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DEPARTMENT OF COMPUTER AND ELECTRICAL ENGINEERING

WIRELESS SENSOR NETWORK FOR CROP-FIELD ANIMAL INTRUSION DETECTION AND ALERT SYSTEM

BY

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DECLARATION

I, Okello Ronald James do hereby declare that this Project Report is original and has not been submitted for any other degree award to any other University before.

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APPROVAL

This Dissertation Report has been submitted with the approval of the following supervisor(s).

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DEDICATION

Dedicated to my Mother, Sisters, Brothers, friends and colleagues

ACKNOWLEDGMENT

I am highly indebted to all those who in one way or another helped me during the research work.

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ABSTRACT

Uganda being an agricultural country needs more innovation in agricultural practices. Monitoring and control of farming environment could play an important role in farm production and management. Farm lands and plantations in Uganda and African countries are usually in remote places, however scale and in most cases not fenced. To monitor and control intrusion on such farmlands can be very expensive and very stressful. Therefore, farmers resort to building stick fences, rope fences, use scarecrows to provide required security measures and intruding animals have continued to destroy crops with all the farmers efforts. In addition, farmers especially around the game parks face security threats from wild animals intruding in their farms. The wireless sensor networks technology can provide the much-needed solution through sharing of real time information about farm intrusion. The designed WSNs system comprises of a set of sensor nodes, surveillance facilities and a base station that communicate with each other, gather information and make decisions about the intrusion. The system overcomes the limitation of building fences which can be very much stressful. It also has the advantages of motion detection, an alarm and alert system as a security measure. The alarm system (which can be replaced by any other system that scare a category of animals determined as regular intruders in an area) will be raised to scare the intruders away from the farm premises. The GSM module handles SMS with the farm owner indicating about the intrusion. It alerts the farmer that some human or animals are on the farm. The system has the weakness in the methods of scaring off of the intruders and I recommend that this system be integrated with other built methods of motion detection sensors and other methods of scaring off the animals could be integrated into the system to allow effective scaring off of the animals

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LIST OF ABBREVIATIONS

AC:	Alternating Current
DARPA:	Deference Advance Research Project Agency
DC:	Direct Current
DSN:	Distributed Sensor Network
EEPROM:	Electronically Erasable Programmable Read Only Memory
EM:	Environmental Management
Etc.	Et Cetera
GCC:	General Current Consumption
GDP:	Domestic Growth Product
GPRS:	General Packet Radio Service
GSM:	Global System for Mobile Communication
I/O:	Input Output
ICSP:	In Circuit Serial Programming
IR:	Infra-Red
MEMS:	Micro-Electro-Mechanical System
MHZ:	Mega Hertz
PWM:	Pulse Width Modulation
RF:	Radio Frequency
SDRAM:	Synchronous Dynamic Random-Access Memory
SEC:	Seconds
SMS:	Short Message Service
SOSUS:	Sound Surveillance System
USB:	Universal Serial Bus
WSN:	Wireless Sensor Network

CHAPTER 1 BACKGROUND

1.1 Introduction

Agriculture forms the baseline to Uganda's economy, contributes about 26% to the GDP in 2015 according to Deloitte Uganda Economic Outlook 2016 (the story behind the numbers) [1]. Apart from providing food security and farm incomes, agriculture supports the agro-industrial base and employs approximately 69% of the population [1]. Farmers in rural Uganda mainly practice subsistence agriculture, while surplus from a given agricultural season may be sold off to supplement farmer's income. The practices thus guarantee food security and income for the particular communities. However, much as agriculture is important to the farmer and the country's economy in general, it is threatened by a number of factors which include; soil degradation, land tenure, misuse of agrochemicals, low technological inputs, low yields, and poor agricultural produce marketing. At household level, subsistence farming is threatened by erratic climatic patterns, civil unrest, cattle rustling, pre and post-harvest losses [2] and crop raiding by animals.

Crop raiding can be simply defined as animals moving from their habitat into agricultural land to feed on the crops that humans grow for their own consumption and trade [1]. In recent years' animals are special challenge for the farmers throughout Uganda most especially in areas located near to game parks suffers greatly from animal attacks on crop if not human lives, wildlife like wild boars, elephant, tiger and monkeys and domestic animals like cattle, goats Etc cause serious damage to crops by running over the field and trampling over the crops causing financial problem to the farmers [2]. A number of solutions like traditional methods of detecting animals in farms by use of human eyes to witness animal movements, Electric fencing, wire fencing and may others to overcome this problem are practiced yet it looks ineffective, expensive and practiced with hardship. In this project I provide a technological solution by use of a wireless sensor network that will be deployed in the garden perimeter to monitor any intrusion into farmland by using animal motion detection sensor nodes. This project utilizes the RF (Radio Frequency) module and GSM (Global System Mobile) modem for this purpose. Farmers will get the SMS informing them of animal's availability in the field. Radio frequency (RF) technology is used to detect animals crossing the boundary in to the field using radio waves. And also, the animal's repellent to the forest by using irritating noise from the speaker.

1.2 Problem Statement

Farmers engaged in either subsistence or commercial farming in all the regions of Uganda most especially areas around game parks and game reserve like Kidepo, Budongo, Marchision falls

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