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Image Processing as Value Chain to Enhance Competitiveness in Healthcare Retail Business

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Abstract - **Naturally, the body will give a response to changes, the changes can indicate symptoms of an attack, the disease can be categorized from mild to high level, for example, people who experience hair loss that continues to indicate having cancer, both cancer early or advanced stage, another example is the change that occurs in discoloration of the nail color, for example one nail will be yellow indicating that the person has jaundice, another indication is that the nail has a long black line, this indication can be identified as a digestive problem on our body. for someone who is already an expert will be experienced in recognizing the disease and the indications will soon be looking for a solution by buying a preventive medicine, or another way is to directly consult a doctor. The problem faced at this time is that someone sometimes is unconscious and lacking in observing changes in the body even considers the change to be a natural thing, even though the body tries to provide a natural warning system for the appearance of a symptom of the disease. The main task of health care marketer are to learn and understand the needs and desires of prospective patients in order to be able to meet those necessities at the highest standards. A key perspective, for this situation, inferred pulling in new patients and offering them inovative quality services in healthcare retail in order to gain customer awareness and develop market vision. In Indonesia, there's trend that arise in healthcare retail business, 80 % growth in healthcare retail business supplied from high quality product and services. Digital tren technology make consumer put more money to make them healthy, begin from medical check-up until digital meet up with the doctor itself. Marketer in retail healthcare business need more innovation idea, creating value that adopt in latest customer trend. Considering the above matters are very important, in this research an image processing based application is made, this application is used to identify changes in the color and texture of the fingernails, the changes will be identified and processed using the image processing algorithm, this algorithm has an accuracy value high, the application will read the discoloration of the fingernail finger and identify and diagnose the symptoms of the disease in our body, the identification results have an accuracy of up to 85%.**

Keywords- Nail finger identification, Image processing, Healthcare, Medical, Marketing

I.   Introduction

Health is an important and invaluable thing, some people will spend more money than the condition of being healthy again. in the modern era, the daily activities and tasks cause us to be insensitive to our own body condition, lack of exercise and culture of fast-food dishes, which makes the disease easier to come along with the immune system decreases. things or disorders of the body in our body, the response can be a pain sensor, or a change in the color of the skin of the nail that indicates there is a disease that attacks the inner body, one of the sensors that are discolored or falling due to decreased melanin and indications cancer, nails are one of the sensors that will change color if there is a serious illness, nail color changes should not be ignored because some researchers and doctors will sometimes examine the condition of the outside body or what is called medical palmistry.

Health care are are a general affirmation of wellbeing needs of a human which comprises of curation, conclusion, treatment, avoidance, rehabilitation of infections and so forth. Enlisted specialists in medication, optometry, dentistry, drug store, and partnered wellbeing, and other care suppliers jumper human services through 4 sorts of human services association, for example, essential care, auxiliary care, tertiary care, and general wellbeing [1]. Patient, is recognized as a prime customer of the healthcare system, are two types - inpatient and outpatient. Inpatient is those who stay overnight at hospital and outpatient are those who do not stay at night. Patient needed has been commodities for marketing research in healthcare retail business. One of product that comes from patient needed are health monitoring product or services.

In Indonesia, many current health monitoring systems have been marketed, even smartphones have been equipped with heart-detected features and other health detectors, in this study is how to create a system that can be used to display

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and find out symptoms and percent (%) level of brightness, this application will detect changes in nail color so that the initial stages of symptom can be directly prevented, nail color data is processed with image processing data, each data image is divided into several parts stored as training data and testing data, each data contains color samples representing indications of health changes caused by nail color, from that perspective we can assume that image processing are a value chain for retail business in healthcare as general and doctor practice in specific term.

Value chain can be define as process creation of value in a particular phase, from the input of raw materials to output of final product consumed by end users [2]. This value chain in healthcare industry used to ensures maximum customer value at total lowest cost by doing coordinated effort among trading partners, widespread strategic alliance, knowledge sharing, inter firm trust, and competing value chains.

II.   Background

Image processing or image processing is a process of processing and retrieving data from an image, the process is used to retrieve useful information, inputting data can be taken from a file in the form of video or in the form of frames, each image has a unique value and characteristics different, data image can be taken even in the form of 2 D (two dimensions) or 3D (three dimensions), the data manipulation process can work with the help of image processing techniques, how the method works is that any data taken in RGB format will be replaced with a method grayscale, the function of this method is to reduce the process of data error when shooting because it affects the value of accuracy [3].

Some important stages in a data segmentation process are the image acquisition process, in this section a calibration process is carried out from the input data according to the type of camera, the second stage is the image refinement processor "feature extraction", then the third is a segmentation process the color where the main object will be separated from the object that does not need to be observed, the last stage is the process of image analysis in this process the classification of objects will be displayed by the system [4].

The initial symptoms of a disease identification can be seen from changes and other forms of organs, including human nails commonly observed by doctors, the normal color of fingernails is usually pink or pink, the observation process can be carried out by experts with eyes naked, but the human eye has weaknesses and it is difficult to distinguish between colored objects and small sizes, so that computerized techniques are needed to facilitate organizing and reading colors [5].

The general way to detect disease is by checking through blood tests, or urine, symptoms of a disease can be displayed through changes in body shape and color, processing image techniques will offer direct selection solutions by detecting color changes and having high accuracy values.

Human nail color has a unique color and is widely used by health experts to detect diseases that exist in the body, or better known as medical palmistry, a health detection system through color has its own proxies in an area of image processing.

The part of the nail that is closest to the palm of the hand has a darker color so that it will affect the value of accuracy, this value will affect the calculation process so that the image sharpening process is required, but this method has a longer reading time than before [6].

The thresholding method is the easiest and fastest method used in the sharpening process of color composition, each color has its own data which depends on the degree of gray, visually the color change of an object will be easily seen if the object is displayed with histogram graph comparison [7].

$$g(x,y) = \begin{cases} \text{foreground if } f(x,y) \geq T \\ \text{background if } f(x,y) \prec T \end{cases} \quad (8)$$

Figure 1.1 Formula of Threshold

On Figure 1.1 is a variable value from a histogram of data divided into two important parts, namely foreground, foreground or often referred to as the main object, (8) the object has a pixel value with the highest color intensity value, then the second is the background, in this section intensity small even smaller than the value of Threshold. [8]

The color segmentation process works by reading pixel color changes in objects that have a foreground area, this method is also called the ROI (Region of interest) technique, this method works by reading pixel changes in the object area or commonly called boundary, cutting technique image with color segmentation techniques have high accuracy values and fast computing time [9].

III.   Research Methods

In this testing method, several steps are carried out, the stages are as follows:
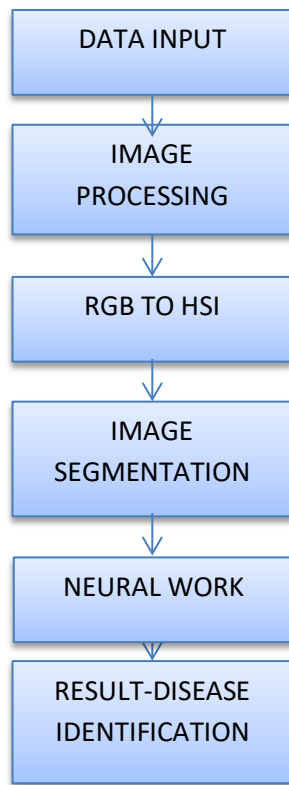
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Figure 1.2 Stages of disease detection systems

- ***Data Input***
  In the process of inputting data taken visually using a mobile phone or other digital devices, the object taken must be right on the part of the nail to be studied

- ***Image processing***
  In this section the incoming image data will be processed using image processing techniques, the data is then carried out a sharpening process to eliminate noise from the previous object.

- ***Threshold***
  the function in thresholding is to increase the brightness of colors in each object, the function is used to reduce errors when processing and reading data.

- ***RGB to HIS.***
  change function from RGB to HSI pattern is to be taken from the RGB process, the brightness data value on an object will be increased again, the color level is made from the value of moderate to bright brightness.
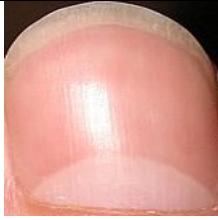
- ***Segmentation Image***
  In the process of color segmentation retrieving data after RGB data, segmentation will separate the nail object from other objects, this separation works so that the main data is not error when moving in binary mode
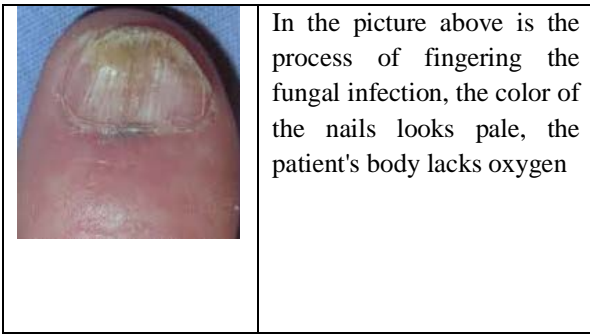
- ***Result***
  in this section the selected system application will be displayed by the system, the results of the system in the form of a visual display of image processing and RGB processes, indications of the disease will be displayed and how high the predictions of the disease are displayed in% (Percent).

- ***Type of disease***
  In this part of this method, the data for each indicator of the disease has been moved in the form of binary numbers, the types of indications for the disease are jaundice, digestive disorders, heart disease, and liver symptoms.

Table 1.1 Types of Diseases

Image	Description
	In the picture next to a healthy nail sample, nail health is seen from the indication of the color of the nails that are pink and crescent-shaped at the bottom
	In the picture next is a sample of slightly pale nails that indicate the body lacks oxygen. and there is a black line that indicates a problem with digestion
	In the picture next is a nail sample that suffers from jaundice, seen at the tip of the nail and also insists that the body lacks oxygen.
	In the picture beside is a nail sample in patients who have digestive problems, the line marks there is an internal disease suffered

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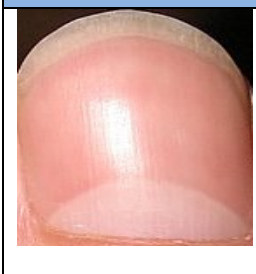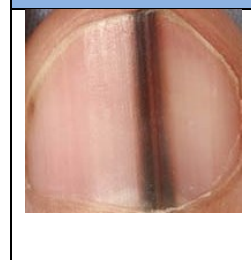| Image	Description
	In the picture above is the process of fingering the fungal infection, the color of the nails looks pale, the patient's body lacks oxygen

IV. System Implementation

In testing this system the application is made in the form of desktop and mobile applications, the benefits made in the two types are so that the application can also be used by doctors or by ordinary people.

The application will process the nail or finger image data taken directly, the application will then process for a few seconds and show the type of disease that the patient is suffering from, the system is also able to minimize the accuracy of the severity of the disease based on changes in skin discoloration.

Table 1.2 Results Of Testing The System For Healthy Nails

Image	Description
	In the picture image beside is the process of taking fingernails on the thumb, the process is the beginning because the image appears to have a lot of noise due to the influence of light refraction.
	In the third process is the process of reading the color of the nail in an area where there is no noise, the data taken separate the color of the nail. in the picture beside the dominance of pink which indicates healthy nails and no disease

Table 1.3 Testing Of Identified Internal Disease Nail Systems

Image	Description
	In the picture beside is a nail that has a long black line that indicates the sufferer has a disease melanoma or cancer
	In the picture above is the process of testing the system on the fingernails of patients who have skin cancer disease, seen in the picture beside the system distinguishes the color of the patient's nails into white so that the main image can be calculated the level of accuracy.
	In the picture beside is the process of comparison and the opposite color of the nails that are not infected, the system gives the object a black mark
	In the picture beside is the result of identifying the nails in other parts, this calculation system is useful for calculating accuracy
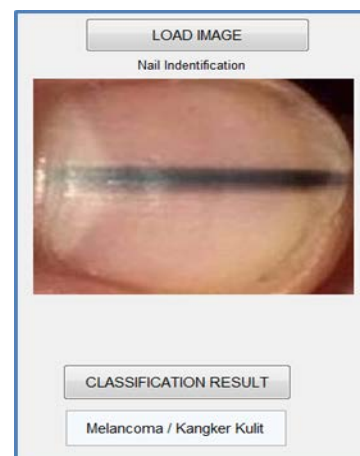
Figure 1.3 Results of detection by the system

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Information:

In the picture above is the result of identifying fingernails taken on the thumb section, the image is taken directly through the mobile device and the system performs the classification process directly, the image can also be taken from several samples stored in the database, application users can press the "classification result" button , the identification data will appear at the bottom with the classification of "skin cancer" disease
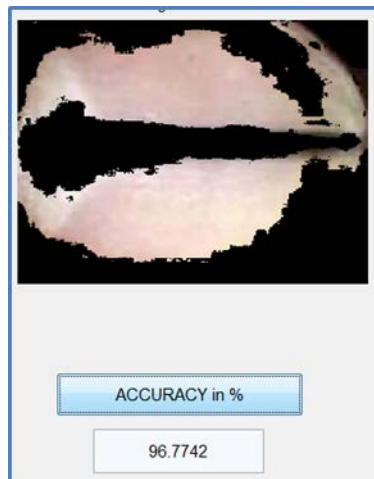
Figure 1.4 Results of identification of accuracy by the system

Information :

In Figure 1.4 above the menu in the application that will display accuracy, the accuracy value is made in one percent (%) which indicates how severe the level of the disease experienced or suffered by the patient.

V.   Conclusion

Based on the experiments above, it can be concluded that the identification of types of fingernails can be processed using image processing techniques. applications can classify into several categories, namely, healthy nails, purple nails (lack of oxygen), yellow nails (jaundice), black line nails (indicative of the presence of internal diseases in the digestive system and finally pale nails (indicative of heart disease). Image processing algorithm will show the accuracy of the disease, with the help of this application, a person will be able to take further action so that his illness is not too severe.

Competitiveness in healthcare industry in Indonesia in specific hospital or doctor practice as retailer in healthcare services can be enhance by added image processing technology in service or digital product called nail disease detection, with this research novelty that is the system can be operate in a few seconds and show the type of disease

that the patient is suffering from in the real time, can be used as marketing strength in order to compete the competitor. For segmentation, this kind of services or product targeted for high-end consumer that has a concern in healthy lifestyle.

Suggestions for further research is to add a database of types of disease not only on the fingernail but on identifying other body changes, this is so that the data taken become more varied and more accurate, such body changes such as identification of the retina of the eye can be seen or fat deposits no, if there are indications that it can be possible for someone to experience problems with cholesterol and sugar.

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