INTELLIGENT SPYCAM WITH ROBOTIC ARM (ISRA)

HAZRUL FAZRIZAL BIN HILMAN

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BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : INTELLIGENT SPYCAM WITH ROBOTIC (ISRA)
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Dedicated to my family, especially Che Mahmood B Che Lah (father), and Puan Mek Jah Bt Yusof (mother). Also to my Projek Sarjana Muda supervisor, Miss Zarina Bt Mohd Noh. Not to forget, to all my friends.

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ABSTRACT

Design for intelligent SpyCam with Robotic arm (ISRA) is a project that to developed a intelligent system that can remotely control all the system by using the radio frequency (RF) signal. In this project there is much that should consider, especially in the arm design. In this project, the basic concept of a ISRA it is using transmitter and receiver to communicate between each system. The distance between receiver and transmitter to sent the data is depend on the frequency of the RF. The distance of the remote control is about 50m to 100 m, so it can be control in the wide area. By using the wireless camera it can easily to monitor the area needed by the user. The advantage of this project is, there is to reduce of the human power in the hazardous place or in the dangerous area. It also can be use as a spy camera to view the human activity through the computer.

ABSTRAK

Reka bentuk untuk "*intelligent SpyCam with Robotic arm (ISRA)"* merupakan satu projek yang yang boleh digunakan untuk mengawal semua system yang dengan menggunakan frekuensi isyarat radio (RF) pada jarak jauh. Dalam projek ini terdapat banyak yang perlu dipertimbangkan agar ianya menjadi satu sistem yang sempurna, terutama sekali dalam reka bentuk lengan "*arm*". Dalam projek ini, konsep asas *ISRA* adalah dengan menggunakan isyarat pemancar dan penerima untuk menghantar atau menerima setiap isyarat antara setiap system yang digunakan. Jarak antara penerima dan pemancar bagi menghantar atau menerima data bergantung frekuensi RF yang digunakan. Jarak kawalan jauh untuk mengendalikan system didalam projek ini adalah 50m sehingga 100 m. Dengan menggunakan kamera tanpa wayar ia secara langsung memudah untuk memantau kawasan yang diperlukan oleh pengguna. Kelebihan projek ini ialah, ia dapat mengurangkan penggunaan tenaga manusia dalam mengendalikan tempat atau kawasan yang berbahaya. Ia juga boleh menggunakan sebagai sebuah kamera pengintip untuk melihat aktiviti manusia melalui komputer.

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LIST OF ABREVIATIONS

DH	-	Denavit-Hartenberg
DOF	-	Degree Of Freedom
FBD	-	Free Body Diagram
FEC	-	Forward Error Correction
ISRA	-	Intelligent SpyCam With Robotic Arm
PCB	-	Printed Circuit Board
PIC	-	Peripheral Interface Controller
PWM	-	Pulse Width Modulation
RF	-	Radio Frequency
R/C	-	Remote Control
SCARA	-	Selective Compliant Articulated Robot Arm

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CHAPTER 1

INTRODUCTION

1.1 Background

At the dawn of the 20th century, an explosion of new scientific theories and inventions led to the creation of a literature that sought to explore their implications and a variety of possible futures. In the science fiction magazines of the 1920s and 1930s, the alien “bug-eyed monsters” were often accompanied by hulking robots. These robots were often relentless in their attempts to carry out some sort of evil plan. Robots also appeared in other media. Indeed, the word robot is first found in the 1921 play Rossum’s Universal Robots by the Czech playwright Karel Capek. Here and in Fritz Lang’s 1927 movie Metropolis, the robot took on a social dimension, symbolizing the threat of automation to human livelihoods and suggesting the relentless metronome-like pace of the industrial world. While many writers caused people to fear robots, Isaac Asimov inspired a generation of engineers to build them [1].

The development of the digital computer as well as sophisticated electronics and control systems during the 1940s gave engineers the practical means to start building real robots. Norbert Wiener, a mathematician whose interests ranged from computers to game theory to neurology, provided in cybernetics a badly needed theoretical framework for understanding communication, feedback, and control in machines including robots [1].

Building and programming a robot is a combination of mechanics, electronics, and problem solving. What you're about to learn while doing the activities and projects in This text will be relevant to "real world" applications that use robotic control, the only difference being the size and sophistication. The mechanical principles, example program listings, and circuits you will use are very similar to, and sometimes the same as industrial applications developed by engineers [2].

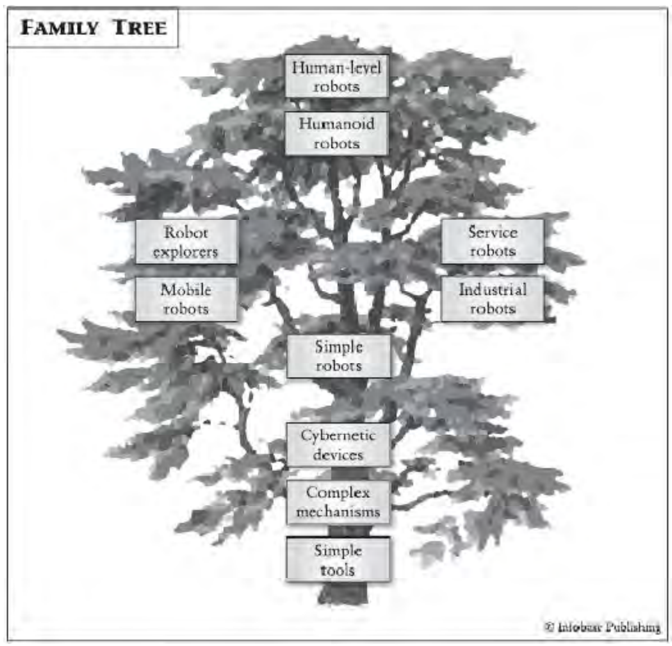

Figure 1.1: A family tree shows development of robots.

Figure 1.1 shown development of robot, from increasingly complex tools and machines. After they gained mobility, robots then branched into a variety of roles, with the potential of becoming humanlike in structure and behavior.

1.2 Objective of this project

1. To design and build a prototype system that can remotely control the system.
2. To find the suitable camera that can be used for this application.
3. To investigate the user interface that can easily be controlled by human.
4. To design small arm that can easily install to the project.
5. To investigate and research about the controlled unit using the PIC to control all the system.

1.3 Scope of project

Below are the scopes of hardware and software for this project:

Hardware and Software section

a) For the user interface design, this system can be control by using the wireless or radio frequency (RF). So before choosing the best interface, the understanding both of the concept is very important.

b) By choosing the best resolution and suitable camera is to make sure this project can function properly and at the same time can view higher resolution video to the user.

c) The servo motor is a motor that is driven and controlled by an electrical pulse train generated by digital device. Each pulse drives the servo motor by a fraction of one Revolution, called the step angle.

d) Skype software or other software that can be used to view the video on the computer.

e) The C language is used to design the PIC program. The PIC is module provides a master Module controlled to control the robotic arm that install to this project.

1.4 Problem Statement

The main problem in this project is to design the system that can carry the camera and arm. At the same time, this system also can be control remotely by using the wireless or radio frequency (RF). The PIC is used to make sure all the system can function automatically. It also can be used as a spy in small area without being seen by enemy.

CHAPTER II

LITERATURE REVIEW

2.1 Background

This chapter is intended to provide a review of the current literature relevant to the topic of this project, and provides justification for the course of research pursued according to the goals outlined in Chapter 1. This chapter is subdivided into three sections: on kinematic modeling of robotic systems, methodologies for synthesizing modular robotic manipulators, and random search methods. Each of these areas is critical for the process of automatically creating, modeling and evaluating reconfigurable robotic system.

2.2 Arm

The control of the arm is provided by the control box that came with the arm except that the connections from the control box go through the microcontroller which controls the outputs to a series of switches that turn on/off /switch direction of the arm's gear motors. The mode of operation is provided by a push-pull button and a push button. When the push-pull button is off and the push button is not pressed, the arm is in normal mode. When the push-pull button is on, the arm is in training mode and when the push button is pressed, the arm is in playback mode. The arm automatically reverts to normal mode after it has finished executing the trained motion.

The ability to manipulate objects is a trait that has enabled humans, as well as a few other creatures in the animal kingdom, to manipulate the environment. Without arms and hands, it wouldn't be able to use tools, and without tools it wouldn't be able to build houses, cars, robots. It makes sense, then, to provide arms and hands to the robot creations so it can manipulate objects and use tools. It also can duplicate human arms in a robot with just a couple of motors, some metal rods, and a few ball bearings. Add a gripper to the end of the robot arm that has been creating to complete arm-hand module. Of course, not all robot arms are modeled after the human appendage. Some look more like forklifts than arms, and a few use retractable push rods to move a hand or gripper toward or away from the robot [4].

2.2.1 Degrees of Freedom (DOF)

The degrees of freedom, or DOF, are a very important term to understand. Each degree of freedom is a joint on the arm, a place where it can bend or rotate or translate. It can typically identify the number of degrees of freedom by the number of actuators on the robot arm. Now this is very important. When building a robot arm there have a few degrees of freedom allowed for the application, because each degree requires a motor, often an encoder, and exponentially complicated algorithms and cost [11].

2.2.2 Denavit-Hartenberg (DH) Convention and the Robot Arm Free Body Diagram (FBD) [8].

The Denavit-Hartenberg (DH) Convention is the accepted method of drawing robot arms in FBD's. There are only two motions a joint could make: translate and rotate. There are only three axes this could happen on: x, y, and z (out of plane). Below I will show a few robot arms, and then draw a FBD next to it, to demonstrate the DOF relationships and symbols. The Figure 2.1, Figure 2.2 and Figure 2.3 show to us the Degree Of freedom (DOF) for the arm robot. Note that I did not count the DOF on the gripper (otherwise known as the end effectors). The gripper is often complex with multiple DOF, so for simplicity it is treated as separate in basic robot arm design.

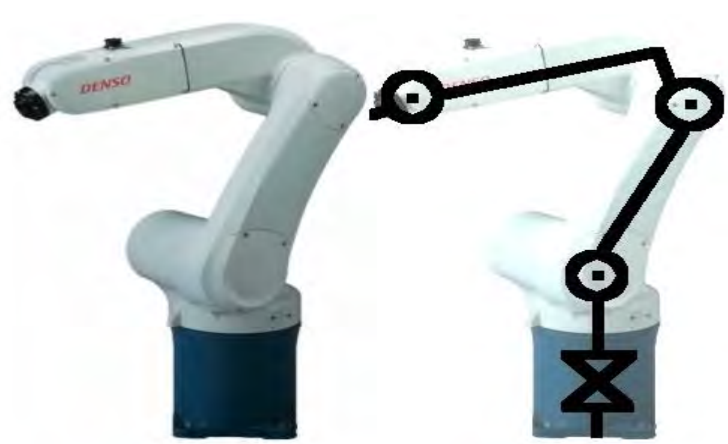

Figure 2.1: 4 DOF Robot Arm, three are out of plane [8].