IMPLEMENTATION SEGMENTATION OF COLOR IMAGE WITH DETECTION OF COLOR TO DETECT OBJECT

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Abstract

Detection of objects in an image 2 dimensional is a process which is quite complex to do. Object detection required a computer vision approach so the desired part of the object can be recognizable computer accurately. The method in this research using waterfall method. This research will describe the application of color segmentation method with the color detection of a digital image to produce image segment object in the form of blob so that the computer can be detected. The object detection process will process the resulting color segment by the process of segmentation so that can know the number of detected objects, the area and the center of the object. This application can take pictures with laptop or notebook webcame. The result of color segmentation based on color detection is strongly influenced by color samples and color tolerance values to which the segmentation process is based. Lighting, location, texture and contour of objects or background image will greatly affect the results of segmentation and object detection.

INTRODUCTION

Development of the computer vision system has been widely utilized in helping humans in the process of introduction or detection of objects. The process of introduction of an object is the work quite hard so that in the process it is recommended to implement computer vision technology to take a role to recognize objects in a 2 dimensional image (Castleman, 1996).

In the process of the introduction of the object or object detection required a separation of parts or certain segments in the image are

accurate, a separation process is known as the segmentation process. The process of introduction of the segment is one of the key in getting a product introduction or detection is accurate. Segmentation divides an image into sections or segments that are more simple and meaningful so that it can be done further analysis (Forsyth & Ponce, 2003). The usefulness of the information retrieval is the segmentation of the image as part of the search engine, the search of a man and of a similar image search. In general the image segmentation approach that is often used is the intensity of the approach, the approach through the color and form of the approach.

For research ever undertaken, i.e: 1. digital image segmentation thresholding using fish performed by Kumaseh, Latumakulita and Nainggolan from Sam Ratulangi University in Manado of research results with use the thresholdinglocal method, the process of image segmentation of digital images against fish successfully separated fish eye object with a value of T3 = 61. The object of the eye is at coordinates matrix [274:295,152:173] (Kumaseh, Latumakulita & Nainggolan, 2013). 2. The implementation of subtracting the image and regionprops methods to detect the number of RGB colored Objects on a Video file written by Ardhianto, Hadikurniawati and Budiarso from University Stikubank with the results of the research was how to use image subtracting 100 can be used to perform object detection based on color by taking the specified color and reduced the average color of the original object (Ardhianto, Hadikurniawati & Budiarso, 2013).

Segmentation of color is the separation of the segment in an image based on the color contained in the image. In this study the author will try to perform color segmentation method of color detection of HSV. HSV color scope consists of 3 elements namely the Hue represents color, Saturation represents the degree of dominance of color, and the Value represents the level of brightness. Thus this method is likely to detect a color and the levels of dominance as well as its brightness.

Color segmentation is the process of segmentation with the field approach that works by analyzing the color values of each pixel in the image and divides the image in accordance with the desired features (Giannakopoulos, 2008).

Image segmentation is a process of breaking down a digital image into many segments/parts of the area that is not mutually colliding (nonoverlapping). Image segmentation will divide an image into areas or objects. In the context of digital image segmentation the results area is a group of related or neighboring pixels (Castleman, 1996).

Image segmentation can be done through a number of approaches, there are 3 kinds of approach (Castleman, 1996), among other things: a) approach the limit (boundary approach), this approach was conducted to get the existing boundaries between regions; b) approach the edge (edge approach), approaches the edge is done to identify and connect the edge pixels pixels-pixels into a desired limits; 4) approach regions (region approach), the regional approach aims to divide the image in these areas so that obtained an area corresponding to the desired criteria.

Mapping and calculation of Objects

Blob is a set of pixels-pixels which have a relationship of neighbors. Process calculation of the blob can be done by doing an analysis of neighboring pixels. Neighboring pixels in a pixel is specified as the pixel is half of the original

pixels. Process calculation of blob will utilize pixel 8-relation neighbours. Figure 1 below is a simple overview of 8-relation neighbours.
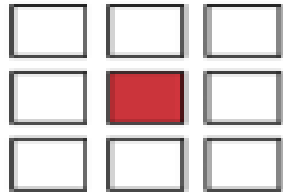

Figure 1. 8-relation neighbours
(Giannakopoulos, 2008)

Calculation of Figure 1. original pixel is a pixel color brown and white pixels is the neighboring pixels of the original pixels. Calculation of the blob based on image processing library based on size. Process pemetaaan objects will be traced and label each pixel on the image so that it can be known pixel blob on the image-forming. The process of information gathering will cultivate labels each pixel so that the known area, level of fullness and a central point of blob. Process filter object will select blob that will be processed based on the height and the width. According to pustaka AForge.Net blob calculation steps are as follows (Gonzalez, Rafael, Woods, & Richard, 2001)

The process of mapping the object will browse through each pixel in each row are there and give the label on the pixels that have a color other than black (RGB = 0 0 0). Each pixel has a partnership relationship 8-neighbours will be given the same label.

Blob information collection process, will collect and manipulate information of each pixel based on the layout of the neighborly and labels that are generated by the process of mapping objects. Layout of the neighbouring pixels and labels are used to form a blob and its supporting information such as area, the degree of fullness, a focal point and a box of blob.

Blob filter process, will do a filter based on the height and width of the blob. Blob with a height or width under the minimum value will be removed from the map object. After blob with a dimension that does not match the minimum requirement removed, do update the label blob is detected.

One of the factors that influence the results of the segmentation of the image was color tolerance. Color tolerance consists of 3 elements i.e. tolerance hue, saturation, and value. Each element of tolerance will provide different image segmentation results. The value of tolerance will determine the range of filter on the color segmentation process; specified value of reference color X with T tolerance and on the process of segmentation will do a color filter on the range X-T up to X + T. Following are some examples of cases that will show the influence of the tolerance of the segmentation results.

Hue is one of the elements in the HSV color spaces that represent color values so that the value of tolerance hue will also affect the value of the color that is selected in the segmentation process. The value of the hue is represented in the form of a circle and have a range in the form of the angle between 0^0 - 360^0 the depiction of elements of color hue can be seen on Figure 2 (Gunanto, 2009).
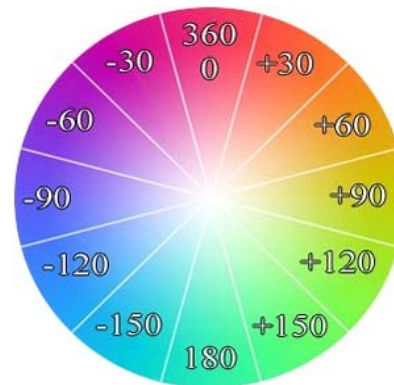

Figure 2. The Circle of Hue Color Element

Image color segmentation process will produce an image of an object covered with specific colors and black, and thus the results of the segmentation process will greatly affect the process of analysis of the object. Process analysis of objects divided into 2 sub process, i.e. the process of calculation of object and the object detection process.

Process of object detection and automated calculation of objects is done by using the BlobCounter class in the Aforge.net library, with minimal-sized blob filter condition 5 x 5 pixels. The following is an example test case the size of the blob object detected.

The light has a close relation with the color of an object, the intensity of light on a part of the object will cause the color to the object in a different image with the color on the other. The area is detected on one of the objects in an image is affected by the value of reference resulting from the processing of color samples and the color tolerance value of HSV are being input. On testing the detection area is one of the objects in the objects of analysis process used the image with a colored object in homogeneous and one light source (Perales, 2001).

Determined several points on objects with different lighting levels to be taken as a sample of the colors so that it produced a reference value color. The testing process will use samples of the same color so that the color value of the generated reference constant. With the same reference value is then given a few different tolerance value to see the area object is detected by the system. The value of the tolerance of the colors used are: 0, the standard deviation of the sample colors, and 3 the value of the empirical (experimental). To analyze the area detected 2 do I testing, testing testing areas detected with one object, while test II test detected area with multiple objects on the image (Perales, 2001).

Matlab is a language with a high performance for computing techniques. Matlab is a numerical computing environment and fourth-generation computer programming language (Wijaya, Marvin & Prijono, 2007).

Matlab integrates computing, visualisation and programming in an easy to use device which problems and resolution can be expressed with mathematical notation is familiar. Matlab developed by MathWork. Inc. www.mathwork.com.

When starting matlab, the first thing you see is the matlab desktop device that consists of a GUI to create files, variables and applications relating to matlab. First you start matlab, the desktop appears with the lay-out of the default as shown in Figure 11 you can change according to needs such as resize, shift and close the tools.

METHOD

In doing the design of the system, needed a framework that dijadi-kan as a guide on the steps that need to be worked on. As for the framework that made the writer refers to the concept of the research methods of Waterfall. Stages for the sake of phases undertaken as shown in the following figure 3 (Suhendra, 2012).
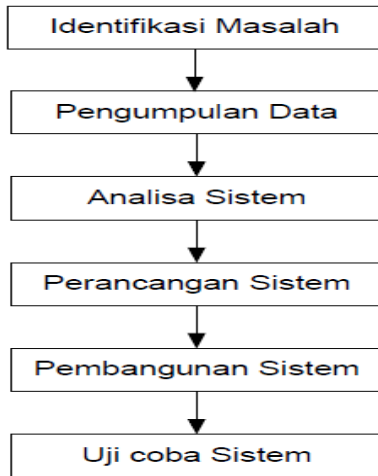
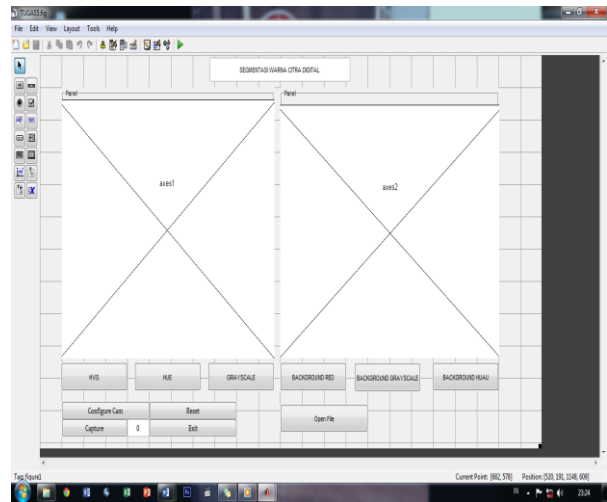Figure 3. *Waterfall* Research Method (Suhendra, 2012)

Figure 4. Design of GUI on Matlab

Based on a test system, it can be seen as follows:

RESULT AND DISCUSSION

Color segmentation segmentation is the process of with the field approach that works by analyzing the color values of each pixel in the image and divides the image in accordance with the desired features.

At the stage of making the author do, namely machining process on Mathworks Matlab software 2012b. Matlab (Matrix Laboratory) is a numerical computing environment and fourth-generation computer programming language, is a programming language developed by The Mathwork Inc. which comes with different characteristics and functions with other programming languages which already existed before.
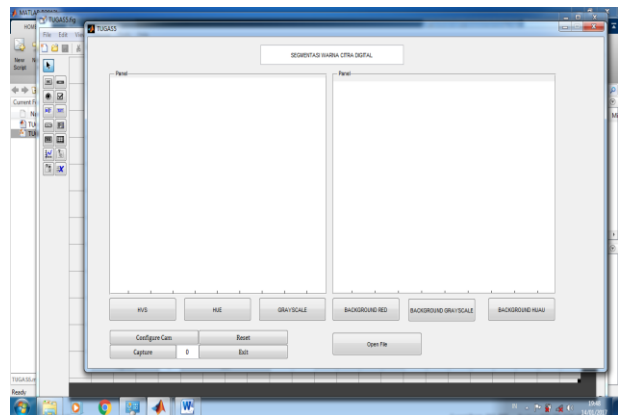

Figure 5. The look of the GUI in Matlab

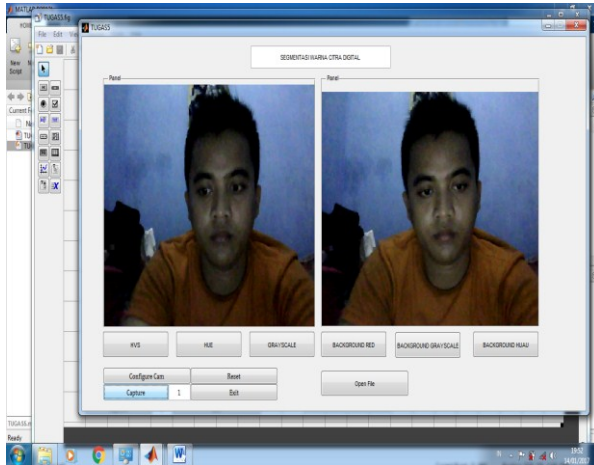Display settings via webcam image capture can be done in the following way:

Figure 6. Taking Pictures Using A Webcam

With coding as below:

```
% --- Executes on button press in pushbut-
ton11.
function pushbutton11_Callback(hObject,
eventdata, handles)
% hObject    handle to pushbutton11 (see
GCBO)
% eventdata  reserved - to be defined in a fu-
ture version of MATLAB
% handles    structure with handles and user
data (see GUIDATA)
IAHI = imaqhwinfo;
IA = (IAHI.InstalledAdaptors);
D = menu('Select Video Input Device:',IA);

if isempty(IA)||D==0
   msgbox({'You don''t have any VideoInput In-
stalled Adaptors!',...
      'Please! try again and select Adaptor
properly.'})
   return
end

IA = char(IA);
IA = IA(D,:);
IA(IA==' ')=[];
x = imaqhwinfo(IA);

try
   DeviceID = menu('Select Device
ID',x.DeviceIDs);
```

```
   F =
x.DeviceInfo(DeviceID).SupportedFormats;
   nF = menu('Select FORMAT',F);
   Format = F{nF};
catch
   warndlg({'Try Another Device or ID ';...
      'You Don''t Have Installed This Device (Vid-
eoInputDevice)'})
   return
end

VidObj = videoinput(IA, DeviceID, Format);
handles.VidObj = VidObj;
vidRes = get(handles.VidObj, 'VideoResolu-
tion');
nBands = get(handles.VidObj, 'NumberOf-
Bands');
axes(handles.axes1)
hImage = image( zeros(vidRes(2), vidRes(1),
nBands) );
preview(handles.VidObj, hImage)
set(VidObj,'returnedcolorspace','rgb');
guidata(hObject, handles);
```

Tampilan saat direset dapat dilihat pada gambar 8 dan dengan code berikut ini:

```
function pushbutton13_Callback(hObject,
eventdata, handles)
% hObject    handle to pushbutton13 (see
GCBO)
% eventdata  reserved - to be defined in a fu-
ture version of MATLAB
% handles    structure with handles and user
data (see GUIDATA)
try
   delete(handles.VidObj)
catch
end

axes(handles.axes1)
cla reset
set(gca,'XTick',[])
set(gca,'YTick',[])

axes(handles.axes2)
cla reset
set(gca,'XTick',[])
set(gca,'YTick',[])
```
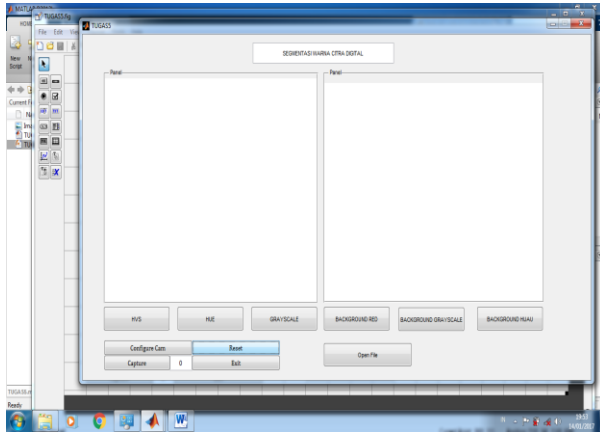
set(handles.edit1,'String',0)

Figure 7. Reset of image

Display open files with the code can be seen in Figure 8 with the following code:

```
function pushbutton15_Callback(hObject,
eventdata, handles)
% hObject    handle to pushbutton15 (see
GCBO)
% eventdata  reserved - to be defined in a fu-
ture version of MATLAB
% handles    structure with handles and user
data (see GUIDATA)
appcitra = guidata (gcbo);
[namafile, format-
file]=uigetfile({'*.jpg';'*.png';'*.bmp'},'tampil
gambar');

image=imread([formatfile, namafile]);
guidata(hObject, handles);
axes(handles.axes1);
imshow (image), title('Citra Asli');

set(appcitra.figure1, 'userdata', image);
set(appcitra.axes1, 'userdata', image);
```
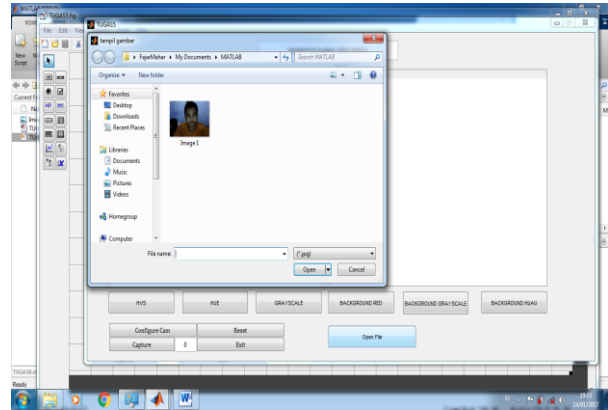

Gambar 8. Open file

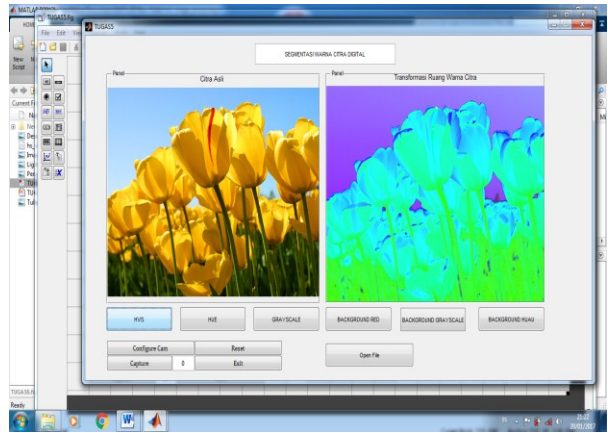Display the process of HVS and HUE can be seen in Figure 9 and 10.
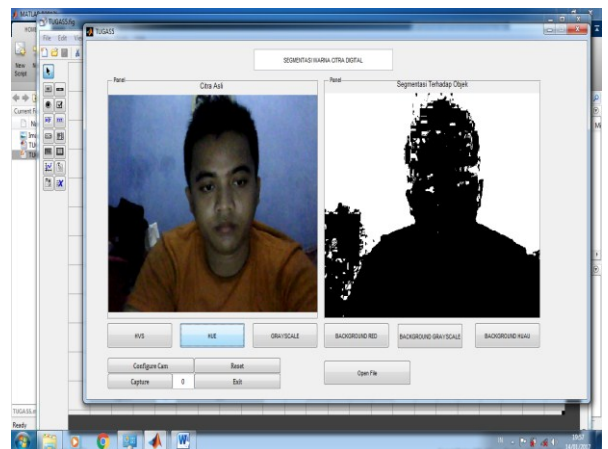

Figure 9. Display of HVS

Figure 10. HUE

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Process grayscale display and the background grayscale can be seen in Figure 11 and Figure 12.
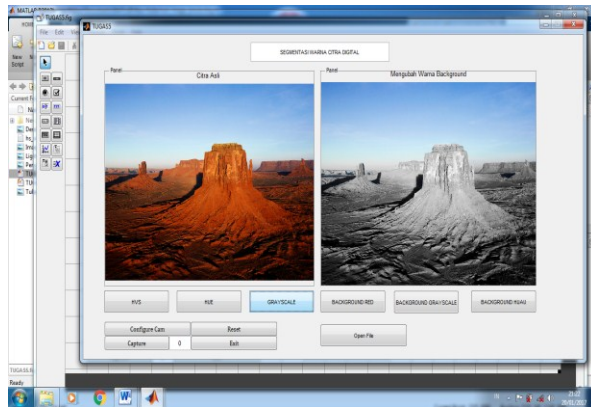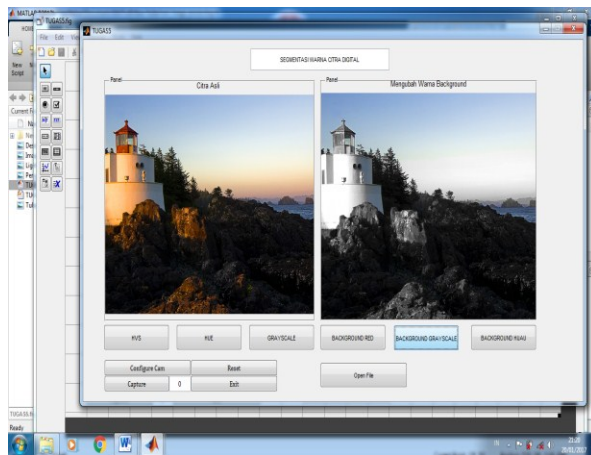

Figure 11. Grayscale

Figure 12. Background grayscale

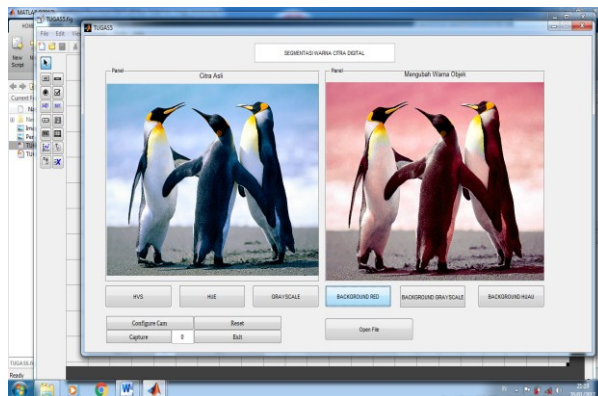The display of red background and green background can be seen there is Figure 13 and Figure 14

Figure 13. Red background

Figure 14. Green background

CONCLUSION

This application can take pictures with a laptop or notebook webcam. The results of the segmentation of color based on the detection of color strongly influenced by color samples and the color tolerance value that becomes a reference for the process of segmentation. Lighting, layout, textures and contours of objects or background image will greatly affect the results of the segmentation and object detection.

In making and designing application segmentation of color digital image processing as the media using the Mathworks MATLAB 2012b software, with regard to the development and subsequent research the author gives suggestions for refinement of the applications have been built, namely: the results of the output files can store all image format which can be selected by user, print or print can be provided on the main menu, the application can provide improved quality of the image, so the image results directly can be repaired and upgraded the quality including a larger file size.

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