



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**THE STUDY OF CONVERSION UNIT FROM PIXEL TO A
DISTANCE MEASUREMENT ACQUIRED BY VISION SYSTEM
USING MATLAB SOFTWARE.**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Engineering Technology (Industrial Electronics) (Hons.)

by

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: THE STUDY OF CONVERSION UNIT FROM PIXEL TO A DISTANCE MEASUREMENT ACQUIRED BY VISION SYSTEM USING MATLAB SOFTWARE.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Electronics) with (Hons.). The member of the supervisory is as follow:

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ABSTRAK

Pemeriksaan visual produk adalah masih dijalankan secara manual atau separa automatik di kebanyakan industri. Seseengah pemeriksaan visual mempunyai kekurangan yang mungkin menyebabkan objek diperiksa tidak menepati speksifikasi yang telah ditetapkan spesifikasi. Bilangan piksel setiap gambar menentukan resolusi gambar. Dengan resolusi ini, boleh menentukan dot satu inci (DPI) untuk mendapatkan jarak bagi satu pixel unit untuk mengukur jarak satu. Kertas kerja ini membentangkan kaedah menukar pengukuran jarak unit pixel yang diperolehi oleh sistem penglihatan. Piksel unit ditukarkan kepada ukuran milimeter menggunakan Matlab.

ABSTRACT

Visual inspection of the product is still carried out manually or semi-automatic in most industries. Some visual inspection has a lack of accuracy which may cause an object to be examined does not meet predetermined specifications. Each camera has a pixel reading on their own. The number of pixels in each picture determines the resolution of the picture. With this resolution, can be define dot per inches (DPI) to get a distance for one pixel unit to one distance measurement. This paper presents a method of converting pixel unit distance measurement acquired by the vision system. Pixel unit is converted to millimetre measurement using Matlab.

DEDICATION

To my beloved parents and family for their love and encouragement.

To my kind lecturers for the past four years of guidance.

Finally, to all my friends their backing and friendship over the years.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

DIP	-	Digital Image Processing
PCB	-	Printed Circuit Board
PNSR	-	Peak Signal to Noise
RGB	-	Red, Green, Blue
CCD	-	Charge-Couple Device
CMOS	-	Complementary Metal Oxide Silicon
USB	-	Universal Serial Bus
DPI	-	Dot Per Inches

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter provides an overview of the inspection system done by the industries. The problem background and problem statement are described next. This is followed by research objectives and scope of the study which involves the research study on the conversion unit from pixel to one distance measurement acquired by vision system using MATLAB software.

1.1 Background

Product visual inspection is still manually or semi-automatically in most industries. Some sophisticated optical inspection methods have already been developed in recent years. Quality is one of the most important factors because it is related to customer satisfactory and its interchangeability. This project is aimed to present intelligent visual inspection system which it is compared with human that can operate untiringly and provide consistent quality and accuracy of the inspected product. The scheme is concerning the conversion unit from pixels to one distance measurement acquired by the vision system using MATLAB Software. The camera will capture the visual images and the visual image enters the software which to determine the algorithm conversion from pixel to measurement acquired by vision system. This result need to be analysing and processed to obtain the result.

1.2 Problem Statement

The ideas for this project is come out after doing a research on the efficiency of the inspection doing by the human and compared with the intelligent visual inspection system. The most difficult task for inspection system is inspecting by the visual appearance of the object. The visual inspection in most manufacturing process mainly depends on the operators whose performance is generally inadequate and variable. The efficiency and the accuracy of the inspection system doing by the humans are not 100% accurate. The image captured by the camera may have some infirmity. On every captured image has different pixels depends on the size of the images. Each camera also has difference resolution, it is depends on the horizontal and vertical pixels in an images. So, come with the idea to convert the reading of the pixel to the distance measurement acquired by vision system using Matlab software for facilitate process intelligent inspection system.

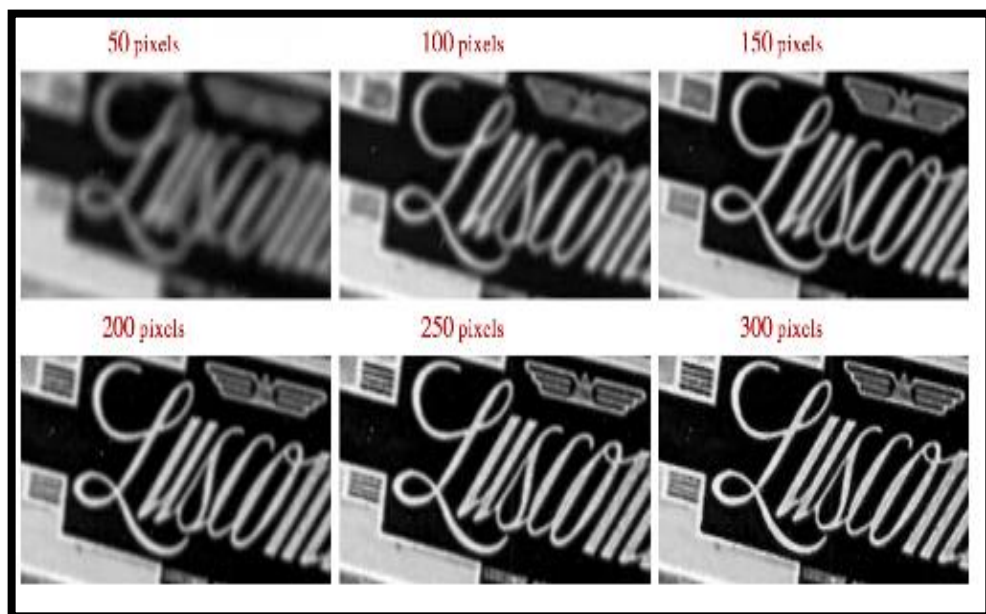


Figure 1.1: Clarity of image captured depends on the number of pixel.

1.3 Objectives of The Study

1. To determine the conversion algorithm from pixels to millimeter measurement acquired by vision system.
2. To design the simulation of the unit conversion of pixels to millimeter using MATLAB software.

1.4 Scope of The Study

The scopes of this project are to study the conversion unit of pixels to a distance measurement acquired by the vision system. The captured images need to convert to the millimeter to obtain the clarity of the images that acquired by a vision system. Other than to obtain the clarity of the images, it also will focus on the distance measurement that can read by any kind of camera even though it has difference resolution. The images are captured by using a webcam. This camera is connected with Matlab Software to convert the images to the algorithms. From the images captured, the algorithms will be created to convert the pixel to the millimeter measurement

1.5 Project Outline

For PSM 1 the report divided into three chapters. Chapter 1 is introduction part which is it will explain the project background, objectives of the study, problem statement to getting the idea of the study and the project scope. Chapter 2 is literature review of the project. This literature review as the references to obtain the understanding on project from various sources such as books, journal, internet and previous project. This material used as main sources for entire project. In chapter 3, will be describe the method used in the study, project flow chart, and an overview of the project software. PSM 2 will cover the Chapter 4 and Chapter 5, which is the analysis of the project and discuss the finding analysis. Meanwhile, Chapter 5 will conclude the discussion that consists in Chapter 4.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter summarizes prior works related to the research on the unit conversion from pixel to a distance measurement acquired by the vision system. It will cover the background and definition of image processing and elementary visual system. In addition, it will summarize the usability of hardware and software to be used for this project. On top of that, this chapter will summarize and discuss the research previous inspection system undertaken by industry.

2.1 Introduction of Inspection System.

M. Jalili, H. Dehgan, and E. Nourani (2013) proposed that a Cheap Visual Inspection System for Measuring Dimensions of Brass Gear. It is only used to measure the dimensions of the brass gear. The inspection systems to recognize a circular object on the images which take from the metal lids on the conveyor and it will detect the defect on the circular object. The system of inspection to identify the object of the circular on the image that takes from the sender's metal lid and it will detect the defects in object of the circular. The visual dimension inspection problems cleared and some solutions have been proposed to improve this system. In the process of examination is done through four steps, namely, image acquisition, image enhancement, thresholding and object matching.

All physical object can be identified by using image signature. However, image representation have a limited number of physical characteristics which it is depends on the object observation and not included in any non-visual features such as the mass of the object or the sound which may present.

Saad Mohamed Darwish (2013) suggested a Soft Computing Applied to The Build of Textile Defects Inspection System. This inspection system provides the ability to analyze images textiles when compromise uncertain and can also to online learning through adaptability based on an ants colony. An algorithmic starting point is an image of the examination that contains textile defects captured by digital cameras in RGB format and via serial port to the computer. These images are converted into greyscale images, and then strained to make it smooth and remove noises. However, this system only in specific fabrics and is not suitable for detecting defects on all fabrics.

Human eye has good capabilities to find imperfections in structure and surface, the defect perceived as irregularities. However, the conclusion on the product quality is subjective. This is means that is influenced by prior knowledge and by fatigue due to repetitiveness work. Automated system inspection helps operators from the visual inspection system, but it cannot be replaced or duplicate many of the unique abilities which the human being has. An automatic system must ensure several advantages compared to inspection that carried out by the human, such as accuracy, quality control and cost reduction. Computer visual techniques do involve many tasks that difficult to do by human and should take several important aspects, such as analysis time, orientation position of the object, calibration of the system and lighting factor.

2.2 Introduction to Vision System

Jidong Lv, De-an Zhao, Wei Ji, and friends (2011) proposed Design and Research on Vision System of Apple Harvesting Robot. The research begins with the theoretically analyse for camera model and imaging theory. The camera as a vision sensor on the vision system and continuously capture video images. The robot and motion control test are done in laboratories in Jiangsu University. This system software

is used to recognize9, and positioned the apple orchard image for the performance test of vision system. As a result, the fruit of the best short distance to the centre after recognized and positioned showing the effectiveness of the research and design method.

Vision systems are a prior consideration by any manufacturer to desire an improvement of the quality or automated production. Vision systems may be conceived that computer can identify, check and communicate critical information to eliminate the costly errors, enhance productivity and give satisfaction to customers through consistent delivery quality products. It used for online inspection, that vision system can make difficult task very quickly with high precision and high consistency.

Xu, Yafan, Zhao Yan, Wu Falin, Yang Kui (2013) discussed an Error Analysis of Calibration Parameters Estimation for Binocular Stereo Vision System. This research paper system reconstruction accuracy of binocular stereo vision system using black box methods. First, the system of binocular stereo equipment is considered as black release a box that a variety of inputs. Second, a system error calibration is seen as input, and error reconstruction system seen as an output. Finally, the papers provide quantitative and qualitative analysis and evaluation of system reconstruction accuracy according to the journal. The reference value is determined based on parameter measurement system calibration algorithms. A large number of experimental simulation show the radial distortion effect parameter error system reconstruction of small faults and mistakes would never exceed 1mm.

Machine vision is the combination between computer vision into industrial manufacturing processes and it is revolved around image processing. Machine vision is used digital input and output to manipulate mechanical components. Machine vision uses to provide the quality inspection within the system that can fall into detect detection, tolerance monitoring, and component measurement. Usually, devices that use vision machine may be found in product inspection, where it frequently uses cameras digital to do the tasks which previously done by the human. However, the way machine vision systems see is quite different from human vision.

2.3 Pixels

Digital image formed from lots different colored dots, known as the pixel. The pixel is small and tightly packed, so when viewed on a screen, individual dots are not perceptible and give illusion a perfectly smooth yet the sharp image. Picture Element (Pixel) is a single point in a graphic image. Graphics monitors display pictures by dividing the displayed on the screen into thousands or even millions of pixels, it is arranging in rows and columns.

Sherin Sugathan and James Pappachen Alex (2014) has proposed an irregular pixel imaging techniques to improve the quality of object edges and details in the image. Irregular pixel used sensor level so that it can reach the digital image better visual picture. This technique offers the same quality to better visual quality while removing part of the calculations involved to find the optimum pixel mask. Various remains messy image pixels in the mask are a solution rather than finding the right image masks based on numerical calculations. This experiment was conducted to analyze the value of PNSR (peak signal-to-noise) irregular pixel image to be represented and compared with the value of the corresponding pixel square image PNSR representatives. Tests have been carried out because of the noise and it uses several arrays of sensors to capture on the spot and that the probability of higher than noise compared to single the various sensors.

The pixels are so close to each other and they appear connected. Each pixel in an 8-bit grayscale image, the value of the pixel between 0 and 255. The value of a pixel at any suitable point with apparent light photon intensity at the time. Every pixel stores a proportional value to light intensity in the special allocation. Every pixel can display three color instantaneous in RGB configuration (red, green, blue), in different intensities of brightness. Every pixel is represented by a numerical value. In general, pixel value related to brightness or color that will see when digital image converted into one analog image for display and show. There may be thousands of pixels that together make up the image. The images will be to the extent that is able to see some pixel division.



Figure 2.1: Pixels representation.

Chuanyong Bai, Richard Conwell, Hetal Babla, and all proposed on Handling of Bad Pixels on Pixelated Solid State Detectors. Methods for handling of Bad Pixels on Pixelated Solid State Detector are the AVG Approach, the LGA Approach, AVG Approach Evaluation - Cardiac Imaging, AVG Approach evaluation - High Resolution Planar Imaging, and LGA Approach evaluation -High Resolution Planar Imaging. As a result, the data that generated randomly have a bad pixel with 50% of sensitivity using AVG approach. Approach from the average pixel neighbours directly effective for low resolution images, such as SPECT imaging where resources are distributed without sharp edges, while the gradient approach less developed in this work is more effective for bad pixel correction in high resolution imaging.

2.6 Camera

This part will explain the camera that used for the inspection system. There has 2 different type of camera that's being used, Charge-Couple Device (CCD) camera and Complementary Metal Oxide Silicon (CMOS) camera. For this project, CMOS type will be used.