



Bahria University
Discovering Knowledge

FINAL YEAR PROJECT REPORT

**TRAFFIC LIGHT CONTROL USING IMAGE
PROCESSING**

In fulfillment of the requirement
For degree of
BS (COMPUTER SCIENCES)

By

S. M ZAIN HAIDER	35706 BSCS
M. AWAIS MEMON	35728 BSCS
HASSAN IQBAL	34726 BSCS
MURTAZA PERVEZ	32796 BSCS
ASAD YOUSUF	33203 BSCS

SUPERVISED

BY

LUBNA SIDDIQUI

BAHRIA UNIVERSITY (KARACHI CAMPUS)

ACKNOWLEDGEMENTS

We would like to thank everyone who had contributed to the successful completion of this project. We would like to express my gratitude to my research supervisor, Madam Lubna Siddiqui for her invaluable advice, guidance and her enormous patience throughout the development of the research.

In addition, we would also like to express my gratitude to our loving parent and friends who had helped and given me encouragement.

TRAFFIC LIGHT CONTROL USING IMAGE PROCESSING

ABSTRACT

As the problem of traffic obstruction is increasing, there is a need for the introduction of advanced technology and equipment to improve the state of traffic control. The problem of traffic controls nowadays is increasing because of the growing number of vehicles and the limited resources provided by current infrastructures. The simplest way for controlling a traffic light uses timer for each stage. Another way is to control the traffic by using equipment to detect the vehicles. We propose a system for controlling the traffic light by image processing. The system will detect vehicles using some techniques to control the traffic light. A camera will be installed along with the traffic light. It will detect the vehicles. The captured images will be analysed to using the techniques of image processing for the detection of vehicles.

The objective of this project is to control the traffic light using image processing by applying different algorithms. This project basically uses the image processing techniques to count and the detection of the cars to control the traffic signal.

This report explores different techniques for counting number of cars like we have used the Gaussian Mixture Model for detection of cars and blob detection technique to count the number of cars.

TABLE OF CONTENTS

DECLARATION		iii
APPROVAL FOR SUBMISSION		iv
ACKNOWLEDGEMENTS		vii
ABSTRACT		viii
TABLE OF CONTENTS		viii
LIST OF FIGURES		x
LIST OF SYMBOLS / ABBREVIATIONS		xii
CHAPTER		
1	INTRODUCTION	12
	1.1 Background	12
	1.2 Problem Statements	12
	1.3 Aims and Objectives	12
	1.4 Scope of Project	13
2	LITERATURE REVIEW	15
	2.2.2 Grayscale Conversion	18
	2.2.4 Image Matching	19
	2.3 Vehicle detection and counting 20	
	2.3.1 Blob Detection for vehicle counting21	
	2.3.1.1 Multiple Thresholding21	
	2.3.1.2 Contour Detection22	
	2.3.2 Detection of Moving Objects22	
	2.3.2.1 Video Frame Difference Technique23	
	2.3.2.2 Mean Method24	
	2.3.2.3 Graph Cut Method24	
	2.3.2.4 Gaussian Blur Model24	
	2.3.3 Noise Removal 25	
3.0	DESIGN AND METHODOLOGY26	
	3.3.1 Phase 1 (Image Optimization)26	
	3.3.2 Phase 2 (Sequence of Image Optimization)	26
	3.3.3 Phase 3 (Vehicles Detection using Blobs)	27
	3.3.4 Phase 4 (Controlling of the traffic lights)	28
	3.3.5 Phase 5 Gantt Chart	29
	4.0 IMPLEMENTATION	29
4.1 Phases of Implementation		29
	4.1.1 Region of Interest	29
	4.1.2 Color Filtering	29

4.1.3 Image Thresholding		29
4.1.4 Calculating Blobs	31	
4.1.5 Contour Method	32	
4.1.6 Guassian Blur	33	
4.1.7 Morphology Transformations	33	
4.1.8 Eroding and Dilating	33	
4.1.9 Distance Calculation		34
4.1.10 Counting of Cars	34	
4.2 Hardware Phase		35
4.2.1 Use of ARDUINO UNO R3	36	
5.0 Results and Discussions		37
5.1 Testing Strategies		37
5.1.1 Requirement Testing	37	
5.1.2 Regression Testing	37	
5.1.3 Integration Testing	38	
5.1.4 Stress Testing	38	
5.2 Test Cases		38
5.2.1 Test Case 1	38	
5.2.2 Test Case 3	38	
5.2.3 Test Case 3		39
5.2.4 Test Case 4	39	
5.2.5 Test Case 5	39	
5.2.6 Test Case 6	40	
5.2.7 Test Case 7	40	
5.2.8 Test Case 8	40	
6.0 CONCLUSION AND RECOMMENDATIONS		41
6.1 Conclusion		41
6.2 FUTURE RECOMMENDATIONS		41
6.2.1 Use of Traffic API	41	
6.2.2 Use of IP Camera	42	
6.2.3 Night Vision Camera	42	
6.2.4 An Artificial Intelligence Technique	42	
6.3 LIMITATIONS		42
REFERENCES		43
APPENDICES 1: GANTT CHART		49
APPENDICES 2: SOURCE CODE		50
APPENDICES 3: FLOW DIAGRAM		60

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1.1:	Guassian Blur	24
Figure 1.2:	Controlling Traffic	27
Figure 1.3:	OCR Block Diagram	28
Figure 4.1.0:	ROI	29
Figure 4.1.1:	Colour filtering	30
Figure 4.1.2:	Colour filtering	30
Figure 4.1.3:	Image Threshold	31
Figure 4.1.4:	Blobs Calculation	32
Figure 4.1.5:	Contour	33
Figure 4.1.6:	Guassian Blur	34
Figure 4.1.7:	Morph Transform	34
Figure 4.1.8:	Erroding dilating	34
Figure 4.1.9:	Distance	35
Figure 4.1.10:	Count of Cars	35
Figure 4.2.1:	Arduino UNO R3	36
Figure 4.2.2:	UNO implementation	37