

CHAPTER 1

INTRODUCTION

1.1 Introduction

Robotics is becoming more and widely used in the automation, medical, manufacturing industries, education, also in many science fiction films and many other fields. Building and programming a robot is a combination of mechanics, electronics, programming and also problem-solving skills (Mu`izz, 2011). Nowadays, robots are constructed tended to be human-like.

Line follower robot is a mobile robot that follows a line drawn on the floor (Pakdaman, 2010). There are many potential applications of line follower robot such as Automated Guided Vehicles (AGV) for the automation industry and a waiter or food delivery in a restaurant or hospital. In this project, line following robot that called as Arrow-bot was used and targeted to be used as a teaching tool for control system in the future. It is hope that this robot will help students to understand the characteristics of the control system.

Arrow-bot is a line following robot that was designed for small size and dedicated to education purpose. It consists of three IR sensors as line detector, two DC motors as actuators, and an ATmega328 microcontroller which has Arduino UNO bootloader. The IR sensors have been attached to the bottom of the robot. The DC motors work as a differential drive that navigate for forward, backward, left and right movement.

1.2 Problem Statement

Ideal line following robot should have autonomously following the line with accurate, smooth and fast capability. The easiest way, to create a line following algorithm is based on bang-bang controller that is providing the robot turn a fixed amount in a particular direction according to the line sensor. However, the robot movement is not smooth and accurate to follow the line. Therefore, it needs an efficient control system algorithm and in this project, the proportional-integral-derivative (PID) controller is used to improve the robot performance.

1.3 Objectives

The objectives of this project are:

1. To design and develop an efficient control system algorithms for Arrow-bot.
2. To analyze the performance of the proposed algorithms with bang-bang controller algorithm.

1.4 Scope of Projects

The scopes of this project are:

1. Robot Configuration: Differential wheel drive.
2. Microcontroller: ATmega328P with Arduino Uno bootloader.
3. Line Sensor: Reflective optical sensor as IR sensor.
4. Voltage Supply: 5V from portable battery power bank.
5. Sensor Algorithm: Analog Concept and Analog to Digital Concept.
6. Control Algorithm: Bang-bang controller, PID controller, and PID controller with ChibiOS Real-time Operating System (RTOS).

1.5 Thesis Outlines

Chapter 2 will explain about the review of the concept of Line follower, control systems, and real-time operating system.

Chapter 3 will discuss the method used to implement the control system in this project. The project is divided into two parts that hardware and software.

Chapter 4 provides the result and analysis of the proposed system. The result is divided by controller design, system interfacing testing, maze specification, velocity Arrow-bot, and performance testing.

Chapter 5 will conclude based on the proposed system, and the future work is suggested for improving the proposed system in the future.