FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER ENGINEERING AND INFORMATICS

FINAL YEAR PROJECT REPORT

A Smart Glasses System for the Visually Impaired People using an Object Detection Model

By

SSEMUJJU RAYMOND

BU/UG/2020/1976

+256 751 709 546/+256762051794

Email: ssemujjuraymond0@gmail.com

SUPERVISOR

Dr. ALUNYU ANDREW EGWAR

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DECLARATION

I SSEMUJJU RAYMOND hereby declare that the information provided in the report is my own original gathered authentic work and has never been submitted before to the Department of Computer Engineering and Informatics of Busitema University main campus and any another institution of high education.

Signature..... Date..28th June, 2024

APPROVAL

This project titled a smart glasses system for the visually impaired using an object detection model has been submitted with the approval of the supervisor.

(signature) (date)

Dr. Alunyu Andrew Egwar (Academic Supervisor)

DEDICATION

I dedicate this report to my lovely family, friends and more especially my mentor Mrs. Ocora Mary N Dawn who have always been there for me whenever they can. Thanks a lot for their love, prayers, emotionally, financially and academic support during the due course of my academics. May the Almighty God bless them abundantly.

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ABSTRACT

To date there are challenges experienced by visually impaired individuals in perceiving their surroundings resulting in navigation and accessibility problems. Therefore, to address this limitation, this project designs a system using a microcontroller, object detection model, and camera to assist blind people in recognizing their surroundings, including faces, objects, and obstacles. The visually impaired individuals receive output in form of audio from the system. The design method is used to develop, integrate and test the system components. A prototype and results of such tests were compiled, reported and will be submitted for examination to the department of Computer Engineering and Informatics, Busitema University.

LIST OF ABBREVIATIONS AND ACRONYMS

AI Artificial Intelligence

IEEE Institute of Electrical and Electronic Engineers

OCR Optical Character Recognition

TTS Text-to-Speech

YOLO You Only Look Once

CNN Convolutional Neural Network

GPU Graphics Processing Unit

GSM Global System for Mobile computing

GPS Global Positioning System

LED Light Emitting Diode

USB-TTL Universal Serial Bus-time to live

PCB Printed Circuit Board

DAC Digital to Analog Convertor

TPU Tensor Processing Unit

FPs Frames Per second

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CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

Blindness is a global health problem affecting millions of people worldwide. According to the World Health Organization, there were 39 million blind and 246 million visually impaired people in 2010 [1]. Recent health measures have reduced the number of people blind due to infectious diseases. However, injuries related to aging are increasing. Cataracts are still the leading cause of blindness worldwide, except in industrialized countries [1].

According to the International Agency for the Prevention of Blindness, about 0.19% of Uganda's population is blind (83,000), and 1.10% has moderate to severe vision impairment (475,965) [2]. The leading causes of vision impairment and blindness in Uganda are river blindness from black flies, cataracts, diabetic retinopathy, glaucoma and age-related macular degeneration [3] [4].

Blindness and low vision can have significant impacts on the quality of life, education, employment, and social inclusion of the affected individuals. As individuals lose their ability to work, participate in education, and contribute to the economy, the overall impact reverberates across communities and the nation.

Many technologies such as white canes, guide dogs, Braille alphabet and audio books have been developed to assist the blind and visually impaired. However, these methods have some limitations, such as requiring special training or being expensive and difficult to obtain. Therefore, more advanced and cheaper technologies are needed to help blind and visually impaired people see and interact with their environment.

One of the new technologies that can meet this need is smart glasses. Smart glasses can be used for many purposes such as education, guidance and entertainment [5]. For blind and low vision people, smart glasses can provide important information about their environment, such as the name, location and distance of objects, as well as exposure effects, words or faces. This

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