has been made and has never been published and/or submitted for any other degree award to any other university or institution of higher learning for any academic award.

Sign: ....

Date: ....

APPROVAL

This is to certify that the project under the title "**Automatic vehicle refueling with electronic payment system**" has been under my supervision and is now ready for examination.

Sign: …………………………..

Date: …………………………..

Ms Nakiganda Agnes

Department of Computer Engineering

DEDICATION

To my family and friends.

LIST OF ACRONYMS

GSM - Global System for Mobile communication

ID – Identification

IDE – Integrated Development Environment

IC – Integrated Circuit

IR – Infra red

LCD – Liquid Crystal Display

NFC – Near Field Communication

PCB – Printed circuit board

RFID – Radio Frequency Identification

SPI – Serial Peripheral Interface

UART – Universal Asynchronous Receiver-Transmitter

UID – Unique Identifier

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ABSTRACT

In current days' fuel stations are operated manually. These fuel pumps are time consuming and require more manpower. To place fuel stations in distant area it very costly to provide excellent facility to the consumers all these problem are sorted out by the use of unmanned petrol pump which requires less time to operate and it is effective and can be installed anywhere the customer self-going to avail the services the payment is done by electronic clearing system. The Automatic vehicle refueling with electronic payment system uses simple and proper use of microcontroller and RFID technology and sensors to provide a total security and automation in distribution of fuel. It has easy operated motor system and graphics user interface (GUI). It is interface with high speed fuel dispenser which is convenient for consumer to operate. In this system a card is provided to the user which gives permission to input anything to the system via a keypad and information displayed on the LCD provided by the fuel station also refueling is not possible until the card is fully verified by the database. Additionally, the circulation of the fuel is impractical until control unit gives the correct summon to the pump.

The automatic vehicle refueling with electronic payment system can be adopted by adding dedicated components to the existing dispensers so as to provide fundamental connection of every component in the dispenser gives security to the fuel distribution and helps the information keeping of the conveyed fuel at a low cost. The system is secure for fuel. The advancement of this project can help industry financially.

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CHAPTER ONE: INTRODUCTION

This chapter comprises of background, problem statement, justification, objectives and scope.

1.1 BACKGROUND

Fueling stations are common place in today's society. The most readily seen station is a gas station that includes one or more fuel pumps that are able to dispense one or more different types of fuel like gasoline, diesel, and kerosene. A fuel station is a facility which sells fuel through fuel dispensers which themselves are used to pump those types of fuel into vehicles and to calculate the financial cost of the product thus dispensed[1]. In 2016, 72.11 million passenger cars were produced worldwide. This figure translates into an increase of around five percent, compared with the previous year and passenger car sales are expected to continue to grow to about 77.7 million units in 2017[2]. This indicates how the fueling stations are increasing due to the increase in the number of vehicles worldwide. Energy in form of liquid fuel like petrol, diesel, and kerosene is a greatly demanded resource in many countries as a requirement for operation of machines and automobiles across the globe. Over the years demand for fuel, has risen as far as retail level thus leading to increased number of retail dispensers throughout many countries[3]. Fuel dispensers are used to pump petrol/gasoline, diesel, compressed natural gas, kerosene into the tanks within vehicles.

Currently fuel companies in Uganda such as Shell, Gapco, Total operate manually where a vehicle operator drives their vehicle to one of the pumps and stops their vehicle. The operator then exits the vehicle to pay for the fuel and then the attendant refuels the vehicle for him or her. This type of fueling system includes a variety of disadvantages. Since stations aim to include quality and modern technologies in their services hoping to realize the optimization of the employed resources[4], the use of credit and debit cards for payment has changed the way fuel is delivered to the increasing number of customers. This has been made possible through the use of computers and the Internet[5]. At some stations, the operator may be required to walk to a nearby kiosk or store to pay for the fuel. Alternatively, the pump may be equipped with an interface to receive credit card payment. Elsewhere in the world, a self-service mechanism is applied where a customer fills up the tank on their own in case an attendant is missing but this works along with electronic payment using credit cards.

However challenges of delays and unreliability at some hours, theft at night by robbers who attack attendants and snatch money from them are still faced. Also the vehicle driver has to pay for fuel

with cash money which makes the attendant prone to receiving counterfeit notes. The other challenge is that each dispenser housing area has one to two fuel pumps and requires an attendant to be operated; this may be time consuming in the case of a lot of traffic awaiting refueling. This causes Congestions and long traffic jams due to the uncontrolled increase in the number of vehicles in recent years. And lastly leaks occur during dispensing process since the serviceman or a customer in case of self- service has to keep holding the nozzle until all the required quantity has been dispensed.

The **Automatic vehicle refueling with electronic payment system** sought to minimize human interaction at the stations through automation. The system manipulated an RFID based prepaid card for electronic payment, position the nozzle towards the vehicle filling inlet then activate the refueling process by automatically powering on the pump system after successful docking of the nozzle in the inlet. This offers the promise of reduced labor levels required at the station to refuel vehicles, counting cash, and balancing books at the end of the day.

1.2 PROBLEM STATEMENT

Petrol pumps at petrol stations are operated manually which is time consuming when there is a lot of traffic and unreliable since stations need to be closed at early morning and late night hours. Every dispenser needs an attendant to operate it, this call for more man power which at the end of the day requires remuneration for the work done. Some of these attendants are dishonest; they dispense less fuel than the amount paid, they are also vulnerable to attacks by robbers since they receive hard cash from customers and keep it till they sign out. Exposure to fuel and inhaling petrol vapor results health related complications like cancer and other adverse health effects like damage of DNA[6].

The automatic vehicle refueling with electronic payment system reduces need for man power during refueling by implementing cashless transactions and automating fuel dispensing.

1.3 OBJECTIVES

1.3.1 Main objective

To design and develop an automatic vehicle refueling with electronic payment system for petrol stations to reduce the need of petrol attendants.

1.3.2 Specific objectives

i. To identify and analyze the requirements needed to develop the proposed system and design the model using the properly analyzed requirements.

ii.   To develop a payment system based on RFID technology.

iii. To integrate components that realize nozzle positioning and automatic vehicle refueling.

iv.   To test and validate the system.

1.4 JUSTIFICATION

With this increase in the number of vehicles manufactured annually, there will be need for more attendants to be deployed at the stations for faster refueling. This project proposes automatic refueling with automatic electronic payment which will ensure a secure payment system since there is no exchange of hard cash. An easy to use interaction style will be incorporated which will facilitate the user to input amount to be spent on the fuel. Theft and fraud are a growing concern for today's retailers; automating the refueling process will prevent criminal activities like robbery of money from attendants. The system will ensure accuracy in the amount of petrol dispensed preventing problems of attendants dispensing less or more than what has been paid for. This is one of the ways which allows the client to conveniently fill up the vehicle tank at any time of the day. The system will be deployed once at the station hence reducing the company's expenditure on employee's salaries.

1.5 SCOPE

The system consists of; a payment unit which will include the RFID reader and card to be read, LCD for display, and keypad for input, a microcontroller which receives a signal from RFID unit to send control signals to the relays which in turn drive the motors for the nozzle and pump. And lastly, an Infra-red(IR) photodiode sensor and IR diode which aid the nozzle to locate the vehicle filling inlet.

The system is developed for petrol stations in Uganda but main focus is on refueling motor vehicles with only liquid fuel. Vehicles with at least four wheels designed and constructed for the carriage of passengers comprising not more than eight seats in addition to the driver's seat.

The design and development n took a period of 6 months starting November 2017 to April 2018.

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