FINAL YEAR PROJECT

" DEVELOPMENT OF SOFTWARE FOR MACHINE VISION BY USING MICROSOFT-C LANGUAGE "

BY

KHAIRUDIN BIN MOHAMED

92000334

ADVANCED DIPLOMA IN MECHANICAL ENGINEERING

MECHANICAL ENGINEERING DEPARTMENT
SCHOOL OF ENGINEERING
MARA INSTITUTE OF TECHNOLOGY
SHAH ALAM
SELANGOR DARUL EHSAN
MALAYSIA.

NOVEMBER, 1994

®

****

ACKNOWLEDGEMENTS

****

Firstly, a great thanks to my Project Advisor, Mr. Muhammad Azmi Ayub, who offers me a great oppourtunity to get involve in this project. Also for his valuable consultation, helpful guidance and supervision, which I have learnt a lot of things through this project.

I wish to express my gratitude to Metallurgy Lab staffs, Mr. Hayub Ta and Mr. Zulkifli , Research and Consultancy Centre (RACC) staffs, PSPP staffs, Engineering Computer Lab staffs, CADEM Centre staffs, School of Mathematic and Computer Science staffs and also friends who involve directly and indirectly in completing my final year project.

Last but not least, my deepest appreciation to my family and relatives for their encouragement and support throughout my studies in ITM.

* Khairudin Mohamed *

November 1994

****

ABSTRACT

****

The aim of this project is to provide a literature of machine vision application especially in auto inspection and to develop a computer program of each technique used by using Microsoft C Language.

The literature describes an overview of machine vision and development in digital imaging technology especially in machine vision auto inspection techniques. There are 3 techniques used, Histogram, Pixel-by-pixel subtraction and Circular background grid.

The data processing in the specific machine vision system may be performed by either using hardware or software. Here Data Translation DT2867 hardware board is used to perform the operation results. The integrated function board performs both grabbing and processing the image frame.

Based on the inspection techniques and specialised hardware board available, the computer programs to control the auto inspection system can be developed. The development of program depends on DT2867 Interface Library. It's Microsoft-C callable function library is utilised to control all hardware directly, thus accessing the DT2867's capabilities without requiring register-level programing.

At the end of the project, the program should be able to compare the parameters of the master product with the inspected product. If the data processed for inspected product are different from the data of master product, the program will produce the sorting result to reject it, else accept it.

TABLE OF CONTENTS

Chapter	Page
ACKNOWLEDGEMENTS	iii
ABSTRACT	iv
TABLE OF CONTENTS	v
CHAPTER 1 : INTRODUCTION.	1-1
1.1 Concept of Machine Vision.	1-3
1.2 Machine Vision Application.	1-5
1.3 A Vision System.	1-10
CHAPTER 2 : IMAGE PROCESSING.	2-1
2.1 Pixel.	2-1
2.2 Gray Scale.	2-2
2.3 Histogram.	2-4
2.4 Image Enhancement.	2-6
CHAPTER 3 : AUTO-INSPECTION TECHNIQUES.	3-1
3.1 Pixel-By-Pixel Subtraction Technique.	3-2
3.1.1 Algorithm.	3-3
3.1.2 Flow Diagrams.	3-4
3.2 Histogram Technique.	3-8
3.2.1 Comparison between Master and Inspected Product.	3-8
3.2.2 Light Distribution	3-9
3.2.1 Algorithm.	3-11
3.2.2 Flow Diagrams.	3-11
3.3 Circular Background Grid Technique.	3-14
3.3.1 Centroid Allocation.	3-16
3.3.2 Formation of Circle.	3-17
3.3.3 Evaluation of Maximum Radius.	3-17
3.3.4 Grid Thickness.	3-18

3.3.5 Development of Circular Background Grid. 3-18
3.3.6 Algorithm for Circular Background Grid Tech. 3-20
3.3.7 Flow Diagrams for Circ. Background Grid Tech. 3-20

CHAPTER 4 : HARDWARE AND SOFTWARE. 4-1
4.1 DT 2867 Hardware Board. 4-2
4.2 DT 2867 Software. 4-4
4.2.1 DT2867 Device Driver. 4-6
4.2.2 DT2867 Device Driver Interface Library. 4-6
4.2.3 DT2867 Interface Library. 4-6
4.2.4 Command Engine Support Library. 4-10
4.2.5 DT2867 A/D Calibration Utility. 4-10
4.2.6 Command Builder Utility. 4-10

CHAPTER 5 : PROGRAM DEVELOPMENT. 5-1
5.1 System Calibration. 5-1
5.2 Development Process. 5-3
5.2.1 Environment. 5-3
5.2.2 Compiling. 5-4
5.2.3 Linking. 5-4
5.2.4 Libraries Creation. 5-5
5.2.5 Execution. 5-6
5.3 Auto- Inspect Main Program. 5-7

CHAPTER 6 : USER GUIDE. 6-1

CHAPTER 7 : DISCUSSION AND RECOMMENDATIONS. 7-1
7.1 Program Recommendations. 7-1

CONCLUSION.

REFERENCES.

APPENDIX.
Appendix 1 : MAIN PROGRAM