

INVESTIGATING THE EFFECTIVENESS OF  
POINT FEATURES MATCHING FOR  
DETECTING GUN ITEMS

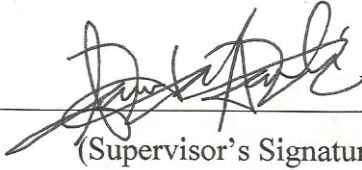
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I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree in \*Bachelor of Computer Science (Computer System and Networking)



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## STUDENT'S DECLARATION

I hereby declare that this thesis entitles “Investigating the Effectiveness of Point Features Matching for Detecting Gun Items” is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

A handwritten signature in black ink, appearing to read 'Nur Najwa Binti Ibrahim', is written over a horizontal line.

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Thesis submitted in fulfillment of the requirements  
for the award of the degree of  
Bachelor of Computer Science (Computer System and Networking)

Faculty of Computer Science & Software Engineering  
UNIVERSITI MALAYSIA PAHANG

DECEMBER 2018

## **ACKNOWLEDGEMENTS**

To begin with, I would like to thank Allah S.W.T for giving me the health and strength to me to complete my thesis.

I would like to portray my thankfulness to my supervisor, Dr. Ramdan bin Razali for the support throughout the thesis phases and completion. Without the assist given from him, I would not be able to achieve this highest achievement in my life. Apart from that, I would like to thank to my friends who lend a hand with their skills and capabilities.

Finally, I would like to portray my biggest appreciation towards both of my parents, Ibrahim Bin Bidin and Rohana Binti Arifin who had supported and guidance throughout the challenges that I faces in order to complete this thesis. Also thanks to my beloved family. I mostly appreciated all the contribution and kindness given to me.

Thank you.

## **ABSTRAK**

Setiap pintu masuk negara mempunyai keselamatan yang tinggi untuk memastikan tiada senjata api dibawa secara haram. Ini adalah jenayah jika membawa senjata api tanpa persetujuan daripada pihak berkuasa. Walaupun pelbagai kaedah telah dilaksanakan untuk mengesan senjata api dari memasuki negara seperti kaedah Point Features Matching (PFM), senjata api masih boleh melepasi pemeriksaan keselamatan negara. Objektif kajian ini adalah untuk mengesan senjata api dengan menggunakan kaedah Point Features Matching (PFM) dan untuk menyiasat keberkesanan kaedah Point Features Matching (PFM) dengan berpandukan saiz dan kedudukan imej adegan. Point Features Matching (PFM) adalah untuk mengenal pasti atau mengesan objek tertentu di dalam adegan imej dan imej rujukan objek. Khususnya di dalam kajian ini, senjata adalah objek yang akan dikesan menggunakan Features Matching (PFM). Berdasarkan eksperimen yang telah dijalankan, Point Features Matching (PFM) sangat berkesan dalam mengesan senjata tanpa mengira kedudukan dan saiz yang berlainan apabila peratus persamaan lebih atau sama dengan 50%.

## **ABSTRACT**

Every entry point has national high-security to ensure no firearms brought illegally. This is a crime if carry firearms without consent from authorities. However, even though many ways have been implemented to detect gun items from entering the county, such as Point Features Matching (PFM) the gun still manage to pass through safety security checks. The objective of this study is to detect gun items using Point Features Matching (PFM) and to investigate the effectiveness of Point Features Matching (PFM) with respect to the size and position of scene images. Point Features Matching (PFM) is to identify or detect a particular object in cluttered scene and given a reference image of the object. Particularly in this study, gun are the items that will be detected using Point Features Matching (PFM). Based on the experiments conducted, the PFM is effectively detect the gun items regardless the different position and various size when the percentage similarity of matching points more than or equal 50%.

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## LIST OF ABBREVIATIONS

ABM	Area-Based Matching
AME	Airport Managing Entity
AMS	Airport Management System
ApSS	Airport Security System
EMD	Earth Mover's Distance
FBM	Feature-Based Matching
FMD	Fuzzy Metal Detection
FUGAS	Fuzzy Gate Assessment System
HOG	Histogram of Oriented Gradient
NCC	Normalization Cross Correlation
PFM	Point Features Matching
SAR	Synthetic Aperture Radar
SURF	Speeded-Up Robust Features
SUSAN	Smallest Univalve Segment Assimilating Nucleus
TIP	Threat Image Projection

# CHAPTER 1

## INTRODUCTION

### **1.1 Introduction**

This chapter discussed about the overview of the Investigating the effectiveness of Point Features Matching for detecting gun items. This chapter consists of five subsection that in section 1.2 briefly explained about background of research work. Next, section 1.3 discussed about problem statement. In section 1.4 discussed about the objective of the research work and section 1.5 discussed about the scope of research work. Lastly, in section 1.6 discussed about thesis organization.

### **1.2 Background of Research Work**

Gun item is one of the popular items that used for the criminal. These items usually brought in at entry points of country and can be committed as unlawful act. There are many ways or method to detect gun. For example, using a metal detector, x-ray security scanner, detecting image and so on. In this research work, one of the method that use is using image features matching. This method is to detect a particular object in a cluttered scene, given a reference image of the object. Based on this method, there are able to observe the object in image scene which have a similarity to the object in image reference. If the results shown there are more similarity between two images, it can be conclude that method are effective to detect gun items.



### **1.3 Problem Statement**

Entry point must equipped with the system that able to identified legal and illegal items inside the luggage. The most frighten illegal items is gun items when it go through the scanning process. The gun items may appear with different size and position while it place in luggage. The challenge is to detect gun items without manually open the luggage. Thus, the only choice left is to study and analyse the image scanned at the entry point. The Point Features Matching (PFM) method has been reported as one of the method with capability in evaluating and analysing the scanned image. However, the effectiveness of PFM in detecting gun items based on scanned image is interesting subject in this research work.

### **1.4 Objectives**

The objectives of the research are:

- i. To identify the possible method to detect gun items.
- ii. To detect gun items using PFM with different size and position of scene image.
- iii. To investigate the effectiveness of the PFM with respect to the size and position of the scene image.

### **1.5 Scope**

In order to achieve the research objective, several scope are determine:

- i. Gun selected based on popular gun that use for criminal.
- ii. Gun image are converted to grayscale image.

## **1.6 Thesis Organization**

There are five total chapter in this thesis:

- i. Chapter 1 discusses about the introduction of the research. This chapter also explain about the reason for this system need to be develop by discover the problem statement. From the problem statement, objective and scope for this research can be achieve in this chapter.
- ii. Chapter 2 (Literature review) discusses the basic theories applicable for this research. Discussion on these theories is based on the background studies or literature reviews. It covers mainly on concept detection or matching of items.
- iii. Chapter 3 (Methodology) describes the general structure and methods of the research work, including all assumptions and considerations for the research methods.
- iv. Chapter 4 (Results and Discussion) this chapter is about the experiment or testing phase of the research and it includes explanation of the discussion that shows the objective of the research work is fulfilled.
- v. Chapter 5 (Conclusions) contain conclusions of research work.

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