NATIONAL TECHNICAL UNIVERSITY COLLEGE OF MALAYSIA

X-Y Table Plotter to Simulate Handwriting

Thesis submitted in accordance with the requirements of the National Technical University College of Malaysia for the Degree of Bachelor of Engineering (Honours) Manufacturing (Process)

By

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KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA

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JUDUL: X-Y TABLE PLOTTER USED TO SIMULATE HANDWRITTING

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I hereby, declare this thesis entitled "X-Y Table Plotter Used to Simulate Handwriting" is the results of my own research except as cited in the reference.

Signature : .....

Author's Name : Shakiwan b. Shabri

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APPROVAL

This thesis summitted to the senate of KUTKM and has been accepted as fulfillment of the requirement for the degree of Bachelor of Engineering (Honours) Manufacturing (Process). The members of the supervisory committee are as follows:

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ABSTRACT

Plotter is a common concept used in many manufacturing appliance such as the printer. There a various types of plotter and the one of them is pen plotter. Pen plotter is basically used to plot or draw by line while printer print a dot. The X-Y Table Plotter is a designed mechanical device which a pen is applied to the plotter in order to produce handwriting onto a paper. Detail of the project development will be explained in next chapter of the report. It contain the study of literature review which focusing on the parts that going to be used in the project and the development of the fabricating the X-Y Table Plotter with it function capability.

ABSTRAK

Pelukis adalah satu konsep yang banyak digunakan dalam aplikasi pembuatan contohnya seperti pencetak. Terdapat berbagai jenis pelukis dan salah satu daripadanya ialah pelukis pen. Pen pelukis pada asasnya digunakan untuk melakar atau melukis melalui garisan manakala pencetak pula mencetak titik-titik. Meja Pelukis X-Y adalah rekaan alatan mekanikal di mana pen digunakan pada pelukis utuk menghasilkan tandatangan pada kertas. Penerangan lanjut mengenai pelaksanaan projek ini akan diterangkan di dalam bahagian berikutnya dalam laporan.Ia mengandungi kajian ilmiah yang mengfokuskan mengenai bahagian-bahagian peralatan yang akan digunakan dan perkembangan dalam penghasilan Meja Pelukis X-Y dengan keupayaan untuk berfungsi.

DEDICATION

I humbly dedicate this to,

My family,
All of your supports and cares make me so comfortable and confident in my journey to success.

My lecturers,
Who always guide me when I need them.

And

My friends,
Thank you for everything you've done for me.

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LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

e = Efficiency

Fl = Load force, lb

Ff = Friction force, lb

Fpf = Preload force, lb

g = Gravitational constant,386 in./sec2

J = Inertia, lb-in.-sec2

Jls = Leadscrew inertia, lb-in.-sec2

Jl = Load inertia, lb-in.-sec2

Jm = Motor inertia, lb-in.-sec2

Jt = Total inertia, lb-in.-sec2

Jp = Pulley inertia, lb-in.-sec2

L = Length, in.

m= Coefficient of friction

N = Gear ratio

Nl = Number of load gear teeth

Nm = Number of motor gear teeth

p = Density, lb/in.3

P= Pitch, rev/in.

R = Radius, in.

Ri= Inner radius, in.

Ro= Outer radius, in.

Sl = Load speed, rpm

Sm = Motor speed, rpm

Tf = Friction torque, lb-in.

Tl = Load torque, lb-in.

Tm = Motor torque, lb-in.

Tr = Torque reflected to motor,lb-in.

Vl = Load velocity, ipm

W= Weight, lb

Wlb= Weight of load plus belt, lb

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

A plotter can be defined as a computer output device that draws graphs or pictures, usually by moving a pen. The plotter was the first computer output device that could print graphics as well as accommodate full size engineering and architectural drawings.

There were many types of plotter available at the market nowadays and one of them is a pen plotter. Pen plotters use drawing pens that provide infinite resolution, because the lines are actually drawn. All other printing devices print dots.

X-Y plotter is a mechanical device designed which is function to transfer a signature from a computer into a piece of paper. Using the driven mechanism there will be a pen which can plot a signature onto a paper based to the signature drawn from the computer.

The application of the pen plotter basically used the common concept of positioning element mechanism. This is because it required accuracy movement and placement. The example of positioning element mechanism can be described such as the x-y table of CNC Machine.

1.2 PROBLEM STATEMENT

The positioning element mechanism such as numerically controlled XY table using the conventional lead screws or the recirculating ball screws which is quite popularly used for the related application such as a plotter. But this is not the economical option always as there are numerous light duty operations where the power capacity of the lead screw or ball screw unit becomes redundant.

1.3 OBJECTIVE

- to determine basic design for the project
- to identify suitable driven mechanism for the project
- to fabricate the mechanical design
- to establish a plotter with handwriting function

1.4 PURPOSE OF THE PROJECT

The main objective of the project is to design a mechanical device which is involving controlling the positioning mechanism.

To do analysis on the traveling mechanism related to the actuator accuracy at speeds rivaling the lead screw models. In this project the purpose is to develop an XY table using the motor drive and screw drive which can be used effectively in light duty operations such as a plotter.

The advantages of this design are summarized below:

- Comparatively low cost
- Low maintenance required

- Remarkable accuracy can be achieved
- High Reliability
- Low capacity motors can be used

1.5 SCOPE OF PROJECT

The scope of this project is to design and develop the mechanical device for the plotter. At this stage basic design of the plotter will be determined and suitable driven mechanism is identified.

Another scope of the project is to develop a controller for the plotter for handwriting purpose. This controller will read a feedback signal and accomplish task for given application.

1.6 PROJECT OVERVIEW

Basic design of the X-Y table plotter consist the shape, actuator and other parts related to fabricate the mechanical device.

X-Y table plotter is designed to plot an input from a computer onto a piece of paper. This design consist a system where the input from a computer is send to a controller. The controller then sends a signal to the driver and produces the output through the plotter.

1.7 PROJECT PLANNING

Table 1.0: Project Planning for PSM I

NAME : SHAKIWAN BIN SHABRI
MATRIC NO : B050120030
TITLE : *x-y* PLOTTER FOR HANDWRITTING
SUPERVISOR : EN. SHAHRIMAN BIN ABDULLAH

NO	ACTIVITY	NOV			DEC				JAN				FEB			
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
1	Proposal Proposed Title, Objective, Scope														
2	Literature Review														
3	Data Collections														
4	Analysis Result														
5	Draft Report														
7	Presentations Prepared														

Remark - Planning - Actual

Table 1.0 : Project Planning

Table 2.0: Project Planning for PSM II

NAME : **SHAKIWAN BIN SHABRI**
MATRIC NO : **B050120030**
TITLE : **x-y PLOTTER FOR HANDWRITTING**
SUPERVISOR : **EN. SHAHRIMAN BIN ABDULLAH**

NO	DESCRIPTION	JULY	AUGUST	SEPT	OCT	NOV	DIS
1	Parts and Material Selection						
2	Product Fabrication						
3	Correction on Design and Fabrication						
4	Interfacing Product and Driver						
5	Software Testing						
6	Report Writing						
7	Project Presentation						