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Pursuing Excellence

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DEPARTMENT OF COMPUTER ENGINEERING

A GLUCOSE LEVEL MEASURING AND MONITORING SYSTEM

By

OPIKO ABRAHAM

Reg. No: BU/UP/2016/263

Email: abrahamopiko@gmail.com

Tel: +256786947100 / +256758068234

Supervisor: Mr. ARINAITWE JOSHUA

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DECLARATION

I OPIKO ABRAHAM, hereby declare that this project proposal report is my original work with the exception where citations have been made and it has not been presented to any institution of higher learning for any academic award.

SIGN: .....

DATE: 27th/01/2021

REG. NO. BU/UP/2016/263

APPROVAL

This is to certify that the project proposal report entitled "GLUCOSE LEVEL MEASURING AND MONITORING SYSTEM" has been under my supervision and is submitted to the board of examiners with my approval.

Mr. ARINEITWE JOSHUA

DEPARTMENT OF COMPUTER ENGINEERING

SIGN: .....

DATE: .....

LIST OF ACRONYMS

mmol/L	millimole per liter
mg/DL	milligram per deciliter
IDF	International Diabetes Federation
IFG	Impaired Fasting Glycemia
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
UI	User Interface
g/L	gram per liter
mL	milliliter
DKA	Diabetic Ketoacidosis
GOX	Glucose Oxidase
LED	Light Emitting Diode
GSM	Global System for Mobile communication
TDMA	Time Division Multiple Access
CDMA	Code Division Multiple Access
MHz	Megahertz
NFC	Near Frequency Communication
CGM	Continuous Glucose Monitoring
IDE	Integrated Development Environment
XAMPP	Cross-platform Apache MySQL PHP and Perl
MySQL	My Structured Query Language.
VOCs	Volatile Organic Compounds

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ABSTRACT

Worldwide, Diabetes is one among the major health challenges of the current century. In 2015, diabetes was estimated to have caused more deaths (5.0 million) than the combined number of annual deaths from HIV/AIDS (1.2 million), tuberculosis (1.5 million), and malaria (0.4 million). Diabetes prevalence has risen globally since 1980 and this rise has been related to both population growth and ageing populations, with the number of adults with diabetes increasing from 108 million in 1980 to 422 million in 2014. Diabetes is a significant health issue that is projected to affect more people in the future. Rising numbers have put great tension on people diagnosed with the disease and on the healthcare system, as diabetes is associated with macrovascular and microvascular complications such as blindness, kidney failure, heart disease, and nerve damage.

Currently many blood glucose self-monitoring systems are privately and publicly used by people in Uganda. The existing common method or system in Uganda for estimation of blood glucose concentration is using glucose meter or test strips, which involves pricking the finger and extracting the blood along with chemical analysis being done with the help of disposable test strips. This kind of method is not favourable for the children, the elderly and the Sickler's to use as it is invasive.

Therefore, in this system, the non-invasive method is used that is based on the measure of glucose levels using urine and breath.

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Chapter One

1. Background/ Introduction

Diabetes is a disease in which the body's ability to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolism of carbohydrates and elevated levels of glucose in the blood. Therefore, diabetes is a state where the human body does not produce the amount of insulin or respond to insulin as required to regulate the normal blood glucose level. For the majority of healthy individuals, normal blood sugar levels are between 4.0 to 6.0 mmol/L (72 to 108 mg/dL) when fasting, and up to 7.8 mmol/L (140 mg/dL) 2 hours after eating. For people with diabetes, blood sugar levels before the meals are 4 to 7 mmol/L for people with type 1 or type 2 diabetes, and after meals are under 9 mmol/L for people with type 1 diabetes and under 8.5mmol/L for people with type 2 diabetes [1]. Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition in which the pancreas produces little or no insulin, and type 2 diabetes means your body's cells are not able to respond to insulin as well as they should.

Diabetes is one among the major health challenges of the current century. In 2015, diabetes was estimated to have caused more deaths (5.0 million) than the combined number of annual deaths from HIV/AIDS (1.2 million), tuberculosis (1.5 million), and malaria (0.4 million). Diabetes prevalence has risen globally since 1980 and this rise has been related to both population growth and ageing populations, with the number of adults with diabetes increasing from 108 million in 1980 to 422 million in 2014. Of this increase, 28.5% is specifically due to the rise in prevalence, whilst 39.7% is due to population growth and ageing, and 31.8% is due to interaction between a rise in prevalence and population growth and ageing. The IDF diabetes atlas provides projections of global diabetes prevalence from 2017 to 2045, suggesting that the number of people with diabetes globally will increase from 424.9 million in 2017 to 628.6 million in 2045. Over the same period (2017 to 2045), global prevalence among 20- to 79-year old people is projected to increase by 1.1% from 8.8% to 9.9%, whilst total healthcare expenditure for diabetes (in 2017 US Dollars) is projected to increase by $49 billion from $727 billion to $776 billion [2].

According to the IDF, an estimated 15.5 million adults aged 20-79 years were living with diabetes in the IDF Africa Region in 2017, representing a regional prevalence of 3.3%. The highest prevalence of diabetes in the Region is found in adults aged 55 to 64. The region has the highest proportion of undiagnosed diabetes, with over two-thirds (69.2%) of adults currently living with

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