WIRELESS CAMERA CONTROLLER

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This Report Is Submitted In Partial Fulfillment Of Requirements For The Degree Of Bachelor In Electrical Engineering (Control, Instrumentation and Automation)

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May 2008

"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 and Automation)"

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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."

Signature :

Name : FATIMAH BINTI RAZAK

Date : 5 MAY 2008

For my beloved mum, Azreena, Muhd. Zaki, Zarina and Muhd. Hafizan.

Thank you very much for everything.

May Allah bless us.

ACKNOWLEDGEMENTS

Alhamdulillah to The Most Merciful of Allah because with His permission, I have finished Projek Sarjana Muda (PSM) on May 2008. This project cannot be finished without support and advice from many people besides me. Also, I would express my gratitude to:

- My family for giving their support to finished this project
- Mr. Alias bin Khamis, my nice supervisor for his advice and suggestions about ‘ Wireless Camera Controller’.
- Mr. Hairul Nizam bin Mohd. Shah, my great tutor for his advise and guidance on MATLAB programming
- Friends who are together to support this project
- Any individual person who are very supportive and encourage to improve this project

ABSTRACT

This project is to develop a "*Wireless Camera Controller*" using MATLAB program. This project combines the knowledge of electrical and information technology. The goals of this project is to control and response wireless camera through a computer as well as remotely. "*Wireless Camera Controller*" uses a MATLAB as the control system to control all the activities. Wireless camera acts as input signal and will send a signal to MATLAB. Then, MATLAB will make a response accordingly and will compute the background and foreground. The response involves images as an output of monitor. The user will view the image using the computer only.

ABSTRAK

Projek ini adalah untuk memajukan "*Kamera Tanpa Penggunaan Wayar*" dengan manggunakan program MATLAB. Projek ini manggabungkan antara ilmu berkenaan elektrik dan juga teknologi maklumat. Tujuan utama projek ini adalah untuk mengawal dan bertindak balas dengan kamera tanpa penggunaan wayar dengan kawalan sepenuhnya daripada komputer. "*Kamera Tanpa Penggunaan Wayar*" akan menggunakan program MATLAB untuk mengawal segala aktiviti kawalan. "*Kamera Tanpa Penggunaan Wayar*" bertindak sebagai suatu signal input dan terus menghantarnya kepada program MATLAB. Kemudian, MATLAB akan bertindak balas dengan memaparkan beberapa imej input yang diterima. Imej pada skrin komputer adalah output terakhir dalam projek ini. Pengguna hanya dapat melihat imej hanya pada komputer sahaja.

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LIST OF ABBREVIATIONS

MATLAB	-	Mathematics in Lab
GPS	-	Global Positioning System
RF	-	Radio Frequency
PC	-	Personal Computers
LAN	-	Local Area Network
GUI	-	Graphical User Interfaces
AM	-	Amplitude Modulation
FM	-	Frequency Modulation
IC	-	Integrated Circuits
OOK	-	On-Off Key

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CHAPTER 1

INTRODUCTION

1.1 Definition

Nowadays, wireless is one of our necessary and were developed for fulfill its applications.Wireless is normally used to refer to any type of electrical or electronic operation which is accomplished without the use of a hard wired connection. The term "wireless" came into public use to refer to a radio receiver or transceiver (receiver and transmitter device), establishing its usage in the field of wireless telegraphy early on. Now, the term is used to describe modern wireless connections such as in cellular networks and wireless broadband internet.

One of the most fundamental and important components in image processing is the decomposition of an image into parts that are meaningful with respect to a particular application. This process is referred to as the segmentation of an image.

Digital image processing techniques provide the necessary tools for realizing this computer based image analysis and are a useful means for monitoring systems and processes. [8] One application where this type of algorithm would be useful, would be in the tracking of a person for surveillance purposes or motion detection. This system is designed to detect any object which is moving relative to a background, by classifying the object as a target.

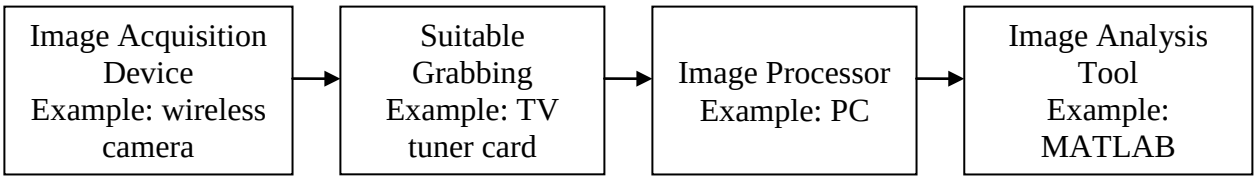
Wireless camera has many advantages and its high technologies applications. Wireless camera using computerized is more efficient and flexible than television. We are able to control a wireless camera as a security whenever not at home and the wide angle of lenses is easier to focus an images.

1.2 Project Overview

This project consists of:

1. Image acquisition setup: It consists of an analogue camera (wireless camera) with suitable interface for connecting it to processor.
2. Processor: it consists of either a personal computer or a dedicated image processing unit.
3. Image analysis: Certain tools are used to analyze the content in the image captured and derive conclusions. Example; locating position of an object.

Pictorially, this system can be represented as;



1. Image capturing can be done using wireless camera available in various resolutions, example 510 x 492 pixels. There are two types of cameras generally available: digital cameras (CCD-charge coupled device and CMOS sensor based) and analogue cameras. Digital cameras generally have a direct interface with computer (USB port), but analogue cameras require suitable grabbing card or TV tuner card for interfacing with computer.

Power requirement: Wireless cameras give high quality and low-noise images. It generates an analog signal and uses analog to digital converter (ADC) and thus consumes high power.
CMOS cameras have lesser sensitivity resulting in poor image quality but consume lesser power resulting in more battery life.

2. Image analysis consists of extracting useful information from the captured images. Firstly, we decide the characteristics of the object to look for, in the image. This characteristics of the object must be as robust as possible. Generally, for the purpose of tracking or identifying the object we utilize:

- Colour
- Intensity
- Texture or pattern
- Edges- Circular, straight, vertical stripes
- Structure- Arrangement of objects in a specific manner

Quantitative or Statistical analysis of image:

- Center of gravity-point where the desired pixels can be balanced
- Pixel count- a high pixel count indicates presence of object
- Blob- an area of connected pixel

This thesis describes the processes and algorithms involved in segmenting a target from a sequence of images using the method of region growing. The sequences being used, can be divided into a background and foreground set of images. Each foreground image contains at least one person that is moving around in a specific environment. The background set of images are generated in exactly the same way as the foreground images, but do not contain any people or targets. The algorithm is required to classify any number of people in the foreground images that move relative to the background as target regions and segment them from the background

1.3 Objective

The aims of this project are:

1 To capture images using MATLAB.

2 To response wireless camera using computer only.

3 To provide clues as to the location of a target in an image.

1.4 Problem Statement

1 Many of wireless cameras very sensitive with light. This will influence an image.

2 Limited distance for wireless networking

3 The market price is very expensive for using computer

1.5 Scope

The concept of wireless camera has been used to perform a relaying from the spot for television broadcasting such as news programs. When such a wireless camera is used, video signals picked up and gathered by the wireless camera are transmitted to a base relay station such as a relay car using ground waves employing radio transmission. Thus, when such a wireless camera is used, since it is necessary to take time to arrange and remove cables, less labor is required as compared with a conventional camera which is connected to cables. Wireless camera series will emit electromagnetic wave, just like other wireless products. But, this output power is less than other wireless product such as mobile phones. The wireless camera meets wireless frequency security standards and recommend indexes while working.

CHAPTER 2

LITERATURE REVIEW

Overview

This chapter provides an idea of the locations from where the bulk information and background used was taken. These references were used to gain an understanding of the ideas and concepts required to implement a working algorithm which would meet the requirements set out in the objectives.

2.1 Wireless Systems

2.1.1 History

David E. Hughes, eight years before Hertz's experiments, induced electromagnetic waves in a signaling system. Hughes transmitted Morse code by an induction apparatus. In 1878, Hughes's induction transmission method utilized a "clockwork transmitter" to transmit signals. In 1885, T.A. Edison uses a vibrator magnet for induction transmission. In 1888, Edison deploys a system of signaling on the Lehigh Valley Railroad. In 1891, Edison attains the wireless patent for this method using inductance.

In the history of wireless technology, the demonstration of the theory of electromagnetic waves by Heinrich Rudolf Hertz in 1888 was important. The theory of electromagnetic waves was predicted from the research of James Clerk Maxwell and Michael Faraday. Hertz demonstrated that electromagnetic waves could be transmitted and caused to travel through space at straight lines and that they were able to be received by an experimental apparatus. [11] The experiments were not followed up by Hertz and the practical applications of the wireless communication and remote control technology would be implemented by Nikola Tesla.

2.1.2 Wireless definitions

The term wireless is normally used to refer to any type of electrical or electronic operation which is accomplished without the use of a hard wired connection. Wireless communication is the transfer of information over a distance without the use of electrical conductors or wires [1].The distances involved may be short (a few meters as in television remote control) or very long (thousands or even millions of kilometers for radio communications). When the context is clear the term is often simply shortened to "wireless".

Wireless operations permits services, such as long range communications, that are impossible or impractical to implement with the use of wires. The term is commonly used in the telecommunications industry to refer to telecommunications systems (example, radio transmitters and receivers, remote controls and computer networks) which use some form of energy to transfer information without the use of wires. Information is transferred in this manner over both short and long distances.

Wireless communication may be via:

- radio frequency communication,
- microwave communication, for image long-range line-of-sight via highly directional antennas, or short-range communication, or
- infrared (IR) short-range communication, for image from remote controls or via IRDA

The term "wireless" is a different with the term "cordless", which is generally used to refer to powered electrical or electronic devices that are able to operate from a portable power source without any cable or cord to limit the mobility of the cordless device through a connection to the mains power supply. Some cordless devices, such as cordless telephones, are also in the sense that information is transferred from the cordless telephone to the telephone's base unit via some type of wireless communications link.

The term "wireless" came into public use to refer to a radio receiver or transceiver (a dual purpose receiver and transmitter device), establishing its usage in the field of wireless telegraphy early on; now the term is used to describe modern wireless connections such as in cellular networks and wireless broadband internet. It is also used in a general sense to refer to any type of operation that is implemented without the use of wires, such as wireless remote control that is used to accomplish the operation.

2.1.3 Applications of wireless technology

a) Security systems

Wireless technology may supplement or replace hard wired implementations in security systems for homes or office buildings. The operations that are required may be implemented with the use of hard wired sensors or they may be implemented with the use of wireless sensors which are also equipped with a wireless transmitter (image infrared and radio frequency) to transmit the information concerning the current state of the door or window.

b) Camera remote control

Some cameras were previously manufactured with hard wired remote controls which plugged in to a receptacle whereas more modern cameras use wireless (generally infrared) remote control units. Wireless camera systems typically use omnidirectional antennas which can produce a number of unwanted side-effects. An omnidirectional antenna transmits in all directions so that the receiver not only receives the direct signal from the camera-mounted transmitter but reflections from buildings, moving vehicles or interior walls. These problems are worsened with the degree of camera movement.

By using a battery-operated broadcast-quality transmitter with a directional antenna atop a pole all of these problems are reduced or eliminated. Walking alongside the cameraman and connected via a short cable, the microwave technician maintains directional control of the transmitter. Other advantages are that the transmitter is elevated above obstructions, a higher-power transmitter can be used, and the combination of higher power and the directional antennas on both the transmitter and receiver greatly increases the possible distance to the receiver to several blocks.