

LINE GUIDED BASED LIBRARY SYSTEM MOBILE ROBOT

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This thesis is submitted as partial fulfillment of the requirements for the award of the
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LIST OF ABBREVIATIONS

GUI	Graphical User Interface
A	Amperes
V	Volt
DC	Direct Current
PC	Computer
Pa	Pascal
AH	Ampere Hour
F	Force
mm	Millimeter
FOS	Factor Of Safety
PVC	Premature Ventricular Contraction
USB	Universal Serial Bus
UMP	Universiti Malaysia Pahang
RFID	Radio Frequency Identification
LED	Light-Emitting Diode
LDR	Light Dependent Resistors
IR	Infrared
PID	Proportional Integral Derivative
PWM	Pulse Width Modulation
AGV	Automated guided vehicles

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ABSTRACT

Technology plays an important role in today's society. A lot of library have been changed from a traditional library to a digital library. Library management system and the campus smart card system that been implemented in the library as book procurement, classifying management, transportation management and book inquiry. With these two systems that been implemented in the library, it only helps its user to identify the location of the book and the availability of the book. Sometime users require a period of time to search for the book. With the advance in technology line following robot, Automated Guided Vehicles and industrial robot is being implement in the industry to increase productivity. In order to overcome this problem, an automated pick and place system for book keeping operation is being developed. The maximum load sustained by the robot arm made using aluminum 6061 is analyzed. In this project Arduino Uno was selected as the microcontroller of the robot. GUI was created using Visual Basic and the serial communication is selected as the communication tool between microcontroller and GUI. In order to determine the maximum load which can sustain by the robot arm. The material aluminum 6061 was analyzed by using computer software (SOLIDWORK) which calculates the finite element of linear stress analysis of each mechanical components of robotic arm. From the result, the robot is able to reduce the burden on librarians and reduce the time taken for its user to search for the book.

ABSTRAK

Teknologi memainkan peranan penting dalam masyarakat hari ini. Kebanyakan perpustakaan telah berubah dari perpustakaan tradisional ke perpustakaan digital. Sistem pengurusan perpustakaan dan sistem kad pintar kampus yang dilaksanakan di perpustakaan adalah sebagai pemerolehan buku, pengurusan mengklasifikasikan, pengurusan pengangkutan dan permintaan buku. Dengan kedua-dua sistem yang dilaksanakan di perpustakaan, ia hanya membantu pengguna untuk mengenal pasti lokasi buku dan ketersediaan buku itu. Kadang-kadang pengguna memerlukan tempoh masa yang panjang untuk mencari buku itu. Dengan kemajuan teknologi, *robot pengesan jalur* dan robot bergerak automatik telah diimplementasi di dalam industri untuk meningkatkan produktiviti. Menggunakan teknologi yang sudah sedia ada, satu robot automatik yang mempunyai fungsi “*ambil dan letak*” telah dibina untuk operasi penyimpanan buku. Di samping itu, satu kajian beban maksimum yang boleh ditampung oleh lengan robot yang dibuat menggunakan aluminium 6061 juga telah dibuat sebagai analisis. Dalam projek ini Arduino Uno telah dipilih sebagai mikropengawal bagi robot. GUI telah dihasilkan menggunakan Visual Basic dan komunikasi siri dipilih sebagai media komunikasi antara mikropengawal dan GUI. Dalam usaha untuk menentukan beban maksimum yang boleh ditampung oleh lengan robot, bahan aluminium 6061 telah dianalisis dengan menggunakan perisian komputer (SOLIDWORK) yang boleh mengira “*finite element*” bagi tekanan linear setiap komponen mekanikal bagi lengan robot. Dengan robot mudah alih ini, ia dapat mengurangkan beban pustakawan dan mengurangkan masa yang diambil untuk pengguna untuk mencari buku.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter basically reviews about the foundation of study, problem statement, and targets of this project and the scope of work to be done in the line guided based library system mobile robot.

1.2 Background of Study

The development of robots and data innovation, library have been changed from a traditional library to a digital library. In order to become a digital campus, most of the colleges and universities had implemented the digital library concept. Library management system and the campus smart card system have become the major factor in achieving the digital library. With implement, the database system, campus smart card can store personal certificates for identification purpose.

Library administration system and the campus smart card system that been implemented in the library which just have the trademark as book procurement, classifying management, transportation management and book inquiry (Sbnchez & Martinez, 2000). With these two systems that been implemented in the library, it is the task for the librarian to identify the location of the book and the availability of the book.

Normally the librarian requires a period of time to search for the book due to the librarian does not know where the shelf for the book is. Furthermore, the location of the book

is different from the library management system database. This is due to the user does not return the book to its location.

Pick and place robot is being commonly utilized in the industry. It can be separated into two sorts which are altered succession, two-point pick and place robot. Two-point pick and place robot is the robot perform picking procedure from one point and putting at another point. The two-point pick and place robot have several advantages such as greater speed, simple compared to the fixed sequence robot. While the other type is fixed sequence robot. The robot is fully controlled by position-programmable servo-controlled. The fixed sequence can move infinitely variable of positions. The arm must be well programmed with the environment so that accident between tool and object. With this advance of technology, the robot arm has being given an eye. Which means the robot can be controlled or programmed using visual perception. The robot will be able to perform more accurately for the given task.

The most common type of robot that utilized in the industry are a line following robot, Automated Guided Vehicles, and an industrial robot. In order to overcome this problem, a mobile robot with the pick and place function will be developed. The development of the mobile robot is to assist the librarian.

1.3 Problem Statement

Nowadays student has difficulty to locate for their required book. Most of the library implement library management system (LMS) in order for the planning of library system. This system only helps the librarian and student to track items owned, orders made, the information by using library management system. The user required a longer time to renew the books, location of the books, and patrons who have borrowed. Normal the user will find it easy to search for search for a book when they need to borrow it. Furthermore, the books are not in the correct order (Sbnchez & Martinez, 2000).

A mobile robot being created to reduce the burden on librarians and student. Few type of robot has been developed to assist in various sectors such as industries, home, and

agriculture. Most of the mobile robot is been developed for the industry. There is few robot is been used in a public place such as the library. In order to overcome this problem, a line guided based library system mobile robot is proposed in this study. This developed system can also apply for several places such as the library, resonance or event in the industry.

1.4 Project Objective

- To implement an automated pick and place system for book keeping operation.
- To develop a mobile robot platform to assist the librarian to search for the book required.
- To design the GUI for a book request system.
- To study the maximum load sustain by the robot arm made of using aluminum

1.5 Project Scope

The scope of the project is limited to:

1. The library is assumed to be installed with a line guided path to assist the mobile robot navigation.
2. RFID tag is assumed to be installed in each book in the library. This is important aspect since the book identification can be retrieved from the RFID information.
3. Only small scale prototype will be developed to prove the theory of the operation.
4. The surface of the floor is assumed to be in a smooth surface. Different surface will affect the mobility of the mobile robot.
5. A static study in SOLIDWORKS simulation to determine the factor of safety of the robot arm at selected position.

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