

Photo Capturing using Color Image Processing (PCCIP)

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ABSTRACT

Photo Capturing using Color Image Processing (PCCIP) is a prototype developed to capture an image with color tracking methods. The prototype developed is able to identify and track two similar color markers which attach at user finger as an identifier. With the identification of the position of the markers, within a certain wait time, the prototype will call a capture function which will capture an image cover inside the color marker boundary. One of the main objectives in the development of PCCIP is to implement color image processing methods in touch less technique, means capture an image based on the detection of color marker, without any body interaction between user and the hardware device. In line with the development of technology, Human Computer Interactions (HCI) is more emphasize and that is why PCCIP was developed to introduce a new interactions way between human and devices. Evolutionary methodology was implemented in the development of PCCIP, through several image processing techniques include image acquisition, image enhancement, image features extraction, image segmentation and object recognition. Ninety samples were tested and the result shown that 90% of the sample has successfully passed from the testing phase. This shown that the developed prototype has met it objective. Therefore, the result indicates that the implementation of color processing techniques in touch less methods was successful to create a new human computer interactions method.

ABSTRAK

Pengambilan gambar dengan pemrosesan imej berwarna adalah satu prototaip yang direka dengan tujuan mengambil gambar menggunakan teknik jejak warna. Prototaip yang direka berupaya menjejak dua penanda warna yang diletakkan pada jari pengguna. Dengan mengenalpasti kedudukan penanda dalam beberapa saat, prototaip akan memanggil fungsi untuk mengambil imej dalam lingkungan penanda tersebut. Salah satu tujuan prototaip ini dibuat adalah untuk mengaplikasi teknik imej pemrosesan warna ke dalam teknik tanpa sentuhan, dengan maksud lain merupakan pengambilan imej berdasarkan penentuan dan penjejakan penanda warna, tanpa sebarang sentuhan daripada pengguna dengan mesin. Dengan pembangunan zaman teknologi, penghasilan peralatan yang berunsurkan interaksi antara manusia dengan komputer semakin dititikberatkan dan itulah sebabnya mengapa prototaip ini direka, iaitu untuk memperkenalkan satu teknik interaksi yang baru di antara manusia dengan komputer. Metodologi Pembangunan Aplikasi Pantas (*RAD*) telah digunakan dalam pembangunan prototaip ini, melalui beberapa teknik imej pemrosesan iaitu teknik pendapatan imej, teknik penambahbaikan imej, teknik pengeluaran ciri imej, teknik segmentasi, dan teknik penentuan objek. Sebanyak Sembilan puluh sampel telah diuji, daripada keputusan yang diuji, didapati bahawa 90% daripada sample yang diuji telah berjaya melalui pengujian. Ini telah membuktikan bahawa pembangunan prototaip tersebut Berjaya menepati objektif yang ditentukan. Justeru, keputusan yang didapati telah membuktikan bahawa pelaksanaan teknik imej pemrosesan warna dalam teknik tanpa sentuhan telah berjaya memperkenalkan satu teknik interaksi yang baru di antara manusia dengan komputer.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

With advance in the technology, people life become more convenient and entertains. Many devices and tools had been created to make people to live more ease and convenient. Moreover, ample of technology and devices was created in line with the development of technology. For an instance, touch screen technology, I Phone, I Pad, PDA, and camera phone, etc which all of it contribute on improving human lifestyle more entertain and enjoyment. Therefore, the new implementing touch less technique on color image processing definitely will be the new trends of technology which can be apply to many devices and attract many people. Photo capturing using color image processing, also known as PCCIP, is one of the ways to apply touchless technique in our daily lifestyle. The prototype functions by using a webcam to capture an image which

trigger by human gesture. The webcam will track the color marker which located at the finger of the people. The webcam after that will capture the image which surrounded by the color marker after certain wait time.

1.2 Problem Statements

In line with the development of technology, many industries have developed a growing interest in Human-Computer Interaction (HCI). Variety of research has been carried out and devices which promote the interaction between human with machine was introduce. One of the examples is the Sixthsense from the MIT Media Lab, an augmented reality (AR) project that aims to seamlessly integrate digital information with user everyday physical world. With the rapidly emerging computing paradigms, devices which are able to interact with human gesture will become a trend in future world. Therefore, the development of PCCIP prototype is in line with the future technology besides promote the implementation of Human-Computer Interaction (HCI).

Furthermore, photo capturing has become a common entertainment of many people. Photo capturing device has been widely used to capture image. As a result, many type of camera, mobile phone which have photo capturing function has been introduce to the market, but the price is rather expensive. Therefore, photo capturing using color image processing is another alternative. Since the prototype just required a webcam to capture an image, it is more cheaper if compare with other photo capturing device.

1.3 Objectives

- 1 To develop a prototype to capture image with a webcam using color image processing technique.
- 2 To identified color image processing technique for touch less photo capturing.

1.4 Scopes

- 1 The target user of the prototype is usually teenager, who more interesting on latest technology.
- 2 Tools use to develop is Microsoft Visual Studio 2010 and OpenCV .
- 3 The device use is a webcam to track only one color marker at one time.
- 4 The webcam resolution is 2 Megapixels.
- 5 The application will be test by 90 samples.
- 6 Color markers used were red, yellow and blue.
- 7 The prototype is more effective on indoor environment.

1.5 Thesis Organization

The thesis consists of six main chapter, from chapter one to chapter six. Chapter 1 gives an introduction and overview of the project that will be developed. Besides that, it also includes problem statements, objectives and scopes of the project. Chapter 2 reviews the previous research that has been carried out by other domain experts. The

details of the techniques that has been used on other related research. Moreover, chapter 2 also includes some theory and definition of the common image processing technique. Meanwhile, chapter 3 discusses the methodology that will be used in the development of this project, including technique, algorithms and project flow in details. On the contrary, the discussion on implementation stage was stated in chapter 4, which discuss about the coding for the prototype. Next, the result of testing are include in chapter 5, where all the result in the testing process for the prototype will be listed in the chapter. Lastly is chapter 6, which is the conclusion part and conclude the thesis.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Chapter two literature review will outline all the information about the project, which is photo capturing using color image processing (PCCIP). As refer to existing system and journal that carried out by many domain experts, it will definitely increase the understanding and knowledge about the project.

Basically, in this chapter there are a few main parts that will discuss in details. Firstly is the introduction of the project, this will include explanation on how the prototype functions on capturing a photo by using color tracking. Secondly is the brief introduction on some image processing technique that can be used. Thirdly is the analysis of the existing prototype or project that had been carried out. These projects will

be a guide and reference in the development process. Besides that, by study the pro and con of these projects, it will help us to avoid the constraints and problem that may be occur in the development process. In the third part, the analysis of existing related system can be divided into two main parts, which are colors tracking and hand gesture recognition. Color tracking is how to detect and distinguish the color with an images background, while hand gesture recognition will discuss variety methods in determining hand gesture besides using color tracking methods. This two sub topic is related with PCCIP project that will be developed, hence by studying on the related resources, it will give more idea on how to develop PCCIP.

2.2 Brief Introduction on PCCIP project

PCCIP project mainly can be divided in to three parts. The first part is the color marker detection and tracking. Two markers which are same in color were attached at user fingertips (refer figure 2.3) for the ease of control on the prototype. Second part is the hand gesture (refer figure 2.4) that will activate the camera to capture an image. The recognition of the hand gesture was detected by the camera based on the position of the color marker (refer figure 2.4). Lastly, after certain wait time, the camera will capture image that covered inside the two marker area (refer figure 2.5). All the process is in real time.

Figure 2.1 is the simple setup of the prototype. Web camera was used in this setup and connects with the user computer. Hand position is the place where user performs their hand gesture in front of the camera. The camera will detect the position of the marker to recognize the correct hand gesture, within a few second wait times, a function will then call to capture the image that cover in the marker area.

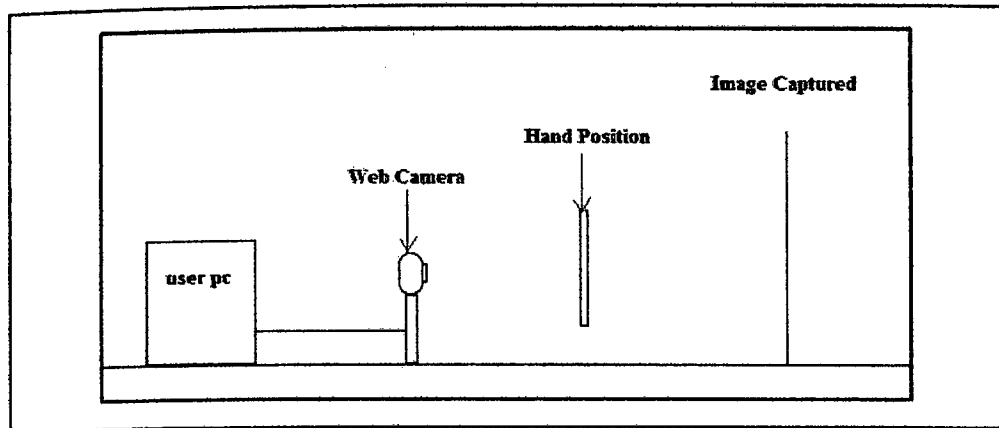


Figure 2.1: Simple setup of PCCIP

As for an instance, the image on figure 2.2 is the image that shows in the web camera. Meanwhile the table lamp is the image that user wish to capture (refer figure 2.2).

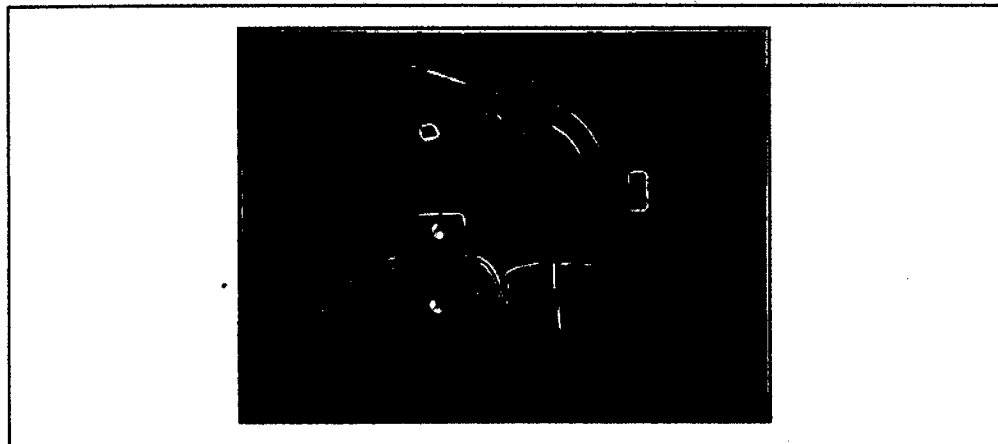


Figure 2.2: Image shows in web camera

Two similar color markers were attached at user finger as a mark for the web camera to detect the marker position (refer figure 2.3).

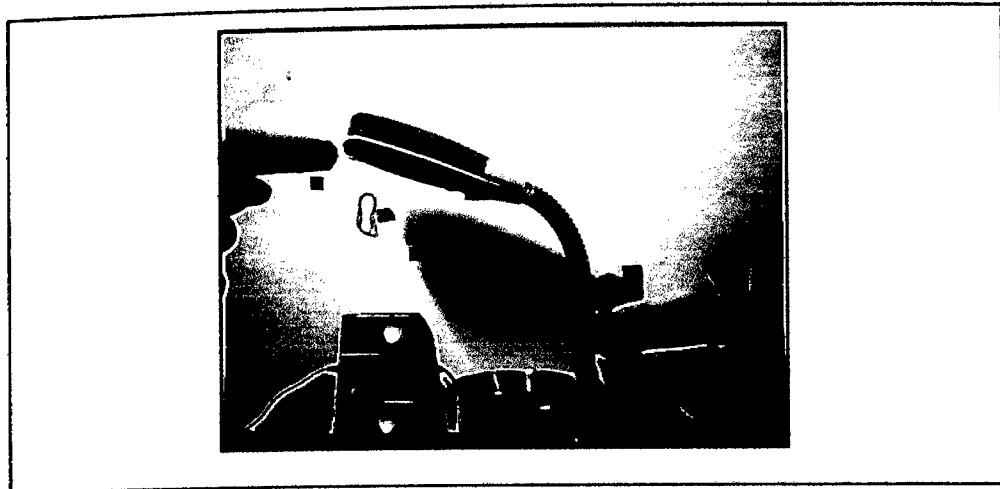


Figure 2.3: Color marker that attached at user fingertips

Web camera will detect the position of the color marker that attached at user fingertips; when the alignment of the marker was placed in the shape as shown in figure 2.4, the web camera will recognize the color marker from the web camera to capture the image (refer figure 2.4).

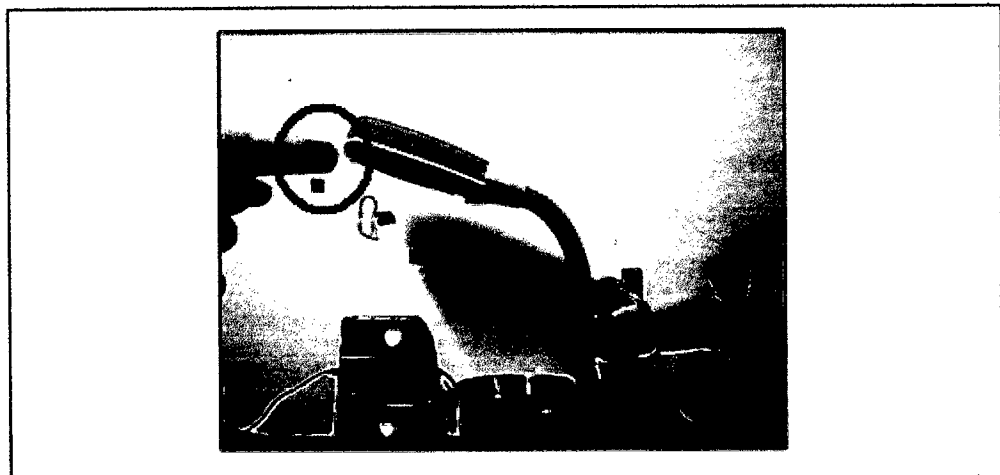


Figure 2.4: Marker position that required for capturing image

After the required marker position was performed within a few second, the image that covered inside the color marker, which are the rectangle area will be captured by the web camera (refer figure 2.5).

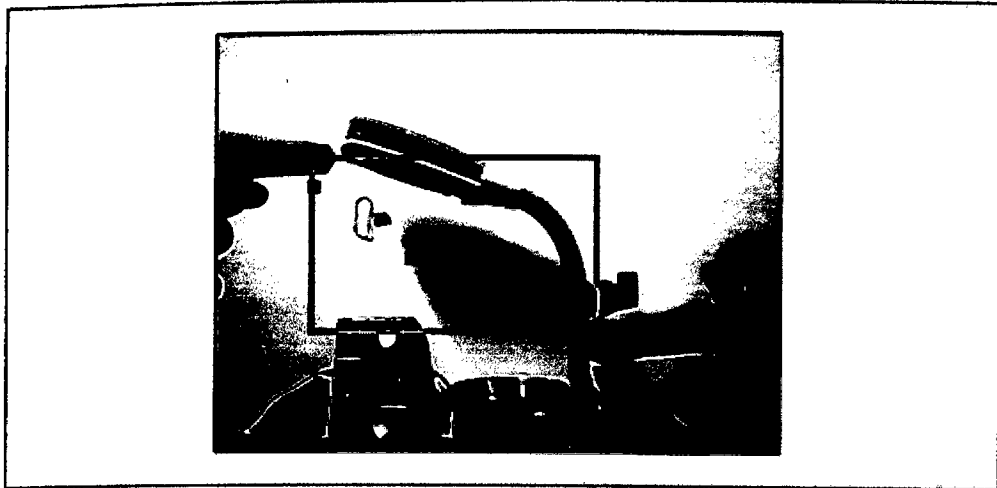


Figure 2.5: Area inside color marker will be captured

2.3 Brief Introduction on Images Processing Technique and Process

2.3.1 Fundamental Steps in Image Processing Process

There are many steps in image processing. Basically, there are five main steps that are the most essential part among all the image processing steps. Those steps mainly are image acquisition, image enhancement, image segmentation, image features extraction and object recognition.

2.3.1.1 Image Acquisition

Image acquisition is the first process in digital signal processing. The main purpose of image acquisition is to acquire a digital form images, whether from a device or any other source. Basically, the image acquisition stage involves some pre-processing technique, for an instance scaling.

2.3.1.2 Image Enhancement

Image enhancement is the basic yet necessary step in the image processing parts. As by implementing image enhancement technique, it will improve an image quality and clarity, make it easy to view by user or interpret by machine. There are a lot of image enhancement technique that available, each of them has its own characteristic and function. For an instance neighborhood-averaging technique, median-filtering technique, prewitt operator, sobel operator and so forth. The next parts are some explanations for the image enhancement technique that will be used in the development of PCCIP project.

2.3.1.2.1 Neighborhood-Averaging Technique [1]

The concept of processing window or kernel is used to define the neighbor. The size of processing window is often choose as 3x3, 4x4 or 5x5, which contains the neighboring pixels surrounding a given pixel. Generally there are three types of neighborhood averaging technique, based on different kernel that will be used. Figure 2.6 is three 3x3 sample kernel that usually will use as template.