

CHAPTER 1

INTRODUCTION

1.1 Background of Project

Robotic technologies have potential to grow and develop rapidly around this recent century. Robots have been essential and vital which not only applying in engineering field, however for other aspects especially in field of education, medical, industries and even to be used for our daily life basis. By time goes by, there is a lot of mechanical robots have been invented to aid humans for complete their daily life's tasks which difficult to be fulfilled by human beings.

The main purpose of this project is to develop a mobile robot with moving straight line ability without the line-following aids. This mobile robot is a four-wheeled platform robot or car-type drive robot which is common in our surroundings. Four-wheeled mobile robot to be chosen due to its front-wheels drive with a smaller radius compared to differential drive and tricycle-type robot which apply with three wheels. To find a configuration that maximizes the qualities especially regards to controllability, stability and maneuverability, thus four-wheeled robot is right to be applied than two-wheeled or three-wheeled robots due to achieve the requirement of development of straight line movement for a robot.

The motion of this mobile robot will be controlled by a direct current (DC) motor or acts as driving motor to control two driving wheels from behind of the robot. In order to move in straight line, the two speeds of driving wheels must be equal to each other for fulfilling the straight line movement requirement. To stop the robot, speed value of DC motor in the above function must be set to zero. For second property, servo motor is used to connect to the front wheels or named as steering wheels for controlling the displacement of two steering wheels. Displacement is set to be zero to ensure the robot performing the straight line movement. For moving in straight line platform, the robot may often oscillate or veer to one side, therefore servo motor has the responsibility to steer the steering wheels back to the original straight line condition.

Digital compass module is added up due to ensure the fixed angle of direction of the robot moving. If the robot suddenly veered to another angle, this error of angle will be detected and respond to the PIC microcontroller in order to react for adjusting the position of servo motor due to move back to the original angle of direction for the robot moving.

Proportional-Integral-Derivative (PID) control has selected to insert and program to the microcontroller due to its control algorithm can be attributed partly to its robust performance and functional simplicity. A PID algorithm consists of three basic coefficients as the name suggested. These gains are varied to achieve an optimal system response. A system output of heading degree or position of robot is read by Digital Compass Module and then compare the reading with the reference point of desired value has fixed and set into the controller. The difference of the reference and the measured output may result an error value using to calculate the proportional, integral and derivative responses. These three responses are then summed to obtain in the output of the controller which used as input to control the servo motor turning in order that robot may move in straight line.

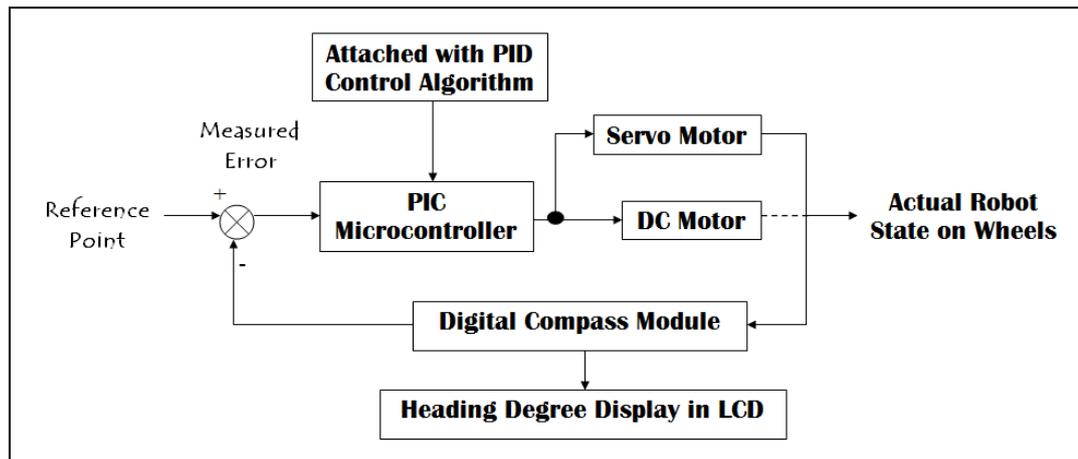


Figure 1.1: Block Diagram of Main Components for FWMR

1.2 Problem Statement

Moving vehicles are a popular type of robot and can be apply as perfect instance for an excellent starting point. Invention of a straight line movement autonomous four-wheeled mobile robot (FWMR) is a relatively simple and straight forward robotic project which approaches to the real moving vehicles especially the cars that we use every day.

Through this project research, four-wheeled mobile robot is my desired choice due to its high balancing condition compared to the others. However, FWMR is a great challenge for the engineers or researches to mainly maintain a straight line movement. There are many aspects require to be considered essentially for the constant rotational speed of a DC motor for driving the back wheels purpose and utilize a servo motor for controlling the displacement of both front wheels due to return back to the straight line condition if FWMR tilted or tend towards other side rather than straight line movement.