DESIGN THE LINE FOLLOW ROBOT SORTING MECHANISM USING PLC

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"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Control, Instrumentation & Automation)"

Signature	:	…….
Supervisor's Name	:	MR. AHMAD AIZAN BIN ZULKEFLE
Date	:	2 MAY 2008

"I hereby declared that this report is a result of my own work except for the excerpts that have been cited clearly in the references."

Signature : ……

Name : MOHD SHAZWI BIN MOHD SHARIF

Date : 2 MAY 2008

Dedicated to my beloved parent

Thank you for everything.

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ABSTRACT

Generally, robot is a programmable machine that imitates the actions or appearance of an intelligent creature which is usually a human. As robot is use to replace human works, there are many robot application in the world such as in military operation, manufacturing assembly, biotechnology for sample handling, space application, and the others. Since these project about mobile robot in pick and place operation, the design is considering the factor that might be influence to the whole robot design. After that, the process will continue to their control of motion the mobile robot and programming the controller and finally the manufacturing process to produce the real mobile robot.

ABSTRAK

Secara umumnya, robot adalah sebuah mesin yang boleh diaturcara untuk meniru tindakan-tindakan atau pergerakan seorang manusia. Robot digunakkan untuk menggantikan kerja yang dilakukan manusia, terdapat banyak kegunaan robot di dunia ini seperti dalam operasi ketenteraan, pembuatan, perhimpunan, bioteknologi, angkasa lepas dan lain-lain lagi. Oleh kerana projek ini adalah mengenai pergerakkan robot dalam mengalihkan barang dari satu tempat ke tempat yang lain, maka reka bentuk robot ini mengambil kira faktor-faktor yang boleh memberi kesan ke atas pergerakan robot. Selepas itu, proses diteruskan terhadap kawalan pergerakan robot dan mengaturcara pengawal dan akhir sekali proses pembuatan dilakukan untuk menghasilkan sebuah robot bergerak.

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CHAPTER 1

INTRODUCTION

Robot, which is derived from a Czech word meaning "menial labor," got its modern meaning from a 1920 play, R.U.R. (Rossum's Universal Robots), by Czech playwright Karel Capek (1890-1938). The robots in Capek's play develop emotions and overthrow their human masters. A sinister "power struggle" with robots has long been a popular theme in science fiction --- for a change of pace, try Isaac Asimov's "I Robot" stories in which he consciously strove to depict robots as a benefit to society.

Robot is a machine that can do human work. It’s also a humanoid machine that can think and act on its own. Robots also define as machine that has self aware. (Gareth Branwyn, 2004) One of the most important areas in the design of robot systems is the design of end effectors. A robot is a re-programmable multifunctional manipulator designed to move material, parts, tools, or specialized devices through variable programmed motions for performance of a variety of tasks (Snyder, 1985).

Today, robots are used in many ways, from lawn mowing to auto manufacturing. Scientists see practical uses for robots in performing socially undesirable, hazardous or even "impossible" tasks --- trash collection, toxic waste clean-up, desert and space exploration, and more. AI researchers are also interested in robots as a way to understand human (and not just human) intelligence in its primary function -- interacting with the real world.

1.1 Problems Statement

In factory, the workers usually moved objects or material manually from one place to other place to sort that objects or material. This method will waste a lot of man power and also will waste money to employ many workers to do that task.

1.2 Objective

Since this project is about mobile robot, so this project is purpose to design a mobile robot that can move object from one place to other place (pick and place), mobile robot also can follow the line, implement sorting mechanism at the mobile robot, and finally to investigate and design a mobile robot that can choose where place it want to sort depend on the input object.

1.3 Scope of the Project

The scope of the project is to design and develop a mobile robot that can follow only the white line. It consists of designing the electronics part (IR Sensor) and develop a program using PLC .The mobile robot will move base on the white line on the black surface sense by an infrared sensor. The robot also can move object from one place to other place (pick and place) but only one object at the one time.

1.4 Project Overview

To ensure that the project is finish within the times that have given, a schedule is made and can divide into PSM 1 and PSM 2. In PSM 1 consists of research information and references about mobile robot and also research about current design & technology used to design & develop mobile robot. The project activities contain the information gathering, literature review, conceptual design, and selection of the electronic and electric part, PSM 1 report writing and learning PLC programming.

For the PSM 1, project understanding and information gathering is done in two month starting from the received topic from the supervisor which from July to August of 2007. The literature review is start on July 2007 until October 2007, the conceptual design and selection of the electronic and electrical part started at the same time on August 2007 until November 2007 and finally the report writing for PSM 1 was started on September 2006 and finish on November 2007. Next, for the PSM 2, the projects continued with designing the electronic and electrical circuit, software design, material selection and fabrication or manufacture the robot. The processes are start on December 2007 and continue until April 2008. The final stage of this project is test the functional of the robot and troubleshooting will be ended on April 2007

CHAPTER 2

LITERATURE REVIEW

2.1 Robots

A robot is a machine designed to execute one or more tasks repeatedly, with speed and precision (Ulrich R., 1990). The another definition of robot is being giving by Robot institute of America (Gareth Branwyn, 2004) which robot is a reprogrammable, multifunctional manipulator designed to move material, part, tool or specialized devices through various programmed motion for performance of variety task. There are as many different types of robots as there are tasks for them to perform. A robot can be controlled by a human operator, sometimes from a great distance. But most robots are controlled by computer. According to the Japanese Robot Association (Gareth Branwyn, 2004), robot are group by several types which are manually operated manipulator, sequential manipulator, programmable manipulator, numerically control robots (playback robots), sensate robots, adaptive robots, smart robots and intelligent mechatronic robot system. The descriptions are given in the Table 2.1.

Table 2.1: Classification of Robot According to Japanese Robot Association (Gareth Branwyn, 2004),

Robot Types	Descriptions
Manually operated manipulator	Machine slaved to human operator
Sequential manipulator	Devices that perform series task in same sequence
Programmable manipulator	Assembly line robotic arm
Numerically control robots (playback robots)	Robot that instructed to perform task through receipt of information on sequence and positioning in form of numerical data
Sensate robots	Robot that incorporate sensor feedback into their circuitry
Adaptive robots	Robot that can change the way they function in response to their environment
Smart robots	Robot that considered to posses artificial intelligent
Intelligent mechatronic robot system	Robot that have the intersection of mechanical, electrical engineering and computer control systems.

Robots are sometimes grouped according to the time frame in which they were first widely used (I.N. Tansel, 2000). First-generation robots date from the 1970s and consist of stationary, nonprogrammable, electromechanical devices without sensors. Second-generation robots were developed in the 1980s and can contain sensors and programmable controllers. Third-generation robots were developed between approximately 1990 and the present. These machines can be stationary or mobile, autonomous or insect type, with sophisticated programming, speech recognition and/or synthesis, and other advanced features. Fourth-generation robots are in the research-and-development phase, and include features such as artificial intelligence, self-replication, self assembly, and nanoscale size (physical dimensions on the order of nanometers, or units of 10^{-9} meter).

Robots also being classify by looking for the robots structure. The jointed arms give many different types of robots such as SCARA robots, (Selective Compliance Assembly Robots Arms), Tricept and Hexapod Robots, Cartesian Co-ordinate Robots, Cylindrical Co-ordinate Robots, and Polar Co-ordinate Robots (Dr Bob, 2004). These robots types different from each other because of their area of access in which each type have their on purpose for certain application such as SCARA robots that specifically designed for peg board type assembly and are heavily used in the electronics industry. They are very stiff in the vertical direction but have a degree of compliance in the horizontal plane that enables minor errors in placement of components to be accounted for. These robots tend to be fairly small and capable of operating very accurately and at high speed. They are used for assembly and machine loading.

Some advanced robots are called androids because of their superficial resemblance to human beings. Androids are mobile, usually moving around on wheels or a track drive. The android is not necessarily the end point of robots evolution. Some of the most esoteric and powerful robots do not look or behave anything like humans. The ultimate in robotic intelligence and sophistication might take on forms yet to be imagined.

2.1.1 Robots Architecture

Robots architecture gives us more clearly about robots. The architecture contains the mechanical structure, actuators, computation and controllers, sensors, communications, user interface, and power conversion unit. The mechanical structure gives the most critical part to be design for the robots. Its include a base that purpose to support the whole mechanical structure of the robots, second is the robots arm which use to move the end of the robots arm to certain location and the third is the end effectors which the most important areas in the design of robots systems that purpose to do the robots task. The actuator yet use to make the robots move while the computation and controller is use to program the robots behavior and task required.

Than the sensors will be the eyes for the robots and transfer the signal and information that have been detected by the sensor by using the communication line of the robots. Finally the power conversion unit is use to supply the power to the robots system.

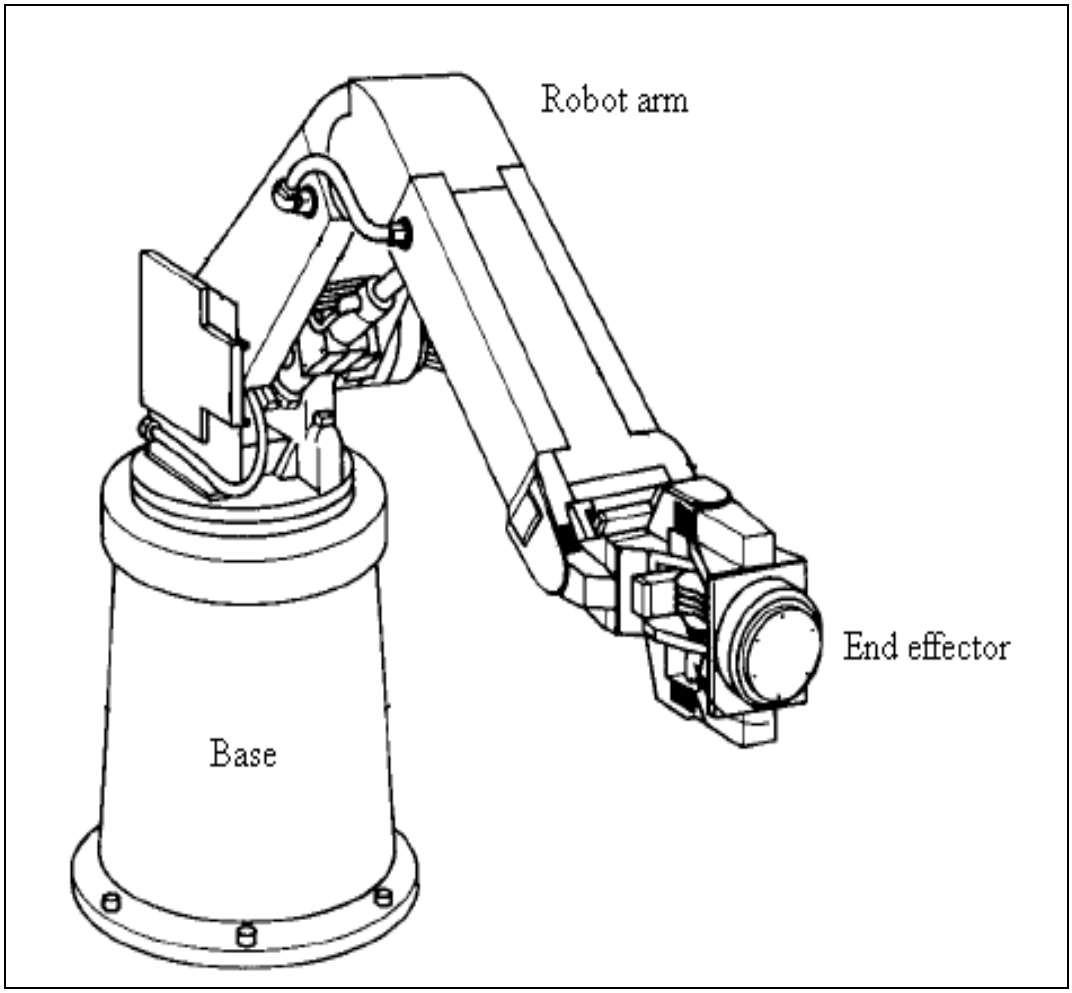

Figure 2.1: General Robot's Mechanical Structure (Dr. Bob, 2004)

2.1.2 Robots Application

Nowadays, robots are being implementing to human work and their applications are widely use especially for replacing human work. There are many causes that make robot replace human works which are to have a quality improvement, to improve the

working environment; to get the better cost effectiveness and the robots itself has a flexibility to change. Most robots applications are in manufacturing industry which widely use for assembly and automation (Dr Bob, 2004). Then, robots also being implement in biotechnology which purpose for micro/nano manipulation, sample handling and automated analysis. Robots are also being use in military in order to do the danger task such as search a mine, and spy. Robots nowadays are being use for outer space application for research and investigation such as NASA/DARPA Robonaut project; humanoid robots that can function as an astronaut equivalent for spacewalks. Human operators on earth can control the robot's movements from distance.

2.1.2.1 Robots at home

As their price falls, and their performance and ability rises, robots are increasingly being seen in the home where they are taking on simple but unwanted jobs, such as vacuum cleaning, floor cleaning and lawn mowing. While they have been on the market for several years, 2006 saw an explosion in the number of domestic robots sold. Currently, more domestic robots have been sold than any other single type of robot. They tend to be relatively autonomous, usually only requiring a command to begin their job. They then proceed to go about their business in their own way. At such, they display a good deal of agency, and are considered true robots.

2.1.2.2 Telerobots

When a human cannot be present on site to perform a job because it is dangerous, far away, telerobots are used. Rather than following a predetermined sequence of movements a telerobot is controlled from a distance by a human operator. The robot may be in another room or another country, or may be on a very different scale to the operator. A laparoscopic surgery robot such as da Vinci allows the surgeon to work inside a human patient on a relatively small scale compared to open surgery. An interesting use of a telerobot is by the author Margaret Atwood, who has recently started using a robot pen (the Longpen) to sign books remotely. The Longpen is

similar to the Autopen of the 1800s. This saves the financial cost and physical inconvenience of traveling to book signings around the world. Such telerobots may be little more advanced than radio controlled cars. Some people do not consider them to be true robots because they show little or no agency of their own.

Figure 2.2: Surgery robot

2.1.2.3 Military robots

Teleoperated robot aircraft, like the Predator Unmanned Aerial Vehicle, are increasing being used by the military. These robots can be controlled from anywhere in the world allowing an army to search terrain, and even fire on targets, without risk those in control. Currently, these robots are all teleoperated, but others are being developed which can make decisions automatically; choosing where to fly or selecting and engaging enemy targets. Hundreds of robots such as iRobot's Packbot and the Foster-Miller TALON are being used in Iraq and Afghanistan by the U.S. military to defuse roadside bombs or improvised explosive devices (IEDs) in an activity known as Explosive Ordnance Disposal (EOD).