Line Following Robot using PID

1.1 Introduction

Robot becomes widely used in industrial due to their characteristics. Robot able to work in 24 hours continuously without feeling tired unlike human that confine to certain time. The cost to setup the robot nowadays becomes more affordable and their long term prospect is bright judging from their capacity to perform. But in reality, there is no robot able to functions perfectly and still making error. A better controller needed here, to allow the robot performs efficiently and make less error.

This project try to implement a PID controller on mobile robot to see whether the robot perform efficiently. This mobile robot has a line tracking module, where it will follow the track that made from black tape. This is area where the PID implemented, the robot will be able to follow the black tape effectively and moving along the track smoothly.

1.2 Objectives

- The main objective of this is to design a line follower robot with PID controller and compare the result with attritional design.
- Design electronic circuit. Using ATmag8 microcontroller, two DC motors, a driver motor, five IR LED sensors, and five photo-sensors.
- Implementation of PID algorithm in software.
- Simulation of line following robot.
- Performance evaluation of the proposed system.
- Practical implementation of the proposed robot.

1.3 Scopes of work

The scope of work is will cover the area of control specially microcontrollers. Part of the work will cover the mechanism of the motors and sensors. The work will focus on the PID controller as the main control Algorithm different soft wear are using for simulation purpose such As MATLAB and Proteus 7 Professional .

1.4 Problem Statement

The industry carriers are required to carry products from one manufacturing plant to another, which are usually in different buildings or separate blocks. Conventionally, carts or trucks were used with human drivers. Unreliability and inefficiency in this part of the assembly line formed the weakest link.

Classical line following robot show a bad response to the error occur through line which easily made the car leave its track that drawn on the floor .this problem will cause the motion of the robot to be unreliable . Although the following robot can follow the black line, its motion needs to be improved.

1.5 Proposal solution

Design a line follower robot with PID controller. As the main controller of the system to minimize the error.

1.6 Methodology

The system is developing in several phases. Firstly, develop PID algorithm using C programming language, compiler the program, Secondly, hard ware design for ATmag8 microcontroller circuit, sensors and construct platform for the robot. Then, test and troubleshoot the hardware and tuning PID system by adjust the software parameters for each factor to achieve better performance. Finally, the robot will follow the black line drawn on the floor while smoothing tracking motion.

The basic Methodology will be used are presented in the flow chart below:-

1. Develop PID in software.
2. Turing PID controller by selecting proper values of K_p , K_i, K_d .
3. Simulation of the software to check for the system performance.
4. Practical buildup for the system.

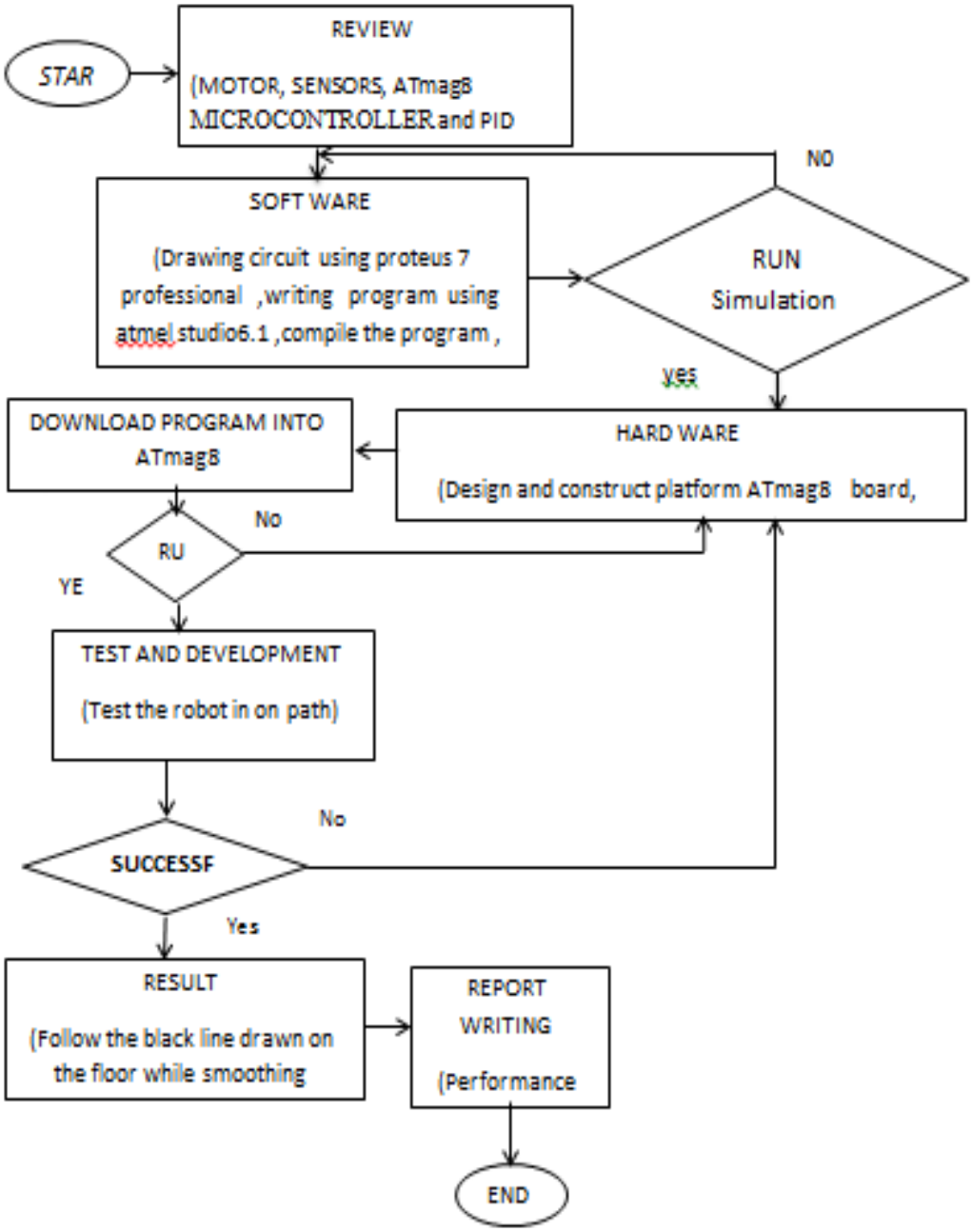

Figure 1.1 Methodology flow chart

1.7 Research Layout

This project includes five chapters.

Chapter One: introduction gives a historical background about the robot and addresses the problem statement and proposed solution.

Chapter Two: Literature Review highlights the robots structure type, PID controller is explained in this chapter along with motors.

Chapter Three: system design shows the proposed system and explains the system structure and program flow chart.

Chapter Four: Result and discussion highlight different cases of the simulation line follower robot and discuss the result obtained from the practical implementation.

Chapter Five: Conclusion and recommendation.