

**UNIVERSITI TEKNOLOGI MARA**

**MULTI-ROBOT ENVIRONMENT  
SPYING PROTOTYPE**

**IRFAN YAZID BIN IBRAHIM**

Dissertation submitted in partial fulfillment  
of the requirements for the degree of  
**Bachelor of Computer Science**  
**(Data Communication and Networking)**

**Faculty of Computer and Mathematical Sciences**

**December 2018**

## **ABSTRACT**

The Multi-Robot Environment Spying Prototype is a prototype that have features that exist in AI (Artificial Intelligence). These robots have the ability to enter an area or environment and take images without the help of any staff or personnel. The main parts that are used for this project is an Arduino robot with wheels as the base and also for movements, along with camera module for capturing images.

## **ACKNOWLEDGEMENT**

I wish to thank Allah SWT for the opportunity for me to go continue on my Bachelor degree and for finishing this journey that was very long and hard successfully.

Firstly, my gratitude and thanks go to my supervisor Sir Kamarul Ariffin Abdul Basit for giving me his precious advice and guidance. Every support that he have given me throughout this whole final year project will be appreciated and not forgotten.

My thanks also goes to the all the lecturers in the course of Bachelor of Science (Hons) Networking and Data Communication at UiTM Shah Alam who provided me with the information and assistance during the whole process. Also special thanks for all of my colleagues and friends for helping me with this project.

Finally, this thesis is dedicated to my loving family, especially my father and mother for being supportive and determined in educating me. Both my father and my mother deserve this achievement and it is dedicated for both of them. Alhamdulillah.

# TABLE OF CONTENT

	<b>Page</b>
<b>SUPERVISOR’S APPROVAL</b>	<b>ii</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	<b>iii</b>
<b>AUTHOR’S DECLARATION</b>	<b>ivv</b>
<b>ABSTRACT</b>	<b>v</b>
<b>ACKNOWLEDGEMENT</b>	<b>vii</b>
<b>TABLE OF CONTENT</b>	<b>vii</b>
<b>LIST OF TABLES</b>	<b>x</b>
<b>LIST OF FIGURES</b>	<b>xii</b>
<b>CHAPTER ONE INTRODUCTION</b>	<b>1</b>
1.1 Research Background	1
1.2 Motivation	1
1.3 Problem Statement	1
1.4 Objectives	2
1.5 Significance of Study	2
<b>CHAPTER TWO LITERATURE REVIEW</b>	<b>3</b>
2.1 INTRODUCTION	3
2.2 DEFINITION OF MULTI-ROBOT ENVIRONMENT SPYING PROTOTYPE	3
2.2.1 Multi-Robots	3
2.2.2 Coordination of Multi Robots	4
2.2.3 Communication between multiple robots	4
2.3 TECHNOLOGY FOR SPYING ROBOT PROTOTYPE	4
2.3.1 IR and PIR Motion Sensors (Infrared)	4
2.3.2 Arduino Platform	6
2.3.3 Integrated Development Environment (IDE)	7
2.3.4 Ultrasonic Sensor	8
2.3.5 Wi-Fi Module	9

# CHAPTER ONE

## INTRODUCTION

### 1.1 Research Background

Nowadays, there are more communication methods and many low-cost sensors and processors. These parts can be used by anyone with enough budget to develop many products that can be useful in our daily live by giving solutions to problems.

Field like militaries are different as they usually have much more sophisticated and expensive devices or arsenals that can be used or deployed in danger zones. Small mobile vehicles for spying, surveillance and inspection would be most precious for the military as spy-robots can help them access areas for collecting data of an environment remotely, where it is difficult for soldiers to manoeuvre or also could cause fatality if caught be enemies. These spy-robots are much smaller and lightweight making them to be more mobile than soldiers in certain terrains and can also enter tight spaces.

### 1.2 Motivation

The motivation for this project being done was mainly an interest in undertaking a challenging project in an interesting area of research. The opportunity to research about a less costly way to develop a multi-robot for spying an environment was appealing. This area is possibly an area that I might study at postgraduate level.

### 1.3 Problem Statement

Based on a website *www.armyrecognition.com* that shows the known equipment and weapons of a military, Malaysian military does not use any small vehicles or robots (Malaysia Land Forces military equipment and vehicle Malaysian Army, 2018). Thus, our military could have less safety concern by having a multi-robot environment spying prototype because these robots can enter the danger zones without any soldiers having to go in as well.

Malaysian military have purchased drones, unmanned aircraft for maritime