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Design and develop wireless camera controller using PIC 16F84A / Anuar Ngadengon.

DESIGN AND DEVELOP WIRELESS CAMERA CONTROLLER USING PIC16F84A

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MAY 2008

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"I hereby declared that I have read through this report and found that it has c
the partial fulfillment for awarding the degree of Bachelor of Electrical Engi
(Power Electronic And Drive)"

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"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."

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Date : 07 / 05 / 2008

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For my beloved father and mother

Ngadengon Bin Salim and Satirah Binti Saian

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Finally, I would like to honor my parent, for supporting me consistently and their appreciated advice through my project completion.

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ABSTRACT

This thesis present theory, design and results of implementations process to develop wireless camera controller system. This whole system consists of wireless camera and camera mount. The user of radio-controlled system is able to state the direction of the camera to capture view. Construction of camera mount is consists of two servo motors which can make pan and tilt movement. User can make the movement of the camera using a remote controller. A transmitter and receiver pair is used in radio-controlled system. This project consists of two separate circuit; remote controller circuit and mount motion circuit. A PIC16F84A is used in both transmitter and receiver part to control the ration of motor. User can control the motion of the camera mount (left-right or up-down) by the remote and servo motor will rotate the motor on input signal.

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ABSTRAK

Tesis ini menerangkan secara terperinci mengenai teori, rekabentuk dan hasil pelaksaan projek yang telah dijalankan bagi mencipta sistem kawalan kamera tanpa wayar. Keseluruhan sistem ini mengandungi kamera tanpa wayar dan tanpa kamera tersebut.Bagi tapak kamera, penggunaan sistem kawalan jauh membenarkan pengguna menentukan arah pergerakan kamera tersebut bagi membolehkan ia merakam persekitaran pada sudut berlainan. Pembinaan tapak kamera ini terdiri daripada 2 servo motor untuk membuat pergerakan secara menegak dan mendatar. Pengguna boleh menggerakkan tapak kamera itu dengan menggunakan alat kawalan jauh. Pemancar dan penerima digunakan dalam sistem kawalan jauh ini. Pengawal PIC16F84A digunakan didalam litar pemancar dan penerima untuk mengawal pergerakan servo motor. Pengguna boleh mengawal pergerakan motor (atas-bawah atau kiri-kanan) dengan mengunakan alat kawalan tanpa wayar dimana motor akan bergerak mengikut butang yang ditekan.

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LIST OF ABBREVIATIONS

CCTV	**Closed Circuit Television**
PIC	**Peripheral Interface Controller**
RF	**Radio Frequency**
DC	**Direct Current**
V	**Volt**
CCD	**Charge-Couple Device**
MHz	**Megahertz**
R/C	**Radio Controller**
PWM	**Pulse Width Modulation**
BEC	**Battery Eliminator Circuit**
FM	**Frequency Modulated**
PCB	**Printed Circuit Board**

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CHAPTER 1.0

INTRODUCTION

1.1 Overview

All kinds of devices or equipments nowadays, begins with the basic design with the basic theory and then all the weakness followed by improvement step-by-step. So this project also do right the same reason which the improvement will be applied to bring the advantages to the user when using the wireless camera on several problems that had been identified. The problems occurs from the current product that one will be improvement soon is identified by covering some factors likes the functionality, reliability, and also safety besides covering on costly so that the aim of why this improvement is carry out will be achieve.

Generally, this project is developing due to improve the wireless controller technique become functional, more effective and reliable to the wireless camera through a device with radio frequency beam technology. What the most important purpose of why this project is being carry out is the radio frequency technology that used for this project is one of the medium on how the wireless camera can be controlled and this is one of the ways that the world today widely used especially in some kind of general application, guard applications, industrial application, military application and also in spy applications.

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- Completing the study about wireless camera.
    - Research must be done about wireless camera and how the operation of the wireless camera.

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CHAPTER II

LITERATURE REVIEW

The second chapter explains the literature review on similar project that had been done before. It also explains about the related projects that have been reviewed and also research about servo motor, PIC16F84A and wireless video camera.

2.1 Case Study

2.1.1 Wireless Video Surveillance System [2]

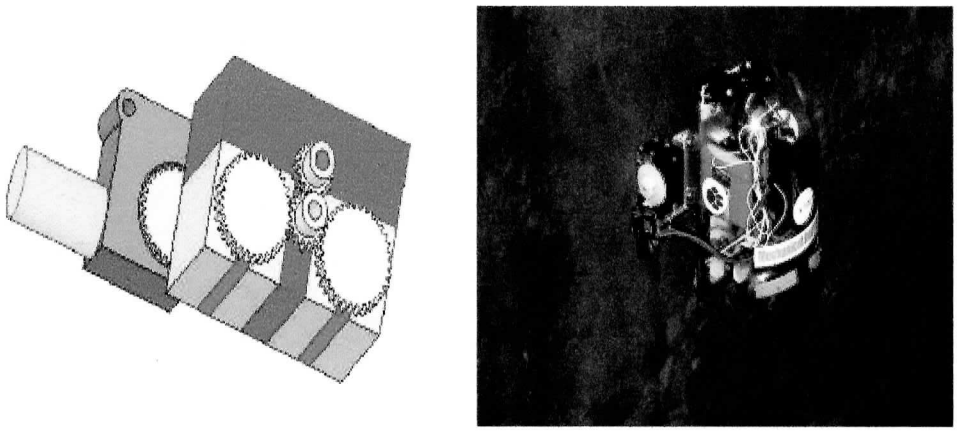

Figure 2.1: Robotic Joint [10]

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In this project, robotic joint parts that can see in Figure 2.1 were contains two DC motor for panning and tilting movement. The two gear sets are used to tone down the speed of the DC motor. So if the motor runs at very high rpm, then the gear can slow the rpm of the motor by 100 times. The motors are chosen to avoid very high rpm as well. The gear also ease come of the torque needed for the joint to move making less work for the motors so that the movement becomes smoother.

This project was used Holtek Encoder and Linx RF pairs for the remote control unit. The power for the controller (encoder, input switches and transmitter) is drawn for eight AA-size 1.5 batteries connected in series, regulated by a voltage regulator down to 5 volts. This scheme was chosen to ensure that's constant 5v would be provided to the chips to enable steady operation of the units. The power units can be turned on and off by a single-throw double-pull toggle switch. Helical style antenna was chosen because it is a wire coil wound from copper and it is very efficient given its small size.

The video signal produces by CCD camera is inverted and modulated. The modulated video signal is then mixed the carrier and amplifier at power amplifier stage. Next, the carrier signal with the video signal is transmitted through the antenna. The image was view on the television set. Summary for case study is shown in Table 2.1

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Table 2.1: Summary for Wireless Video Surveillance System

Features	Descriptions
Applications	• To survey widest possible viewing range and portability at ground area.
Controlling part	• Use Holtek encoder and Linx RF pairs for remote control units. • Contains two DC motor for panning and tilting movement. • Used LMD 18201 in motor control unit.
Camera	• Used wireless video camera and video transmitter to transmit image to tv monitor.
Software	• The software is written in EPROM programming for command encoder CY7C245 for controlling the motor rotation.
Power supply	• Use 4AA-size 1.5 batteries and regulated to 5V.

2.1.2 An Automated Surveillance Blimp [7]

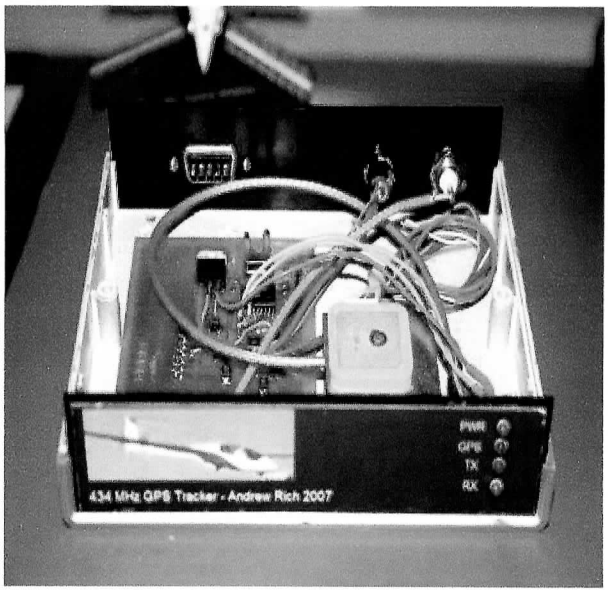

Figure 2.2: Blimp Controller [12]

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The purpose of the Intelligent Surveillance Blimp Team (ISB) was to create a blimp prototype that is automated through computer control software. Figure 2.3 show an automated surveillance blimp. By attaching camera to the blimp it becomes a marketable tool as a security or surveillance device. The software used to control the motion of the blimp. While allowing the user intervention, must be a multifaceted programming environment.

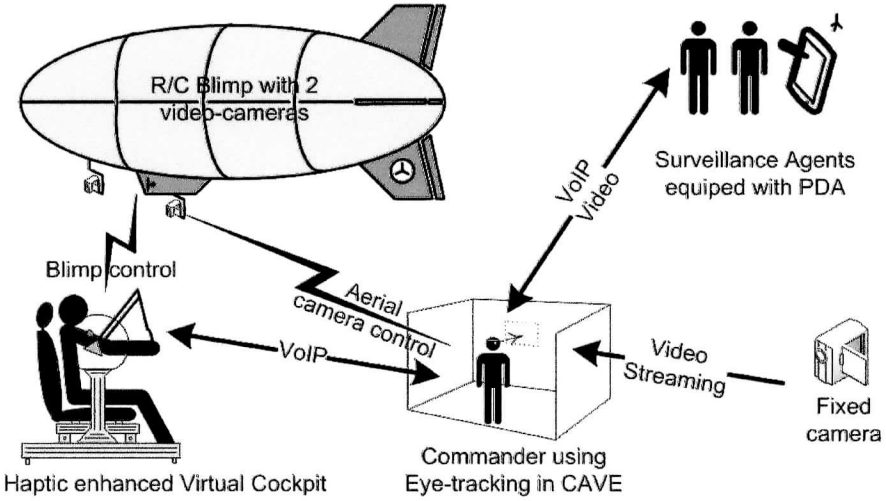

Figure 2.3: An Automated Surveillance Blimp [12].

In terms of design, the video system is relatively simple compared to the other part of the project. Originally there are two basic approaches to the video system; the fixed camera approach and the rotating camera approach. While the rotating camera option has not been abandoned completely they currently do not plan to mount the camera n a rotating base. A pan-tilt camera would significantly increase the weight and the complexity of the system. Assuming the camera will be fixed, it will be mounted facing 45 degree downward from the horizontal. In this project use a PC-18XS micro video camera and an SX-1 video transmitter. This system can be powered for one and two hours by a package of AAA batteries. The mount was static because in this project the main part was only concentrate to design the blimp itself. Summary for case study 2 is shown in Table 2.2.

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Table 2.2: Summary for an Automated Surveillance Blimp

Features	Descriptions
Applications	• The purpose of the Intelligent Surveillance Blimp Team (ISB) was to create a blimp prototype that is automated through computer control software.
Controlling part	• The mount was static because in this project the main part was only concrete to design the blimp it self.
Camera	• In this project use a PC-18XS microvideo camera and an SX-1 video transmitter.
Software	• Use lab view to control blimp movement.
Power supply	• This system can be powered for one and two hours by a package of AAA batteries.

2.1.3 Comparison for Case Studies

Table 2.3: Comparison for Case Studies

Title	Objective	Method	Results
Wireless Video Surveillance System	To survey widest possible viewing range and portability	Use video transmitter to transmit image to tv monitor.	Development of wireless surveillance robot.
An automated Surveillance Blimp	To be as a marketable tool as a security or surveillance device	• Use a PC-18XS micro video and SX-1 video transmitter. • Use static mount. Only airship is move.	Development of wireless surveillance robot.

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2.2 RC Servo Motor

Figure 2.4: RC Servo motor [13]

Servo motor in Figure 2.4 are used in a variety of application in industrial electronic that include precision positioning as well as motion control of larger motor. Servo motors are geared DC motor with positional control feedback. Servo motor are commonly use for position control for radio-controlled models. The shaft of the motor can be positioned or rotate through a minimum of 90 and 180 degrees. [7]

There are thee wire leads to a servo motor. The three wires are +Ve supply, -Ve Supply and Signal. Servo typically runs on 5 volts, but they often work with voltage between 4 and 6 volts. The control line is used to position the servo. In and R/C model, this line is attached to the radio receiver on robots it is usually attached to the processor. [13]

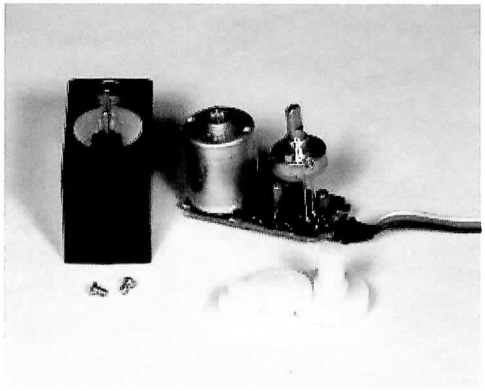

Figure 2.5: External Servo Motor [13]

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Servos are constructed from four basic pieces: A motor, some gear, and a feedback device and control board. Figure 2.5 show the external of servo motor. In R/C servo, the feedback device is typically a potentiometer. The motor, through series of a gear, turns he output shaft and the potentiometer meter simultaneously. The potentiometer is fed into the servo control circuit and when the control circuit detects that the position is correct, it stops the motor.

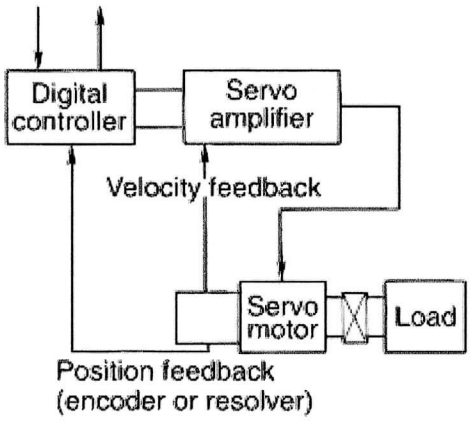

Figure 2.6: Closed Loop Control Systems [13]

Servos are controlled by sending them a variable width pulse. The control signal is a pulse of 5 volts with a Frame rate F and pulse width P. typical frame rate are 20ms, typical value of P vary from 1.0ms to 2.0 ms. On most servos, 1.5ms place the servo at the middle also known as the neutral position. When servos are recommended to move to a particular position, they will actively hold that position. Thus, if a servo is commended to a neutral position and an external force is present to push against the servo, the servo will actively resist being moved out of that position.

2.3 Pulse Width Modulation (PWM) [5]

Pulse width modulation (PWM) is a powerful technique for controlling analog circuits with a processor's digital outputs. PWM is a method of controlling the amount of power to a load without having to dissipate any power in the load driver. PWM is employed in a wide variety of applications, ranging from measurement and

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