

BUSITEMA UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER ENGINEERING

A HELMET BASED MOTORCYCLE IGNITION CONTROL SYSTEM

By

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Declaration

I **Kajubu John** Reg.no BU/UG/2012/64 hereby declare that this project report is my original work and has not been presented for a degree to any other University or any other award.

Sign: 

Date: 08th/05/2016



Approval

The undersigned certify that he has read and hereby recommend for acceptance of Busitema University a Project report entitled *A Helmet Based Motorcycle Ignition Control System*.

Mr. Odongtoo Godfrey

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Sign: 

Date: 07/06/2016

Dedication

This project report is dedicated to my entire family members who were very supportive in all ways; including financial support, emotional support and their prayers. May the almighty God bless them abundantly.

Acknowledgment

In everything I do, I believe I am never alone for the Almighty God is always by my side. So I would like to take this opportunity to thank Him for having made me go through this tough time of my research successfully, for He gave me good health and that kept me strong to carry on with the study.

I would like to thank the department of computer engineering, Busitema University for having given me the opportunity to carry out this study and also great thanks go to my supervisor Mr. Odongtoo Godfrey who has stood with me throughout this research and implementation season right from the time the academic year began. He has been approachable and available for any consultations I had to make from him, may God bless him abundantly.

Finally I would like to thank all my friends and colleagues that helped me to overcome some of the challenges that came across my way during this period.

Abstract

This project mainly focuses on addressing the safety of a motorcycle rider and passenger while riding a motorcycle. Due to the many cases that have had been reported over the recent years in various major hospitals in Uganda like mulago and many others, it is evident enough that riding a motorcycle without a helmet is very dangerous. In addition, since a motorcycle is a two wheel automobile it is prone to accidents unlike motor vehicles. The helmet based motorcycle ignition systems tires to solve the problem of the low use of helmets by motorcycle riders and the passengers they carry in Uganda. The system operates in such a way that before one can start or ignite the engine of the motorcycle, he has to first put on a helmet before the ignition line can be completed. And if a passenger seats on the motorcycle, the ignition line will not be completed until he also puts on a helmet. The developed system is mainly based on RF technology for wireless communication. This is set on a specified frequency and more so a specific signal is sent to distinguish between the rider's helmet (1) from that of the passenger (0). The helmet sub system was deployed in a real motorcycle helmet as shown in the preceding chapters, and the ignition control circuitry was demonstrated using a toy that was which had the circuit well embedded and integrated. This was important as it easily demonstrated how the system would operate if it was to be deployed in the real world. Motorcycle helmets while riding a very important because in case of any accident, a person might get injured but with minimal chances of death. Therefore this project tries to ensure that if someone is to raid a motorcycle then they ought to put on a helmet.

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List of Acronyms and Abbreviations

ADC-Analog- Digital Converter

A/D- Analog-Digital

GND- Ground

ISP- In system programmer

LED- Light Emitting Diode

RF- Radio frequency

USART-Universal synchronous-asynchronous Receiver Transmitter

CHAPTER ONE

INTRODUCTION

This chapter mainly describes the background of the system, the objectives, the justification and significance to design and develop the system. It further more describes the assumptions taken and the limitations of the project.

1.1 BACKGROUND

For a very long time now over the years, there has been low use of helmets by both motorcycle riders and the passengers they carry. This problem has led to high death rates due to motorcycle accidents which are rampant in Uganda since they can occur at anytime and anywhere hence loss of lives. In the new vision news on june 6th 2013, according to the injury control center Uganda, mulago hospital alone receives 5 to 20 motorcycle accident cases everyday resulting into at least 7280 cases in a year [1].

On Saturday 10th sept 2012 breaking news kampala Uganda in the new vision "at least 290 boda boda cyclists have died in Uganda in road accidents since the beginning of this year", said the commissioner traffic police Steven Kasima [2]. In 2013 motorcycle fatalities fell 6.4 percent to 4986 in 2012. In 2013, 56 out of every 100,000 registered motorcycles was involved in fatal crash, compared with only 9 out of every 100,000 passenger cars, according to the National Highway Traffic Safety Administration (NHTSA). In 2013 motorcyclists were about 26 times more likely than passenger car occupants to die in a crash per vehicle mile travelled and five times more likely to be injured, according to NHTSA [3].

The current system in Uganda is just a basic helmet that is ensured on by law enforcement by traffic police whereby motorcycle riders are advocated to always have a helmet on while they are riding so that in case of any accident occurrence, they are a bit protected and hence minimal chances of losing a life and if one doesn't have the helmet while riding they are fined by a traffic police officer. However most times these motorists ignore having the helmet on while riding, they instead place the helmets on the

References

- [1] new vision. (2013, june) www.newvision.co.ug.
- [2] new vision. (2012, september) www.newvision.co.ug.
- [3] insurance information institute. (2015, july) www.iii.org.
- [4] William Deutermann, "Motorcycle Helmet Effectiveness Revisited," National Highway Traffic Safety Administration, US Department of Transportation, Washington,DC, Technical Report DOT HS 809715, 2004.
- [5] Ph.D Richard L. Stalnaker, Max Bender, and Ph.D. John W. Melvin, "SAFETY HELMET-HEAD INTERACTION STUDY USING HIGH-SPEED CINERADIOGRAPHY," National Institute of Occupational Safety and Health , West Virginia, Research UM-HSRI-77-48, 1977.
- [6] motorcycle safety foundation. (2014) www.msf-usa.org.
- [7] suite jenner, "cycle safety information," *what you should know about motorcycle helmets*, vol. 2, no. 150, pp. 50-62, october 2014.
- [8] Lt. Gen. kale Kayihura. (2012, december) www.m.facebook.com.
- [9] WHO. (2007, june) www.who.int.
- [10] Fujikura Ltd., *Long range human body sensor with capacitive sensor*, 1st ed., koji sakiyama, yasushi nakamura and kazuya akashi takeshi togura, Ed. china: Fujikura Technical Review, 2009.
- [11] ATMELcorporations, *8-bit AVR microcontroller with 8k bytes in-system programmable flash.*: ATMEL, 2009.

[12] inc. insurance information institute. (2015, july) www.iii.org.

[13] new vision. (2013, june) newvision.co.ug.