Prototype Mobile Intra Oral Camera

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ABSTRACT

Background: Clinical photograph is needed as clinical database, documentation, monitoring, demonstration, and publication. Beside as a dental record, clinical photograph can also enhance patient-doctor communication. Based on a survey from 23 respondents, 18 of them didn't use oral camera in their clinic, while 5 others use them. Intra oral camera can be used to ease dentist interaction to educate patient effectively. Therefore, a new mobile device is needed.
Purpose: To help dentist documented patient's medical history digitally and to help dentist giving dental education to patient about their oral conditions.
Methods: This is an experimental laboratory study to test a prototype that captured the image of oral condition through a questioner with 30 dental student respondents. Data are then analyzed with Spearman correlation test.
Result: There's a significant correlation between the 4 variables, so it can be said that this device can be used to record clinical photograph of patient's oral condition.
Conclusion: The image from the mobile intra oral camera can be used to see the inside of a patient's mouth and this device is mobile because it can be carried everywhere by dentist easily.

INTRODUCTION

Dental and oral health are a fundamental part of general health and affect well-being[1]. In establishing the diagnosis and determining the treatment plan, several analysis is required from direct examination data, study models, and clinical photographs[2]. Medical records are files containing records and documents about patient identity, examination, treatment[3], actions and other services that have been provided to patients[4,5]. Medical records must be made in writing (manually) or electronically. Electronic Medical Record (RME) is a technology that has been developed and created to help safer work processes[6].

RME must pay attention to authentication and security access, and also can be accessed at any time as needed[7]. One important element in medical records is clinical photographs. Clinical photographs are required as a clinical database, documentation, monitoring, demonstration and publication. Dentists can attach clinical photos to a patient's dental record to make a simple track record of changing a patient's medical history[8]. Clinical photograph can also be used as a means to improve the quality of communication with patients[9]. Good communication between the dentist and the patient can make the patient not afraid to do a treatment. The patient can be more concerned with the state of their mouth[10].

Taking clinical photographs as a means of doctor and patient communication requires technological tools. One technology that can be used is an intra-oral camera. Intra-oral camera results are used by dentists to discuss a patient's oral health by looking at the capture results and images on the LCD screen[11].

The survey results on 23 dentists, as many as 18 people did not use intra-oral camera in their dental practice, while 5 other people used intra-oral camera. Overall, the dentists recognized the benefits of intra-oral cameras. Benefits that are considered important include the media

for patients to know the state of their teeth before and after treatment. Thus, patients can follow the treatment process[12,13], because they can see for themselves what is happening in their oral cavity[14]. Intra-oral photographs are also used as an education so that patients are more willing to receive treatment because the patient knows the reason for the dentist to take an action. Another benefit is being a promotional media for dentists, because the oral camera can increase market prices.

18 dentists who currently do not have an intra-oral camera, they have the same reason, which is still opposed to the oral camera price which is still relatively expensive. Therefore, it is necessary to create a new tool that can be used at an affordable cost and can be used more effective to utilize the oral intra camera function. One of the efforts to obtain an intra-oral camera at an affordable cost is to use a webcam.

Webcam is a term for a real-time camera (currently) whose images can be accessed or viewed through the World Wide Web, instant messaging programs, or video call applications. A webcam or web camera is a small digital video camera that is connected to a computer through (usually) a USB port or a COM port[15].

An intra-oral camera can facilitate dentists in providing education to patients. According to the experience of a social-humanitarian foundation, after using an intra-oral camera, children who have been treated can experience firsthand seeing the condition of their own teeth. With the experience of seeing their own teeth, children are increasingly aware of the importance of maintaining teeth from an early age[16].

In this fast-paced era and the rapid flow of globalization, it demands that we work efficiently and have high mobility. Similarly, dental health practitioners[17,18], must be able to make innovations that take advantage of modern technological advancements to be able to conduct examinations and provide education to the

public to increase awareness of dental health more effectively. From these problems the researcher will make a mobile intra oral camera, which is used to help the dentist, when not in a clinic or practice to increase dental health awareness.

MATERIAL AND METHOD

The research is experimental laboratory research. The research and manufacture of this tool was carried out in the basic electrical laboratory of the Faculty of Electrical Engineering. The components used in this study are cameras to capture images. Then the mini pc as (System on Chip) SOC will be used in this study. The push button is used to accept input and LCD to display images.

The first research procedure was to make electrical designs. The electrical design used is a digital design that is already contained in the SOC (System on Chip) to process data from the camera. Data taken by the camera is forwarded to the mini pc to be processed and displayed on the LCD screen. The program accepts input from the camera in the form of a matrix with a camera resolution. The program processes the matrix so that the image resolution is the same as the screen resolution and then displayed on the LCD screen.

Block diagram of operating system tools, the prototype mobile intra-oral camera has one camera, one LCD and one micro SD. In the picture from left to right, the mechanism of the tool, the camera captures the object, the data from the camera is processed by the mini pc, and the results of processing by the mini pc are displayed to the LCD, when shooting then processing will stop momentarily. Stopped data will be stored on a micro SD, then restored and processed by a mini PC.

The survey results that have been carried out describe the state of the oral cavity, then analyzed to see a comparison of the ability of the prototype to describe the oral cavity with mobile variables, the camera when it is in a moving condition, the camera when it is stationary or fixed, and when it has become an image in the form of a file.

The results of the images from the file and LCD were analyzed by distributing questionnaires to dental students. The data obtained were analyzed in a Pearson Correlation test with a significance level of 0.05 to see the correlation that the tool can be used by dentists.

RESULTS

The image that appears on the LCD screen appears slightly striped when the camera is in motion. When the picture is taken and stored in memory in JPEG format, the lines that appear on the LCD are no longer visible. A survey was conducted to determine the ability of the prototype to describe the oral cavity, by providing questionnaires to 30 respondents. The questionnaire consisted of several features of the prototype camera.

The data were then analyzed from the results of the questionnaire. From "the ability of prototype mobility in describing the mouth condition in the state of a moving camera" variable, 27 people strongly agree, 3 people agree, 18 people agree, and 12 people disagree. In "the ability of the prototype to describe the state of the oral cavity when the camera is in a state of fix / silent" variable, 10 people agreed, and 20 people agreed strongly. In terms of t"he ability of the prototype to describe the state of the oral cavity in the form of photographs" variable, 5 people agreed, and 25 people agreed strongly. The last variable is "the level of effectiveness of using this camera prototype to describe the condition of the oral

cavity", 23 people stated strongly agree. Furthermore, the Pearson correlation test between the four variables above was used to analyze the relationship with a prototype mobile intraoral camera to describe the state of the oral cavity.

A statistical analysis test was carried out with Pearson correlation test, and the results obtained value of the correlation coefficient and significance between the characteristics of the camera and the prototype mobile intra-oral camera to describe the state of the oral cavity. The presence or absence of the relationship of the two variables can be seen from the significance value (p-value). If $p < \alpha = 0.05$, then H0 is rejected which means there is a relationship between the two variables. If the value of $p > \alpha - 0.05$ then H0 is accepted which means, there is no relationship between the two variables.

There is a significant relationship between the variables "prototype mobile intra-oral camera that is mobile with the ability to describe the state of the oral cavity". The value of p value is 0.000, which means that many respondents consider that this prototype can describe the state of the oral cavity because it has mobile properties that are easy to carry. Furthermore, there is an insignificant relationship between the variable "prototype mobile intra-oral camera that can describe the condition in the mouth when the camera is moved with the ability to describe the state of the oral cavity". The p value is 0.055, which means according to respondents the prototype of the mobile intra oral camera is less able to describe the state of the oral cavity when the camera is moved.

In further characteristics, there is a significant relationship between the variables "prototype mobile intra oral camera describing the condition in the mouth through the LCD when the camera is in a fixed / silent state with the ability of the prototype to describe the condition of the oral cavity". The p value is 0.014, which means that the respondent thinks this prototype can describe the condition of the oral cavity because this prototype is able to describe the state of the oral cavity when the camera is in a fixed / silent state.

For the last variable, it is known that there is a significant relationship between the variables "prototype mobile intra-oral camera which describes the condition in the mouth when in a photo file with whether or not this prototype can describe the state of the oral cavity". The value of p value 0.034 which means, this prototype can describe the state of the mouth because this prototype can describe the state of the oral cavity in the form of photo files.

DISCUSSION

The study aimed to determine the ability of the prototype to describe the oral cavity was carried out by giving questionnaires to 30 respondents. Overall, it can be concluded that this prototype can already describe the state of the oral cavity. This prototype is mobile and can see the state of the oral cavity when the camera is still and in file form. But when the camera moves, it is still unable to describe the state of the oral cavity properly.

Correlation value of 0.604 indicates a strong and significant relationship between the mobility of the prototype and the description of the oral cavity depicted by the prototype mobile intra oral camera. While having a positive relationship, because the value of r is positive, it means that the higher the mobility, then this prototype can describe the condition of the oral cavity well.

Correlation value of 0.354 indicates that there is a weak and insignificant relationship between the characteristics of the moving camera and the description of the state of the oral cavity illustrated by the prototype mobile intra oral camera. While the direction of the relationship is positive. Because the value of r is positive, it means that the higher correlation value of the prototype can describe the state of the oral cavity when the camera is moving, this prototype can describe the condition of the oral cavity well.

Correlation value of 0.446 indicates that there is a moderate and significant relationship between the characteristics of the fix camera with a picture of the state of the mouth which is described by the prototype mobile intra oral camera. While the direction of the relationship is positive because the value of r is positive, it means that the higher the correlation value of the prototype can describe the state of the oral cavity when the camera is in a fixed / silent state, then this prototype can describe the condition of the oral cavity well.

Correlation value of 0.388 indicates a weak and significant relationship between the characteristics of the camera in the form of a photo file with a picture of the state of the oral cavity illustrated by a prototype mobile intra oral camera. While the direction of the relationship is positive. Because the value of r is positive, it means that the higher the correlation value of the prototype can describe the state of the oral cavity in the form of a photo file, this prototype can describe the condition of the oral cavity well.

The initial process of making a prototype, namely hardware design, whose purpose is to plan or design hardware and software in accordance with the specifications and ways of working of the system to be made, so that it is expected to be able to streamline time, cost and energy. The result is a diagram blog. The camera captures the object, then the data from the camera is processed by the mini pc, the results of processing by the mini pc are displayed to the LCD, when shooting, the processing will stop momentarily, the stopped value will be stored on the micro SD, the stopped value is resumed and processed by the mini pc again. The next process is the basic design of the program using the raspberry pi's natural programming language, python. After that the program installation testing is carried out. When the program is installed several things occur that make it error. The error is handled by fixing the program again. These improvements take a long time, because sometimes it cannot be predicted what the error. After the repair program is complete, then the setup process can only be done.

The image produced on the LCD will appear lines if the camera is not in a fixed condition. That is because initially the processor was not designed to perform the process on the LCD, so the size was not appropriate. The pixel size was initially 600 * 800 then changed to 320 * 480. The process of reducing the pixel size is finally visible lines. The real thing must be done so that these lines can run fast so it is not visible, by replacing the hardware with a higher clock, RAM is added to a minimum of 1GB, and the programming language is also replaced with C language for better memory management.

The process that is done when taking pictures will be used for medical record data, starting by pressing the push button. The capture gives a value of 0 and then immediately retrieves the available data (the matrix is captured). Images on the LCD will experience a delay of 1 second, it means the picture was successfully taken.

The LCD returns to normal again, after which the image is saved into memory in the JPEG file format.

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