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INTRUDER DETECTION USING HISTOGRAM AND EDGE DETECTION ALGORITHMS

TAN KAI YANG

Report submitted in partial fulfillment of the requirements
for the award of the degree of
Bachelor of Engineering (HONS) in Mechatronics Engineering

Faculty of Manufacturing Engineering

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June 2016

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I hereby declare that I have checked this report and in my opinion, this report is adequate in terms of scope and quality for the award of the degree of Bachelor of Mechatronics Engineering.

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TABLE OF CONTENTS

	Page
SUPERVISOR'S DECLARATION	iii
STUDENT'S DECLARATION	iv
ACKNOWLEDGEMENTS	v
ABSTRACT	vi
ABSTRAK	vii
TABLE OF CONTENTS	viii
LIST OF TABLES	xii
LIST OF FIGURES	xiii
LIST OF SYMBOLS	xv
LIST OF ABBREVIATIONS	xvi
CHAPTER 1 INTRODUCTION	
1.1 Introduction	1
1.2 Problem Background	1
1.3 Problem Statement	3
1.4 Project Objective	3
1.5 Project Scope	3
1.6 Project Scope	4
CHAPTER 2 LITERATURE REVIEW	

2.1	Introduction	6
	2.1.1 Searching Method	7
2.2	Literature Review Result	7
	2.2.1 Computer Vision	8
	2.2.1.1 OpenCV	8
	2.2.1.2 Matlab	8
	2.2.1.3 Comparison for Computer Vision	11
	2.2.1.4 Conclusion	12
	2.2.2 Image Processing Algorithms	13
	2.2.2.1 Introduction	13
	2.2.2.2 Histogram	15
	2.2.2.2.1 Histogram Calculation	15
	2.2.2.3 Edge detection	17
	2.2.3 Implementation of image processing for intruder detection	18
	2.2.3.1 Introduction	18
	2.2.3.2 Project and Research	19
	2.2.3.2.1 Intruder Detection System	19
	2.2.3.2.2 Image Change Detection Algorithms	19
	2.2.3.2.3 Unmanned Aerial with Night Vision	21
	2.2.3.2.4 Night Vision Camera System	22
	2.2.3.2.5 Tracking Humans for the Evaluation	25
	2.2.3.2.6 The Study and Implementation	25
2.3	Conclusion	27

CHAPTER 3 METHODOLOGY

3.1	Introduction	28
3.2	Project Flow	28
	3.2.1 Process Flow Chart	29
3.3	Equipment	30
	3.3.1 Hardware	30
	3.3.1.1 Personal Laptop	30
	3.3.1.2 Wired Webcam	31

3.3.2	Software	31
3.3.2.1	Ubuntu Software	32
3.3.2.2	OpenCV	33
3.4	Code	34
3.4.1	Code Explanation	34

CHAPTER 4 RESULTS AND DISCUSSION

4.1	Introduction	37
4.2	Results for Image Processing Algorithms	39
4.2.1	Histogram Calculation	39
4.2.2	Functionality Test for Edge Detection with Histogram	42
4.3	Experimental Result	46
4.3.1	Experimental for Various Scenarios	46
4.3.1.1	Experiment under Low Light Condition	46
4.3.1.2	Experiment under High Light Condition	56
4.3.1.3	Experiment based on Distance	66
4.3.2	Comparison Discussion	67

CHAPTER 5 CONCLUSION AND RECOMMENDATION

5.1	Introduction	71
5.2	Conclusion	71
5.3	Recommendation	72

REFERENCES	73
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APPENDICES	75
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A	Final Year Project 1 Gantt Chart	75
---	----------------------------------	----

B	Final Year Project 2 Gantt Chart	76
---	----------------------------------	----

LIST OF TABLES

Table No.	Title	Page
4.1	White pixel change over time in seconds	51
4.2	Summary for experiment under low light condition	53
4.3	White pixel change over time in seconds	61
4.4	Summary for experiment under low light condition	65
4.5	White pixel change over time in seconds	66
4.6	Comparison between low and high light condition result	68

LIST OF FIGURES

Figure No.	Title	Page
2.1	Logo for OpenCV	8
2.2	Partial overview of the OpenCV library	9
2.3	Logo for MATLAB	10
2.4	Bits gray scale image	14
2.5	Blue, Red and Green Planes	15
2.6	Matrix contains information of an image	16
2.7	Range in subparts, bins	17
2.8	Number of pixels versus bins graph	18
2.9	Comparison original image and edge image	19
2.10	Original Image Acquired from Camera	20
2.11	Image after subtraction of subsequent frames	20
2.12	Image covered into binary image	20
2.13	Image after filtering	21
2.14	Tracking Human without color histogram	22
2.15	Contour for the object	23
2.16	Without intruder at outdoor environment	24
2.17	With intruder at outdoor environment	24

2.18	Camera Display	26
2.19	Detection Result	27
3.1	Process Flow Chart	29
3.2	Logitech C300 webcam	31
3.3	Ubuntu Software	32
3.4	Ubuntu terminal	33
3.5	OpenCV	33
3.6	Global Variable	34
3.7	show_histogram function	35
3.8	For loop for plotting real time graph for white pixel	35
3.9	Infinite loop	36
4.1	Output of BGR histogram graph for a room	40
4.2	Output of BGR histogram graph for a room with a blue bottle blocking in front of web-cam	41
4.3	Output of BGR histogram graph for a room in low light condition	41
4.4	Histogram graph for pixels value versus intensity	42
4.5	Live stream video, edges image	43
4.6	Edge image histogram	43
4.7	Time in seconds and Value for White pixel at the particular seconds shown as result	44

4.8	Time in seconds and Value for white pixel at the particular seconds shown as result	45
4.9	Edge image and white pixel time graph at the beginning for a no light source room	47
4.10	Edge image when intruder enter the scene	48
4.11	White pixel time graph when intruder enter the scene	48
4.12	Edge image when intruder leave the scene	49
4.13	White pixel time graph when intruder leave the scene	50
4.14	Edge image and white pixel time graph at the beginning for a hall with ceiling light	56
4.15	Edge image when intruder enter the scene	57
4.16	White pixel time graph when intruder enter the scene	58
4.17	Edge image when intruder moving around inside hall	59
4.18	White pixel time graph when intruder moving around in hall	59
4.19	High Complexity of edge image	69

LIST OF SYMBOLS

x' Center of mass in coordinate X in contour

y' Center of mass in coordinate Y in contour

A Bin number in histogram

LIST OF ABBREVIATIONS

MATLAB Matrix laboratory

IOS iPhone Operating System

OpenCV Open Source Computer Vision

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ABSTRACT

Nowadays, night vision technology enables a person to be seen in the dark. In the past, night vision was implemented by making use of the infrared spectrum of electromagnetic waves and devices such as image intensifiers. With the growing popularity of digital computing, many digital image processing techniques have been proposed to implement night vision. These techniques can enhance the images captured by ordinary cameras under low light conditions and can be implemented completely in software. The entire project is done by using image processing techniques via OpenCV which run on Linux environment. The challenge of this project focuses on the detection ability of intruder by using a webcam at a fixed position in low light condition.

ABSTRAK

Pada masa kini, teknologi visi malam membolehkan seseorang dapat dilihat dalam gelap. Dahulu, visi malam telah dilaksanakan dengan membuat penggunaan spektrum inframerah gelombang elektromagnet dan peranti-peranti seperti imej intensifiers. Dengan populariti berkembang pengkomputeran digital, banyak teknik pemprosesan imej digital telah mencadangkan untuk melaksanakan visi malam. Teknik ini boleh meningkatkan imej-imej yang ditangkap oleh kamera biasa keadaan cahaya yang rendah dan boleh dilaksanakan sepenuhnya dalam perisian. Seluruh projek dilakukan dengan menggunakan teknik pemprosesan imej melalui OpenCV yang dijalankan pada persekitaran Linux. Cabaran untuk projek ini memberi tumpuan kepada keupayaan pengesanan penceroboh menggunakan webcam di kedudukan yang tetap dalam keadaan cahaya yang rendah.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Chapter 1, Introduction will have an overview on some topic which included project background, problem statement, objectives, scope of the project and lastly expected outcome.

1.2 PROJECT BACKGROUND

The goal of any night vision technology is to enable a person to see in the dark. In the past, night vision was implemented by making use of the infrared spectrum of electromagnetic waves and devices such as image intensifiers. With the growing popularity of digital computing, many digital image processing techniques have been proposed to implement night vision. These techniques can enhance the images captured by ordinary cameras under low light conditions and can be implemented completely in software. They do not require the use of infrared light and special devices. There are types of algorithms which can be able on camera in order to generate night vision effect.

Few of the popular and efficient algorithms for adjusting the contrast of an image are a motion detection and histogram. With respect to night vision, many algorithms based on this technique have been proposed and successfully implemented. In this thesis an improved histogram equalization approach with respect to night vision is presented. This algorithm is applied to video surveillance which involves the capturing of image frames from a camera, video transmission, recording and buffering over a computer network and application of histogram equalization to these frames in real time. Due to these requirements, the efficiency of the technique used is of critical importance. As it is intended to be part of an intelligent video surveillance system, the quality of the images produced is also extremely important. The end result must be suitable for the application of object detection and pattern recognition algorithms which would otherwise not have been possible for images captured in the dark.

As a conclusion, this project will go through the development for a static programmed camera which equip with night vision function that can work under limited light intensity and utilize the programmed camera as object detection system that will able user to detect object under low light intensity, medium complexity of background and certain distance. This project presents the detection of intruder existence by using webcam system under different environment. The entire project is done by using image processing techniques via OpenCV which run on Linux environment. The challenge of this project focuses on the detection ability of intruder by using a webcam at a fixed distance in low light condition. The histogram of edges is generated to show the pixels value of every frame of the images. Intruders can be detected by detecting the changes occur in the edge image, the changes of histogram of edges and pixels value from the real-time video streaming through the webcam.

1.3 PROBLEM STATEMENT

The problem statements for this project are listed below:

- i. The ability to detect intruders at night is needed in many places.
- ii. An expandable programming architecture is required to implement complex algorithms for night vision and intruder detection.

1.4 OBJECTIVE

Objectives are tools that emphasize the plan and act as measurement for the goal. This project will have two main objectives which listed as following:

- a. To use histogram and edge detection algorithms for intruder detection.
- b. To investigate the performance of histogram and edge detection algorithms under various scenarios.

1.5 SCOPE OF PROJECT

The scope of project is listed as following:

- a. Night vision camera programmed using OpenCV and Ubuntu.
- b. Interface wired camera with the program.

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