RETROFITTING A CONVENTIONAL MILLING MACHINE TO A COMPUTER NUMERICAL CONTROL (CNC) MILLING MACHINE USING DC SERVOMOTOR

Thesis presented in partial fulfilment for the award of the

Advanced Diploma in Electrical Engineering of

INSTITUT TEKNOLOGI MARA

JOUPIN BIN SABIN
Department of Electrical Engineering
INSTITUT TEKNOLOGI MARA
40450 Shah Alam,
SELANGOR
JUNE 1995

ABSTRACT

CNC milling machine is one of the machine that ever manufactured which evolved from the so-called *computer numerical control* (CNC) technology. As far as CNC is concerned, the subject on CNC milling machine system is very wide. This thesis only provides some fundamental idea about the milling machine and CNC system. The knowledge of conventional milling machine as well as he CNC systems theoretically and practically is very essential in the retrofitting of the conventional milling machine to a CNC milling machine. The idea presented would enable someone to at least control an operation of basic CNC milling machine that is its XY table movement.

Generally and theoretically, a conventional milling machine is retrofitted to a CNC milling machine by replacing the manually operated handwheels with electrical or hydraulic motors that can be controlled from digital computer. Also, In this thesis, an example of DC servomotors control system is provided and explained in certain extent which is needed in the project assigned.

ACKNOWLEDGEMENT

All the glory, honour and praise belong to God Almighty who gave me strength, patient and wisdom in the finishing of this thesis.

I would like to express my sincere gratitude and appreciation to those who have helped me in making this thesis a successful one.

First and foremost, to my project supervisor, Ir. Dr. Syed Abdul Kader Aljunid who by his inspiration, encouragement, counsel, support and constant guidance have encouraged me most.

Second, my appreciation also goes to Mr. Azad Chacko, Mr. Gareth Charles and En. Fauzi who were willing to share their knowledges and experiences which have added the "substance" of the thesis.

Special thanks to En. Ramli Adnan who has edited this thesis thoroughly and patiently, where, without his instruction and help this thesis could not be finished as presented here.

Last but not least, I want to thank to all the lecturers, computer laboratory assistants, laboratory assistants and also to all my friends who have helped me throughout the completion of this thesis.

JOUPIN SABIN
MARA INSTITUTE OF TECHNOLOGY

RETROFITTING OF CONVENTIONAL MILLING MACHINE TO A COMPUTER NUMERICAL CONTROL (CNC) MILLING MACHINE USING DC SERVOMOTOR

TABLE OF CONTENTS

CHAPTER 1

1.0 INTRODUCTION

The use of computer in conventional milling machine and numerical control (NC) milling machine is widely explored in most manufacturing system nowadays. In other words, the conventional milling machine and the NC milling machine are being and continue to be converted to computer numerical control (CNC), where such conversion is often referred to as 'retrofits'. To understand CNC system, one should understand first the NC system which is the CNC predesessor.

1.1 RETROFITTING

Machine like lathe, vertical and horizontal milling machine and others have been used for decades to machine mechanical parts. These machines are manually operated. For some precision parts and parts that need to be produced in large quantity, highly skilful machinists are required and the rate of production are also slow. To overcome these problems, machines that can be operated and controlled by computers will be useful. Initially, numerical controlled (NC) machines and later, computer numerical controlled (CNC) machines have been manufactured for these purposes. CNC machines are very expensive to buy, especially for small and medium-scaled industries (SMI). Since manually operated machines are not expensive and many of these SMI's already have a few of these machines, the automation of these machines for relatively inexpensive cost will be helpful to these SMI's. Retrofitting is the process of turning a manually-operated machine into a CNC machine for a fraction of cost of a new CNC machine.