The Identification System of Acne Type on Indonesian People's Face Image

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Abstract.

We report the results of the detection of types of acne on the human face that are identified directly by a specialist skin and genitals. The proposed algorithm has been tested on a standard image and gives very reasonable results, there are 5 types of acne identified, namely Blackhead Blackheads, Blackhead Blackheads, Papules, Pustules and Nodules. Work completed using PYTHON.

1. Introduction

Digital Image Processing (Digital Image Processing) is a technique for processing or taking an image from the real world to be seen, changed and stored into a computer, the stored digital image is usually in the form of a combination of RGB colors (Red, Green and Blue)) which can be referred to as pixels, the denser the number of pixels, the higher the resolution of the image. Digital image processing is very widely used from various fields, ranging from security to the medical field, one of its uses in the medical field is to detect diseases that exist in parts of the human body.

Acne is one type of skin disease that can affect the shape of a person's surface, the occurrence of acne is caused by the blockage of hair follicles by dead skin cells and oil under the outer layer of skin, causing inflammation of the skin called acne [1] . Factors causing acne are genetic, hormonal, stress, Propionibacterium acne microorganisms, environmental factors and the use of cosmetics that are not appropriate to their skin type [2]. With these various factors can cause various types of acne such as Blackheads, Whiteheads, Papules, Pustules and Nodules. Blackheads are small, black bumps that often appear on the nose area. Blackheads occur due to open hair follicles clogged with oil. Blackheads look like black spots but do not cause pain, this type of acne is commonly called mild acne because it does not cause inflammation that results in redness of the facial skin.
Whiteheads are a type of acne that occurs because the pores are blocked by oil and dead skin cells. Blockage of oil and dead skin cells is able to cover the entire top surface of the pores because that is the type of acne that is difficult to treat. Whiteheads look like white bumps but are small. Whiteheads often occur in women of any age at puberty, menstruation, pregnancy and menopause. Papules are acne that appear on the underside of the skin surface, if touched

like a bulge is dense and painful. The surrounding skin area is red and swollen. This type of acne papules is often called inflammation because of irritation that can damage the surrounding skin. Pustules are acnes that have bumps, the tops of inflamed reddish-colored pus-filled skin. This type of acne occurs because the clogged pores are infected by bacteria. Nodules are acnes that cause pain, this type of acne starts from clogged pores and is infected with bacteria. The infected bacteria enter the surface of the skin and then damage the tissue and cells underneath, resulting in the pores become red and swollen. Types of acne Nodules will appear bumps, if the lump has deflated, acne scars appear usually black or dark.

Acne growth is very susceptible to oily facial skin types, on average Indonesian skin types are oily skin types with tropical country conditions, so that there are many cases of acne easily appearing on one's facial skin. The average Indonesian does not pay too much attention to the condition of his facial skin, as a result many people do not know the condition of facial skin and what types of acne are on his facial skin. From this problem, an analysis of the types of pimples suffered by a person can be done by using digital image processing techniques to detect pimples on facial skin and the classification of these types of acne.

Detection of the type of acne that will be done, will only be used on images with Indonesian facial skin objects, the limitation of this study is because the average facial skin color of Indonesian people has a brown tan range. The image that will be processed to detect pimples uses an image that has a face facing forward or toward the camera with even lighting. The type of camera to take a minimum camera using a smartphone camera. The author ensures that it is acne (not blackheads) by using feature extraction. Feature extraction is a stage which is done to obtain certain characteristics or information from an object. Information obtained from an object can be used to recognize similar objects or to distinguish them from other objects. Detection of features based on color and reading results from experts. But it must still be considered a problem in the lighting because of the different light colors, different color values of the object.

2. Literature Review

Acne treatment on the face is something that is important to do. But there are still many ordinary people who cannot identify acne or acne-like diseases because of their limited knowledge about it. In 2019, Kusbianto et al conducted a study using the Forward Chaining method to assist the identification process by matching the symptoms of a disease according to existing regulations [3]. In this research, a desktop-based system, designed using the Visual Basic programming language and XAMPP Database. The system contains seven disease data, 32 disease symptom data and 18 disease treatment data. The results obtained from this study aim to help ordinary people take the first steps in treating acne to prevent errors and provide information about the disease. zits. At the time of this study, the system was tested by experts and users. The final result of this study is 83.3% of the system is quite effective in identifying acne on the face.

Face Detection is very popular in today's society. Many applications have been developed to be able to detect faces. Face detection itself is useful for knowing the color of a person's facial skin because facial skin is one of the important things and is often noticed, especially by women. In 2010 Aldasouqi et al conducted a study that detected human faces in an image [4]. In that study, there are five algorithms used for face detection such as Principle Component Analysis, Linear Discriminator Analysis, skin color, wavelet and artificial neural networks using the Hue, Saturation, and Value (HSV) color method. The results obtained from these

studies aim to classify the face criteria through a model of facial skin color that matches the HSV value. At the time of this study, the system was still being worked out using MATLAB. The final result of this research is to use the HSV color model to increase face detection around 12-28s detection speed and performance by 93-100%. These results are very reasonable to be used for further system development.

In 2012 Han et al conducted a study of lighting for facial recognition [5]. In that research, illumination preprocessing is divided into three categories, namely: Gray level transformation, Gradient or edge extraction and Reflectance plane estimation. The results obtained from these studies aim for facial recognition, a better visualization effect after preprocessing lighting does not imply higher recognition accuracy. From this research, the final result is a holistic localization with illumination preprocessing approaches such as HE, GIC, LTV and TT can improve the existing performance.

3. Methods

3.1 Segmentation

Segmentation is an image processing technique that can be used to separate objects that will be detected with the background of the object, this technique utilizes colors and shapes of objects to be able to distinguish objects from their background, so that it will produce images that focus on the object [6].
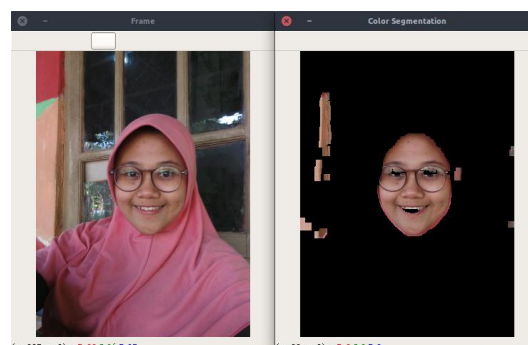
3.2 Morphology

Morphology is an operation that can normalize the shape and expansion of object readings, in this operation can process gray and binary images to be able to expand or narrow the readings of the object, using two basic operations, namely erosion operations that reduce the number of pixels against pixels that become a barrier between each object and also a dilation operation that will increase the number of pixels to the pixels that are boundaries between each object [7].
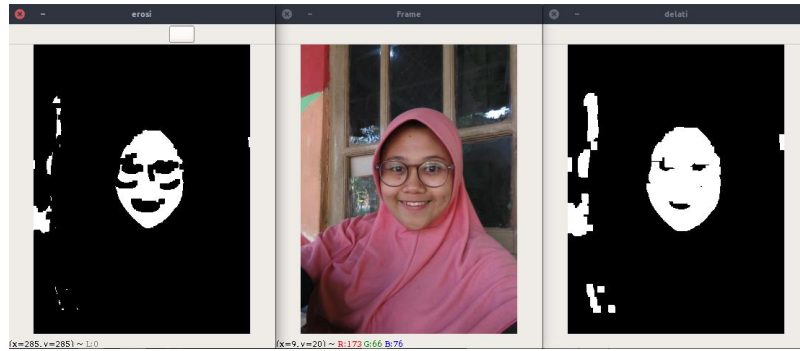
3.3 Edge Detection

Edge detection is one of the image processing techniques to get or find out the farthest points located on an object, but it can also be used to analyze the shape of the detected object because this technique will only display shapes in the form of dots that follow the shape of objects and display edges from the object that was detected [7]. One method that can be used for edge detectors is laplacian.

3.3.1 Laplacian

Laplacian is an image processing technique that can be used to detect edges of objects, this technique uses mathematical convolution operations to produce the images needed in the next process [8], an example of the results of laplacian processing as follows.
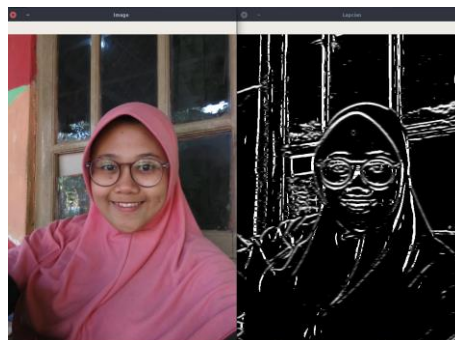
4. Result and Discussion

4.1 Training Stage

Before the system design process is carried out, the author collects data for facial images with a acne face, the data will be used as reference material for the types of acne and the characteristics of acne, then from the objects identified as acne will be used as a benchmark of the system to detect acnes from other images, namely the color intensity of each type of acne. In this study the authors used 36 acne facial images as training data.
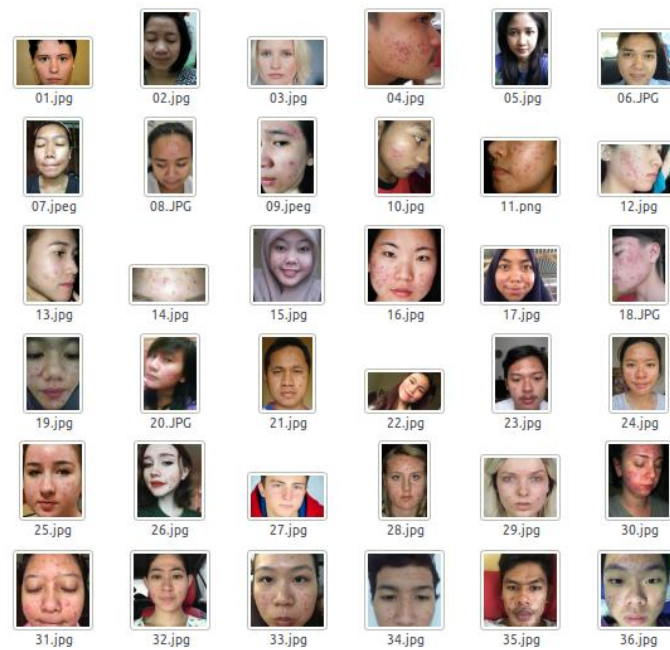
4.2 Testing Stage

At this testing stage, using image data from Indonesian faces, judging from the characteristics of Indonesian skins, which on average have a range of tan color and oily skin types, to ensure that the results of acne detection using the system are of true value, observational data will be used from the dermatologist as a benchmark for the analysis of the types of acne, so the development of this system also involves experts in terms of the observation of the type of acne, namely Jodi, Rosmelia, and Nafiah.

Doctor identification results are based acne type code	
Acne Type Code	Details
1	Blackhead Komedo
2	Whitehead Komedo
3	Papul
4	Pustul
5	Nodul

From these data will then be detected by using a system of acne, the results of the detection of acne will then be taken the color value of the zits that are detected, so that the type of acne can be determined based on the colors that arise, the system will work using image processing methods with the following flow.
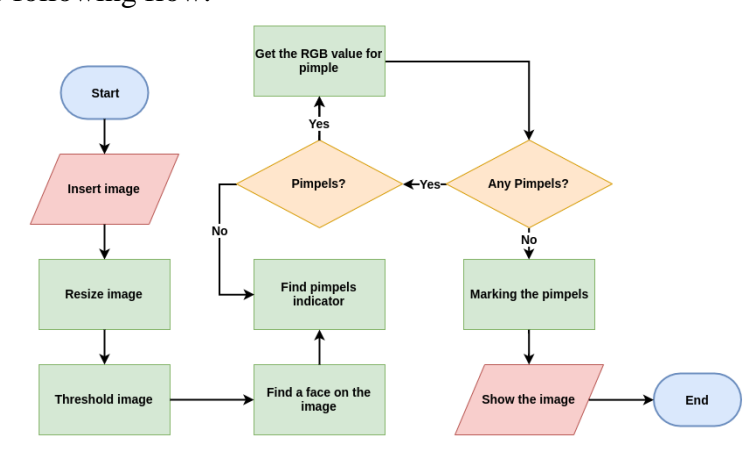
4.3 Result Stage

From the results of detection using the system, for testing conducted on the 4th image obtained the number of points indicated as zits as much as 216 points. And for these points have the following color values.
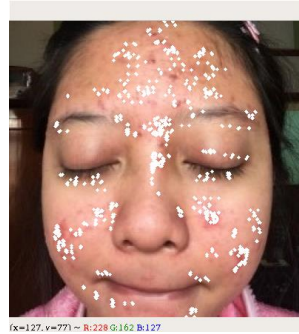
Spots On The Face	Spots RGB On The Face			Type Identification
	R	G	B	
3	145,48	156,01	209,74	3
4	149,74	162,16	213,12	3
14	139,51	146,97	186,94	4
37	155,01	163,13	233,05	5
53	188	194,09	247,33	3
89	131,11	145,55	207,54	3
100	159,16	175,33	225,17	3
120	146,92	160,12	220,14	3
148	187,01	198,99	246,57	3
150	165,67	179,87	236,86	3
204	174,5	188,99	238,33	3

5. Conclusion

The developed system tries to detect zits based on the dots that are indicated as zits on the face, then the system will distinguish the types of zits that are detected based on the value of the RGB color of each point. From the results of the analysis of acne detection, some points that are indicated as pimples on facial images are dominated by Papul acne types, but at some points there are also Pustules and Nodules, and from each type of acne has a combination of different RGB color values.

6. References

[1] W. D. James, "Acne," *The New England Journal Of Medicine,* vol. 352, no. 14, pp. 1463-1472, 2005.

[2] B. J. K. S. S. R. Cindy K Manarisip, "HUBUNGAN STRES DENGAN KEJADIAN ACNE VULGARIS PADA MAHASISWA SEMESTER V (LIMA) PROGRAM STUDI ILMU KEPERAWATAN FAKULTAS KEDOKTERAN UNIVERSITAS SAM RATULANGI MANADO," *Jurnal Keperawatan,* vol. 3, no. 1, 2015.

[3] R. A. D. A. H. Deddy Kusbianto, "IMPLEMENTASI SISTEM PAKAR FORWARD CHAINING UNTUK IDENTIFIKASI DAN TINDAKAN PERAWATAN JERAWAT WAJAH," *Jurnal Informatika Polinema,* vol. 4, no. 1, pp. 71-80, 2017.

[4] M. H. Iyad Aldasouqi, "Human Face Detection System Using HSV," *Human face detection system using HSV. InProc. Of 9th WSEAS Int. Conf. on Circuits, Systems, Electronics, Control & Signal Processing (CSECS'10),* pp. 13-16, 2010.

[5] S. S. X. C. W. G. Hu Han, "A comparative study on illumination preprocessing in face recognition," *Pattern Recognition,* vol. 46, no. 6, pp. 1691-1699, 2013.

[6] K. F. M. Taufiq Setiawan, "Aplikasi Penghitung Telur Ikan Gurami menggunakan Deteksi Blob berbasis Android," *Seminar Nasional Aplikasi Teknologi Informasi(SNATi) Yogyakarta,* pp. 28-31, 2016.

[7] "OpenCV (Open Source Computer Vision Library)," *https://opencv.org/about/,* 2019.

[8] "Laplacian/Laplacian of Gaussian," *http://homepages.inf.ed.ac.uk/rbf/HIPR2/log.htm,* 2003.