UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND DEVELOPMENT OF A NAVIGATION SYSTEM FOR AGV

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Manufacturing Engineering (Robotic & Automation) with honours.

by

ASHROF BIN SUAIB

B051110217

890909025873

FACULTY OF MANUFACTURING ENGINEERING

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of requirement for the degree of Bachelor of Manufacturing Engineering (Robotic & Automation) with Honours. The members of the supervisory committee are as follows:

(Signature of Principal Supervisor)

……
MR. MAHASAN BIN MAT ALI

(Signature of Co-Supervisor)

…….
(DR. MUHAMMAD HAFIDZ FAZLI BIN MD FAUADI)

ABSTRACT

Automated Guided Vehicle or also known as AGV in the industrial sector is another technological enhancement in material handling field whether for the complete part or material transportation from one place to another. Normally, the AGV are used in manufacturing and warehousing storage sector. AGV technology is designed to work automatically or without need a guidance from workers. In this study, line following AGV are proposed. The system are using an advance auto calibrating line following sensor that used to give an input signal. The data then send through microcontroller in order to control the wheel rotation and the navigation of the AGV. The methods to complete this project are starting with designing programming in Micro C, commissioning the line following sensor into the mobile robot with complete circuit wiring and analysis of the project. The biggest concern is to ensure that the robot are able to move according the line that have been marked on the floor which already the path is already predefine as white line. To analyze the project, a navigation experiment is done with two different paths and each path is repeated until 4 times experiments. The experiment result will be represent using line graph in order to know the effectiveness of the mobile robot movement using line following sensor. The result shows a few errors during all experiments but it is still a good result because the mobile robot able to follow the line as expected by using the line following sensor. Lastly, as conclusion the significant finding in this project is proven that line following sensor are able to be applied as line following Automated Guided Vehicle.

ABSTRAK

Kenderaan automatik berpandu atau juga dikenali sebagai AGV dalam sektor industri adalah satu lagi kemajuan teknologi dalam bidang pengendalian bahan sama ada sebahagian lengkap atau pengangkutan bahan dari satu tempat ke tempat lain. Biasanya, AGV digunakan dalam pembuatan dan sektor penyimpanan gudang. Teknologi AGV direka untuk bekerja secara automatik atau tanpa memerlukan bimbingan daripada pekerja. Dalam kajian ini, penggunaan AGV dicadangkan. Sistem ini menggunakan automatic advance calibrating line sensor yang digunakan untuk memberi isyarat input. Data yang kemudian menghantar melalui microcontroller untuk mengawal putaran roda dan navigasi daripada AGV. Kaedah-kaedah untuk menyiapkan projek ini bermula dengan mereka bentuk pengaturcaraan dalam Micro C, pemasangan sensor ke dalam robot mudah alih dengan pendawaian litar lengkap dan analisis projek. Fokus yang paling penting adalah untuk memastikan robot yang mampu bergerak mengikut garisan yang telah ditandakan di atas lantai yang sudah jalan yang ditetpkan sebagai garis putih. Untuk menganalisis projek, satu eksperimen navigasi dilakukan dengan dua laluan yang berbeza dan masing-masing jalan diulang sehingga 4 kali percubaan. Hasil eksperimen akan mewakili menggunakan graf garis untuk mengetahui keberkesanan pergerakan robot mudah alih menggunakan talian berikut sensor. Hasil kajian menunjukkan beberapa kesilapan dalam semua eksperimen tetapi ia masih keputusan yang baik kerana robot mudah alih dapat mengikuti garis seperti yang diharapkan dengan menggunakan talian berikut sensor. Akhir sekali, sebagai kesimpulan dapatan penting dalam projek ini membuktikan bahawa talian berikut sensor yang dapat digunakan sebagai garis berikut Automatik Kenderaan berpandu.

DEDICATION

My appreciation are given to my beloved God, especially family and best friend where help me during my development. Thanks to all for giving the continuous support and spirit in order to fulfill the needs of Final Year Project task. Thank you for all the supportive and always stay behind me and give me a good advice and also knowledge

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LIST OF ABBREVIATIONS

A / D Module	-	Analog to Digital Module
AGV	-	Automated Guided Vehicle
AL	-	Aluminium
CCP	-	Capture / Compare / PWM
cm	-	Centimeter
DC	-	Direct Current
DOE	-	Design of Experiment
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
FTDI	-	Future Technology Device International
FYP	-	Final Year Project
GHz	-	Giga Hertz
IC	-	Integrated Circuit
ICSP	-	In Circuit Serial Programming
ISO	-	International Organization of Standardization
Kg	-	Kilogram
LCD	-	Liquid Crystal Display
LED	-	Light – Emitting Diode
m	-	Meter
mm	-	Millimeter

PIC	-	Programmer Interface Controller
PSM	-	Projek Sarjana Muda
RAM	-	Random Access Memory
RISC	-	Reduce Instruction Set Computer
SOC	-	State of Charge
UART	-	Universal Asynchronous Receiver and Transmitter
USB	-	Universal Serial Bus
V	-	Volt

LIST OF APPENDICES

A - Final Year Project Gantt Chart

B - TURNITIN Result

C - Micro C Programming

CHAPTER 1

INTRODUCTION

Nowadays robot are widely used in all field such as industry, military and others. This chapter introduce the problem statement, the objective and the scope of the project. The project is to design and develop a navigation system for AGV by using a line following sensor.

1.1 Background

Automated Guided Vehicle (AGV) is one type of mobile robot which function by following a guideline to transfer any kind of thing to preset destination without guidance and widely used in manufacturing industry, services and indoor environment such as office and house (Fang et al, 2004). An AGV is widely used to move objects or perform tasks in various places where human could not work in.(Lee et al., 2013) Mobile robot navigation based on lines, landmarks and signs have been widely implemented around the globe.(Marhaban et al., 2009). With implementation of the AGV, the manufacturing cost can be reduce and at the same time may increase the efficiency of manufacturing rate (Sulaiman et al., 2010). AGVs come essentially in two form which is AGV guided by wires in the floor and AGV guided by visual marker in the environment. The AGV navigates by restricting their paths to predetermined routes, which are typically demarcated by stripping the floor in some manner or by using buried cables The AGV guided by visual marker in the environment is an automatically guided vehicles without using any wires but with some intelligence. For the traditional AGV, the AGV are tracking buried cable or floor painted guide.