DENTAL MEASUREMENT SYSTEM FOR UIAM

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ABSTRACT

Dental is the place would explore and giving treatment or take care human tooth of health. Nowadays, the dental society is very successful. The technology they using are very modern and it bring many advantages to the dentist and patient such as the modern technology can give dentist get the tooth decay data with accurate compare to the traditional method and save the patient time to always come to find dentist. But because the high technology involve the high cost many in the develop country such as Malaysia, still have many dentist are continue using the traditional method and this situation also occur in many university and one of the universities is Universiti Islam Antarabangsa Malaysia(UIAM) dental clinic. Therefore, this system is the supporting system for UIAM dental clinic to computerize the traditional method and used for process the tooth decay image makes it clearer and provides the calibration and measurement to allow the staff and students UIAM measure the tooth decay based on image.

ABSTRAK

Pengigian merupakan salah satu bidang yang mangkaji dan merawat kesihatan gigi manusia. Pada masa kini, bidang pengigian sangat berjaya. Teknologi yang digunakan adalah moden dan membawa banyak kebaikan kepada doktor gigi. Misalnya, teknologi moden yang dapat memudahkan doktor gigi mendapatkan data kerosakan gigi dengan tepat dan pesakit dapat menjimatkan masa untuk berjumpa dengan doktor gigi untuk membuat gigi palsu. Walaubagaimanapun, teknologi yang canggih memerlukan kos yang tinggi di negara-negara membangun seperti Malaysia. Terdapat ramai doktor gigi yang masih menggunakan kaedah tradisional di negara ini dan situasi ini juga berlaku di universiti-universiti. Salah sebuah klinik gigi di universiti ialah Universiti Islam Antarabangsa Malaysia (UIAM). Oleh itu, sistem ini dapat membantu dan memudahkan doktor gigi di UIAM dengan menggunakan komputer bagi menggantikan kaedah tradisional. Sistem ini juga digunakan untuk memproses gambar kerosakan gigi dan menjadikannya lebih jelas melalui penyediaan kalibrasi dan pengukuran bagi memudahkan kakitangan dan pelajar UIAM mengukur gigi yang rosak.

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LIST OF ABBREVIATIONS

UIAM	-	Universiti Islam Antarabangsa Malaysia
DMS	-	Dental Measurement System
CCD	-	Charge-Couple Device
DICOM	-	Digital Image and Communication in Medicine
JPEG	-	Joint Photographic Expert Group
TIFF	-	Tagged Image File Format
JAD	-	Joint Application Design
RAD	-	Rapid Application Development
SDLC	-	Software Development Life Cycle

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

This chapter briefly discuss on the overview of the research which is introduction, follow by the problem statements, objectives of the system, scope of the system, and the lastly is the organization of thesis.

1.1 Introduction

Nowadays the dental society in the high technology country is very success. The hardware and software they using a very modern such as paradigm sensors, fiber optic polarimetric sensor, laser sensors and shade vision to provide 3D measurement and shape function, wave measurement function and X-ray function to make the dentist can get the data more accurate and can observe more clear about the tooth decay. Besides that, this high technology also can save the dentist and patient time

because with the accurate data dentist can more easier and save the time to repair the decay tooth and patient don't need always come to checking whether the repair tooth have any effect. In addition, the university also provides the technology for the student to learn something new technology and train them how to observe the tooth decay with using high technology to get the accurate data.

In the develop country, most of the dental is unable to using the high technology hardware and software because it involve a very high cost and they using the traditional method which is using sliding caliper and intraoral video camera to observe the tooth decay. This method needs using a lot of time to get the accurate data and also difficult to observe the tooth decay. This situation also occurs in many universities and one of the universities is Universiti Islam Antarabangsa Malaysia (UIAM) dental clinic.

Therefore, the Dental Measurement System (DMS) is the supporting system for the UIAM dental clinic. This system will be computerize the traditional method and used for process the image make the tooth decay image clearer and it also provides the calibration and measurement for the tooth decay by using image to allow the UIAM staff and student dentist to measure the tooth decay.

1.2 Problem Statement

The problem occurred in the UIAM dental clinic is the dentist difficulty to observe the tooth decay. This is because they need to use the periodontal probe or something sticks with a mirror to observer the tooth decay. Using the traditional method or manual dental measurement is quite complex and in UIAM there still no computerize dental measurement system.

1.3 Objective

The research objectives as followed:

i. To develop Dental Measurement System.

ii. To analyze, calibrate and measure the tooth decay image

1.4 Scope

The scope for the research as followed:

i. The system using 2D image of tooth decay to measure.

ii. The system only can measure width and length from the image 720 x 572 pixels.

iii. The system measure only one tooth image data at one time.

iv. The image capture distance is 1 millimeter. (Based on expert dentist advice).

v. The type of tooth decay to be measure is molar tooth decay

vi. The target user for this system is UIAM staff and student dentist.

vii. The hardware limitation for the system is Intel Pentium 4 Processor and above better processor support better performance. This is because the OpenCV software just only supported Intel Processor

viii. The system is a standalone system.

1.5 Organization of Thesis

This thesis consists of six chapters. Chapter 1 discuss about the introduction to system. This chapter will introduce the basic concept of the system, problem statement, objectives, scopes and organization of thesis. Chapter 2 will explain the case study of the system. This chapter will review the techniques, method, technology and the system that relate to this project. Chapter 3 discuss about the methodology of the system. This chapter will explain all the method, approach and techniques that will be use to design and implement the system. Chapters 4 discuss about the coding and design will be using during to develop system and chapter 5 is discussing the result and the output of system. Finally, the project will conclude in chapter 6.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Literature review collected the information that relevant to the area of research for this project from books, journal, scholarly article and other resource. Literature review is the way to gain a suitable and clearer perceptive in developing this project. This chapter will gathered all the information from the previous research for this project and explain it. It will include the description of the concept for this project. In addition, this chapter will also explain the description of development technology, techniques and methodology have been chosen for this project. This section also will discover the strength and weaknesses for the manual system and the existing system.

2.2 The Concept of Complete Dentistry

Inside the dentistry environment, to become a complete dentistry the establishment of definitive goals is the foundation and has four comprehensive goals for the complete dentistry (Peter Dawson, 2004).

1. Optimum oral health
2. Anatomic harmony
3. Functional harmony
4. Occlusal stability

Peter Dawson (2004) state that when each of goals above is achieved, the treatment is assured become success and the whole entire system is running health, harmony of form and function and the relationship are stable, is meaning that the treatment is considered complete. Furthermore, every diagnostic or treatment decision should be made on the basic of understanding the reasons for the problem and the reasons for the treatment. Planning must then be directed at definitive goal

Peter Dawson (2004) also states the most important step in achieving complete dentistry is a careful diagnosis to determine disharmony, instability, and disease.

2.3 The Concept of Tooth Decay

According to the Brian Kerr (2002) the expert author for the EzineArticle.com, the tooth decay have start occur when the bacteria called as plaque inside our mouth produces the acid surround the tooth. People would practice of poor hygiene and brushing teeth one time in a day is the fact make the tooth decay occurred. Brian Kerr (2002) also mention that, there are a lot of bacteria inside one people mouth and just have one type of bacteria will produces acid to corrodes teeth and it can be passed by sharing the same drink, kissing or eating from the same plate from one people to another people. The decay process will move slowly when it set into the tooth's enamel to way through second layer of element. Inside the second

layer of element have contains the tooth nerves and blood source called as pulp and when the decay reaches pulp the pain of tooth decay will apparent and it will eat the tooth nerves of the end. Based on the Brian Kerr (2002) research there has three types of tooth decay, smooth decay, root decay and pit decay. Smooth decay normally will begin a white spot in the tooth and dissolve the enamel of tooth and it generally targets the young adult between twenty thought thirty. Root decay will begin on the people surface of tooth's root and it usually come from dry mouth or eating a lot of sugar. Pit decay start at narrow divots nearest molars and this type of tooth decay normally moves quickly than the smooth decay.

2.4 The Concept of Digital Image

Torsten Seemann (2004) state that digital image is discrete two-dimensional function, $f(x, y)$, and it represent with rectangular by consisting of Y rows and X columns. X x Y is the resolution for the image and at the top left corner of image the $f(0,0)$ is taken and f(X-1 ,Y-1) is taken by bottom right corner. Below is the summarized in Figure 2.1

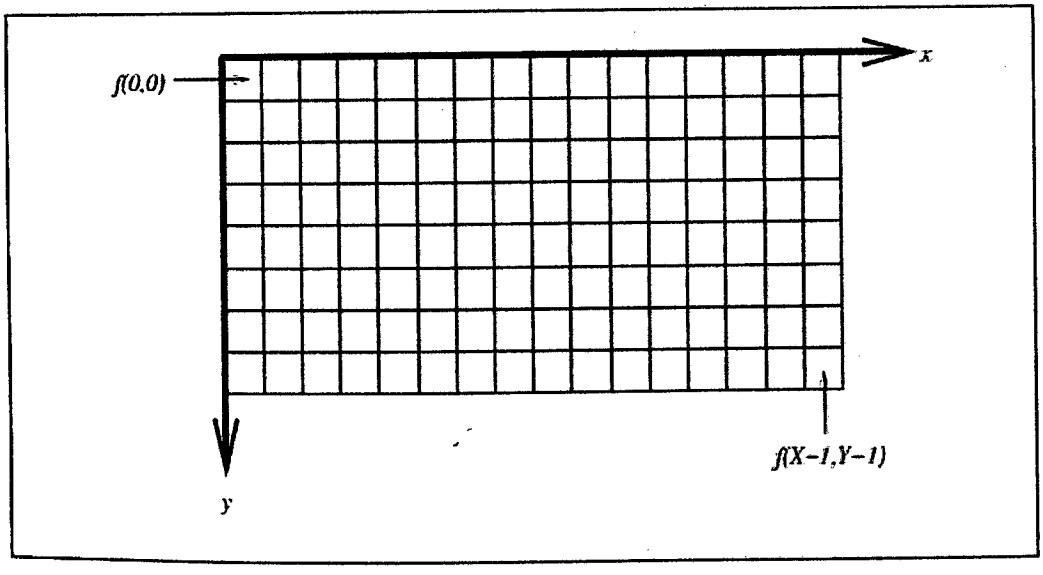

Figure 2.1 the rectangular digital image of resolution 16 X 8

From the figure 2.1 every each distinct coordinate in the image is called pixel or picture element and all the output of the pixel is dependent on the type of image and the measurement able to take the any numerical form (Torsten Seemann, 2004).

2.5 Technology

In this section, we will discuss the technology use by other people. Technology is the one of the important part in this project. It can be affected the overall result when choose a not suitable technology.

2.5.1 Kodak 1000 Intraoral Video Camera

Kodak 1000 Intraoral Video Camera is the Carestream Dental Company product. It equipped with a ¼ inch Sony high-resolution Charge-coupled device (CCD) with light source halogen to provide a clear and precise image and it can automatically adjust the ambient light to optimizing the image. Kodak 1000 Intraoral Video Camera connects to the computer by using USB port 2.0 and the resolution for this intraoral video camera is 752 x582 pixels. Kodak Dental Imaging Software can provide manage and modify images by connected to this device (Dentalcompare, 2005-2010).

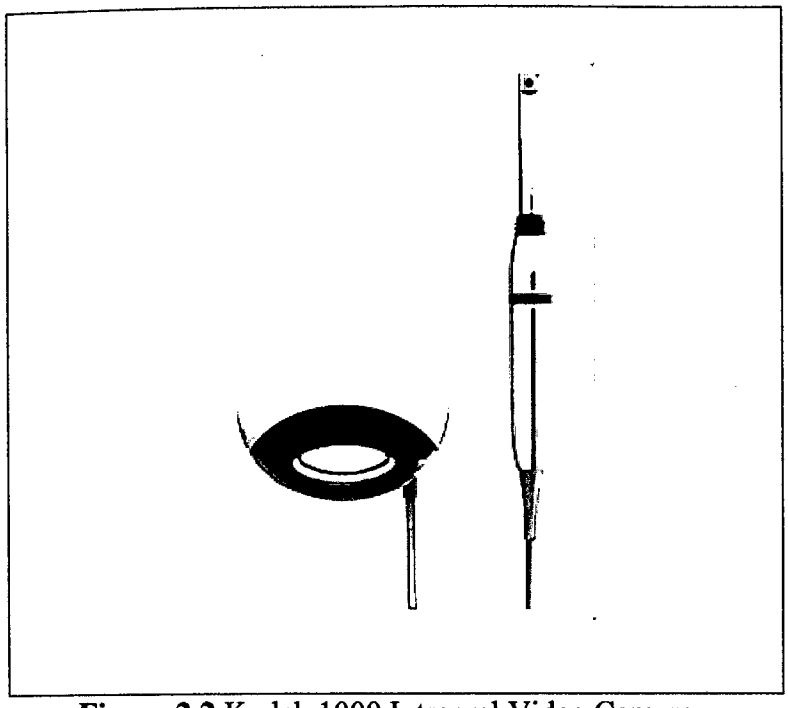

Figure 2.2 Kodak 1000 Intraoral Video Camera

2.5.1.1 Advantages of Kodak 1000 Intraoral Video Camera

Kodak 1000 Intraoral Video Camera can be helping detect the cavities and fractured teeth. It also can evaluate the condition of existing restoration under high magnification and visually observe hard to see areas of the mouth (Dr. Ritchie Beoigher and Dr. Tori Irvine, 2010). It is suitable for the practice dentist and dentist student.

2.5.1.2 Disadvantages of the Kodak 1000 Intraoral Video Camera

The Kodak 1000 Intraoral Video Camera no provides preventing shock function any hand shake or shock will be affected the result of capturing image. The device wires will be set the limitation how far the device capture image.

2.5.2 Nikon D100 Digital Camera

Digital camera is one of the important diagnostic tools for the dental. Nikon D100 digital camera has 6.1 megapixel image qualities and the image pixel can maximum to 3008 x 2000 pixel and it also provides the 5-area autofocus. This digital camera supports the USB port 1.1 to connect computer and it also can support camera lens (dpreview.com, 1998-2010).

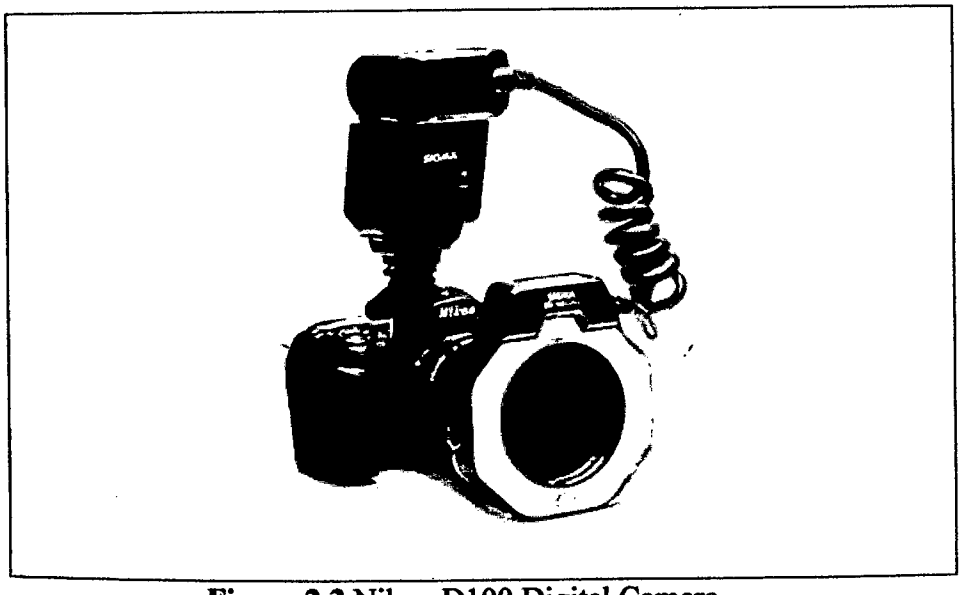

Figure 2.3 Nikon D100 Digital Camera

2.5.2.1 Advantages of Nikon D100 Digital Camera

This digital camera is suitable to use for patient communication, treatment planning, shape matching, treatment confirmation, computerized imaging, and lecture purpose (Dr. Ritchie Beoigher and Dr. Tori Irvine, 2010).

2.5.2.2 Disadvantages of Nikon D100 Digital Camera

The Digital Camera is heavy and awkward because the size is bigger and it need takes two people to make images which is one holding the camera the other steadying the camera. It also not easy to see through which is squinting with one eye through a small viewing whole (Dennis, 2008-2009). The USB port 1.1 that support by the digital camera is slower.

2.5.3 Kodak 1500 Intraoral Video Camera

Kodak 1500 Intraoral Video Camera is the new technology product by the Carestream Dental Company. It equipped Micron ½.5 CMOS sensor with light source which is 8 white LED array and the image resolution is 1024 x 768 pixels. This device also supported the video record and for the video resolution are 640 x 480 pixels. USB port 2.0 is the connection that using by this device to connect to the computer and supported the WIFI-transmission technology with the range can recover to 10 meters (Carestream Dental Company, 2010). This intraoral video camera also has built in a true autofocus and an automatic light source to help obtain all the view needed (Zen Cart, 2010).