BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

CAR COLLISION AVOIDANCE SYSTEM AROUND SHARP CORNERS AND MOUNTANIOUS AREAS

BY

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DECLARATION

I ABAASA PATRICK, BU/UG/2012/54, declare that this project report is my original work except where explicit citation has been made and it has not been presented to any Institution of higher learning for any academic award.

Signature…….

Date……

APPROVAL

This is to certify that the project report under the title “Car collision avoidance system around sharp corners and in mountainous areas” has been done under my supervision and is now ready for examination

Mr. Odongtoo Godfrey

Department of Computer Engineering

Signature……

Date……

DEDICATION

This project report is dedicated to my Parents Mr. and Mrs. Kamwezi Patrick, my brother Noble Nuwahereza, sisters Patricia, Hope and Evas.

ACKNOLEGDEMENT

My thanks and appreciations go out to my family who have been supportive in meeting most of my physical needs, my friends who have supported me all the way and my class mates all the way since year one. I would also like to appreciate my project supervisor Mr. Odongtoo Godfrey for his support and guidance and the entire BCT department at large for their continued support throughout all the four years at campus. May God richly bless you.

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ABSTRACT

Driving in mountainous areas or around sharp corners requires attention, skill experience and vehicles being in good mechanical conditions. This is because of the nature of its complexity if any of these factors is missing, the chances of accidents are increased. Despite all these factors being present, there are still situations which can still put drivers at risk of having a collision kind of accident. From Observation roads in mountainous areas are not always broad enough because of difficulty in constructing them due to the bad terrain and rocky mountain sides.

Drivers in such places must be very careful while approaching such points by reducing the speed or keeping the car alarm on in case there is any car approaching from the other side. A speeding Vehicle could collide into another vehicle in such places due failure to notice sign posts and warnings. This is common especially in cases where the driver is not familiar with the road. The project being reported solves this problem by reducing the chances and possibilities of collision or accidents in such areas.

Using RF technology, the driver is provided with enough information about the status and nature of the road in time before it is too late. The system has control modules which keep transmitting information about the status of the road. The driver is warned in advance with a an alarm inside the car and a display on a small screen when he approaches such places and another alarm and display informing him of any traffic ahead of him where he is not able to see. The driver is now able to now able to approach such places with confidence being aware of the status of the road.

The system is able to solve the problem of drivers entering corners unaware hence reducing the risk of accidents and collisions around such places. The report gives the details of implementation, development and testing in chapter four and five. The different tools and technologies used are explained and expanded. The report also contains a circuit diagram showing how the different components were put together, the budget, and time frame and finalizes with technical recommendations in the last chapter six.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

MVC	Motor vehicle collision
RF	Radio Frequency
LCD	Liquid Crystal Display
MC	Micro Controller
ACC	Adaptive Cruise Control
UPF	Uganda Police Force
PC	Personal computer
Aref	Analog reference
RST	Reset
RX	Receiver
TX	Transmitter
ADC	Analog Digital convertor
IDE	Integrated Development Editor
RS	Register Select

CHAPTER ONE

1.0 INTRODUCTION:

Road transport is currently the most commonly used type of transport in Uganda and the world at large. This is because it is cheaper and easily accessible compared to other types. The road sector is ultimately the most important mode of transportation in Uganda as it carries 97% of freight cargos and 99% of the passenger traffics [1].

Transportation has an element of danger attached to it in the form of vehicle crashes. Road crashes not only cause death and injury, but they also bring along an immeasurable amount of agony to the people involved. Technological innovations have given the traffic engineer an option of improving traffic safety by utilizing the available communication tools and sophisticated instruments. Using sensors and digital maps for increasing traffic safety is in its infancy. Systems are being developed to utilize the available state of the art facilities to reduce or possibly prevent the occurrence of crashes. Total prevention of crashes might not be possible for now, but the reduction of crashes could easily be achieved by using the collision avoidance systems [2].

1.1 BACK GROUND:

As the population rapidly grows, the number of vehicles on the roads has been simultaneously increasing. Between 2000 and 2010, the number of vehicles in Uganda increased from 300,000 to 800,000, along with the number of deaths due to traffic accidents. The number of vehicles plying Ugandan roads has increased by over 500,000 (100%) in the last 20 years [1]

According to the Uganda Revenue Authority (URA) estimates, there are 635,656 vehicles in Uganda today, an increase from 50,102 in 1991. (New Vision 11th January 2011) [3].The increased number of road users especially vehicles has led to increase in road accidents because of increase in traffic intensity, over speeding, fatigue, unqualified or bad drivers, black spots like around corners, mountainous areas and many others.

A number of factors contribute to the risk of collision, including vehicle design, speed of operation, road design, road environment, driver skill, impairment due to alcohol or

drugs and behavior, notably speeding and racing. Worldwide, motor vehicle collisions lead to death and disability as well as financial costs to both society and the individuals involved.

Today, Uganda has the second highest rate of road accidents in Africa and the world after Ethiopia. According to the World Health Organization's Global Status Report on Road Safety 2013, Uganda is named among countries with alarmingly high road accident rates. [4] If such trend of traffic accidents continues to increase, the health losses from traffic injuries may be ranked as the second to HIV/AIDS by 2020.

The government and police together with the road authorities have put measures to combat these causes of accidents which include speed limit sign posts, traffic officials to monitor traffic intensity, sensitizing road users, installing speed governors, among others. [1] The measures put have tried to reduce the accidents to some percentage. There is however one area that still remains a threat. Less or ineffective measures have been put to combat accidents specifically due to collision around sharp corners or bends and mountaneous areas. Due to the nature of the complexity of driving around sharp corners and mountaneous areas where it is difficult to see the incoming traffic or obstacle, the driver can easily collide into an incoming vehicle or pedestrian, or in case of an obstacle on the road.

Among the commonest methods employed by traffic police to reduce such collisions around curves and sharp corners is road sign posts and warnings. Many times, drivers may be paying attention to the road but will misjudge the danger of an approaching curve. As a result, transportation departments put signs before these dead-man's curves [5]. This method has been helpful but still has weaknesses for example when it is raining heavily or on a foggy day or at night, it becomes difficult to quickly see and recognize the sign posts and take quick action. People with sight problems also face the same problems.

This system will deal with these issues especially in cases where the driver misses the sign post warning him of a sharp bend or is not aware of the vehicles coming the other side. The driver can be notified or alerted of the approaching vehicle or obstacle or in case of a pedestrian crossing so that the driver can reduce his speed or even stop where necessary. The driver does not have to take the trouble to strain his eyes to look out for sign posts or strain his ears to listen to the sound of an approaching vehicle, because

part of the proposed system is planted inside the car to alert him in time whenever he gets close to such places.

1.2 PROBLEM STATEMENT

While driving, one relies so much on the senses of seeing and hearing to make decisions. This however becomes difficult when it comes to negotiating sharp corners and in mountainous areas because the driver is not able to see what is approaching from the other side of the bend. Hearing also becomes difficult due to the noise generated by the vehicle engine itself. The sharp corner or mountain side puts a barrier to driver's sight preventing him from seeing clearly where he is going. It becomes difficult for the driver to see approaching cars or obstacles hence increasing the chances of collision accidents at such points.

1.3 OBJECTIVES

1.3.1 Main Objective

To design and implement a car accident and collision avoidance system around sharp corners and in mountainous areas

1.3.2 Specific objectives

- **i.** To investigate the various conditions and circumstances under which collision accidents occur around sharp corners and mountainous areas.
- **ii.** To design communicating and control modules for the cars and roadside infrastructure
- **iii.** To connect the car and control modules to communicate and interact together as a whole system.
- **iv.** To test and validate if the communicating and control modules can monitor traffic, communicate with each other and give alerts and warnings.

1.4 JUSTIFICATION

Collision accidents especially around sharp corners and mountainous areas have claimed many lives and so many vehicles have been destroyed. Sign posts put by road authorities to warn drivers of sharp corners are not very effective especially at night or when it is raining or foggy. The driver is not able to see clearly in order to take action.

Even though the driver is able to see the speed limit sign post, the sign post will not warn him of the approaching vehicle the other side of the bend.

This system on implementation helps the driver monitor the status of the road on the other side of the bend or mountain where he is not able to see and hence reducing on the risk of collision into an approaching vehicle. The system can act like the eyes of the driver, no matter the time of the day hence giving him confidence while approaching the sharp bend or mountain side.

1.5 SIGNIFICANCE:

- The system is able to keep monitoring the status of the road on both sides of the bend or mountain side hence aiding the driver to know if the road is clear of approaching traffic or not.
- The system alerts the driver of the sharp corner or bend in order to reduce his speed whenever there are bad weather conditions like when it is raining heavily or foggy and at night when it is hard for the driver to use his eyes to see the speed limit sign posts or listen to the sound of an approaching vehicle and this avoids the risk of the driver entering into a corner at high speed or without notice.

1.6 SCOPE OF THE STUDY

This project focusses on design of an advisory collision avoidance system at sharp corners and mountaneous areas only.

1.7 LIMITATIONS

The following are some of the limitations of the system:

i) The system does not stop the car or control its speed. It only tells the drive of the condition of the roads; whether there is traffic or not. It is an advisory collision avoidance system.

ii) The system does not detect or communicate with cars that do not have the system installed in them.

iii) The system does not detect obstacles like fallen trees, animals, or people crossing.

iv) The system does not work in limited power.

v) The system is an advisory collision avoidance system, it does not take over control from the driver. The driver takes advice from the system about the status of the road in order to take proper decisions

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