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## Cropping Method on Grayscale Images for Periapical Radiographs of Human Teeth

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# Cropping Method on Grayscale Images for Periapical Radiographs of Human Teeth

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**Abstract.** This study explains the comparison of techniques for cropping existing in Matlab for graylevel images on periapical radiographs of human teeth. Some cropping techniques in Matlab are rectangular crop, square crop, circular crop, ellipse crop, polygon crop. This research will explain how each existing cropping technique will give different results based on their respective shapes. So that eventually will produce the most appropriate cropping techniques among several existing cropping techniques in matlab. The five cropping techniques that have been mentioned here where the four existing cropping techniques namely rectangular crop, square crop, circular crop, ellipse crop still carry other objects that are not needed in research, so it is not appropriate to be used for research objects that have irregular shapes. Appropriate cropping technique is polygon cropping because it is able to identify research objects that have irregular shapes.

## 1. Introduction

The use of computers to process an image has different main purposes. One of those goals is to make it easier for an image to be recognized, an image is a pixel that has a rectangular array and each pixel that represents it represents a dimension of the property owned by an image [1]. The image is a representation of the information contained therein so that the human eye can analyze and interpret the information in accordance with the expected goals. The content of image information can be divided into two parts, namely basic information, and abstract information. Basic information is information that can be processed directly without the need for special knowledge. This basic information is the color, shape (shape), and texture (texture). Abstract information is information that cannot be directly processed except with the help of additional specialized knowledge [2].

There are three types of images in Matlab, namely binary images, graylevel images, and RGB images. A binary image consists of only 0 and 1 to express black and white, while a grayscale or graylevel image consists of a collection of class arrays whose pixel value is one or multiples and for an RGB image is an image with the actual color where each pixel contains three component values namely red, blue, green in

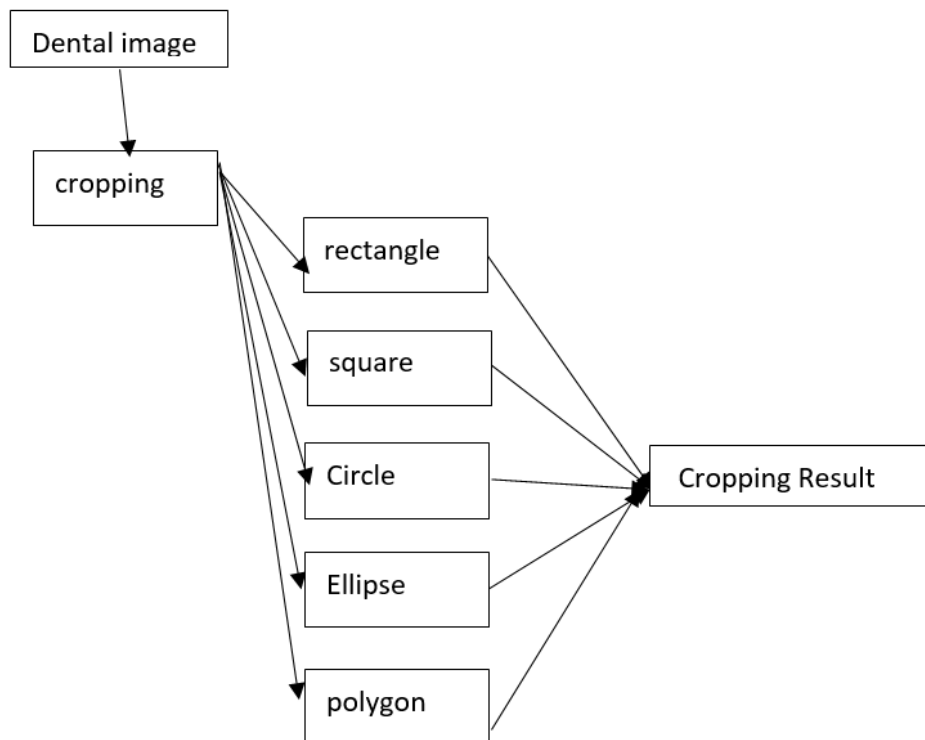


scalar pixels [3]. Dental radiograph is a modality that has an important role in diagnosing dental disease, for example, cavities. Usually, dentists use radiographs to find hidden tooth structures such as porous teeth, benign or malignant cancers, holes that cannot be visually examined. Radiograph is a diagnostic tool that can provide valuable information which is a graylevel image [4]. An image can be defined as a two-dimensional matrix  $f(x, y)$ , where  $x$  and  $y$  are the spatial coordinates and the amplitude of  $f$  in each pair of coordinates  $(x, y)$  is called the intensity or graylevel of the image at the destination point. Where the processed image will be applied to several operations on existing pixels to produce useful information. An image processing technique is considered as a matrix with many dimensions that can do color correction, image compression, image recognition, and image cutting. From these techniques, the two main ones are the modification of image quality and resizing of image size or cropping. Cropping is creating a new image from the original image, this is a very important part because it is needed to extract certain parts of an image, this cropping, in general, is to remove unwanted parts from an image. Cropping techniques have various forms including rectangular cropping techniques, rectangular cropping techniques, circle cropping techniques, oval cropping techniques, and irregular shape cropping techniques. All of these cropping techniques are used for different purposes according to the needs of the object being studied [5].

Cropping technique is a technique of forming a new image from the original image of an object by using a form of cropping technique that suits the needs of its users. Cropping techniques can also be used in grayscale imagery which is usually used to support medical activities.

## **2. Methodology**

A scientific research must use a scientific approach to gain knowledge, it can be in the form of a method, procedure or step with a clearly defined method and objective procedures. So that from this study obtained results that are scientific and can be justified [6]. Figure 1b show the research method is divided into two stages. The first stage is the collection of image data that will be used for the cropping process. The second stage is the process of cropping and cropping results.



**Figure 1.** The stages of the research process

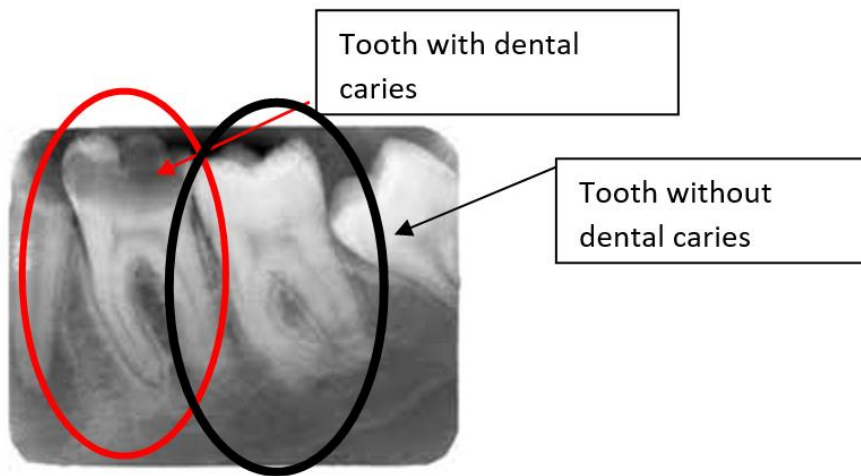
The process of cropping is the process of separating the object under study with the surrounding noise. Noise can be inside the area of the object to be studied or outside the area of the object under study [7]. Especially for noise that is outside the object area under study, one way to eliminate it is by the process of cropping. Reducing the size of an image by cutting the image at the coordinates specified in an area of the image is called cropping [8]. In the process of cropping an object will be obtained by cutting rather than an image or part of an image of a certain size.

This research was conducted with the aim of comparing existing cropping methods with image object data using human dental images with periapical techniques with the aim of finding out what cropping methods are suitable for the identification of dental image objects.

### **3. Results and Discussion**

#### *3.1 Data on periapical images of human teeth*

The original image is used as input data. The original image used is a periapical image (Periapical Dental X-Ray) in the form of files with the format \*.jpg. All images of patients to be tested are Periapical Dental X-Ray images. In Figure 2 is an image of Periapical Dental X-Ray there are teeth that do not have caries and there are also teeth that have caries.



**Figure 2.** Data of periapical images containing teeth without caries and having caries

Figure 2 shows the image of the teeth of the caries sufferer on the teeth marked with a red color indicated by arrows. This caries is characterized by the depth level of the tooth cavity. While teeth that are marked in black are healthy teeth.

The process of taking periapical images is one of the three techniques contained in the intraoral radiograph technique for dentistry. Periapical shooting techniques seen from the point of view of the use itself consists of two techniques, namely the parallel technique and the technique of two angles of the field. Parallel technique is a technique of taking pictures of teeth that only shows a few teeth that are indicated to be infected with the disease and display the shape of teeth clearly up to the tissue inside, while the two-angle technique is a technique of taking teeth that displays teeth from two viewpoints of photos and displays more teeth than parallel technique. In dentistry, the most widely used is the parallel periapical technique.

### 3.2 The process of cropping periapical images of human teeth

Greyscale images use two-dimensional matrices for each layer which are represented by pixel numbers from 0 to 256. The use of matlab in reading image data of objects using the `imread` function [11] and the process of cropping in matlab uses the `imcrop` function [1]. Several cropping technique using matlab:

1. Cropping Using Rectangle Crop
 

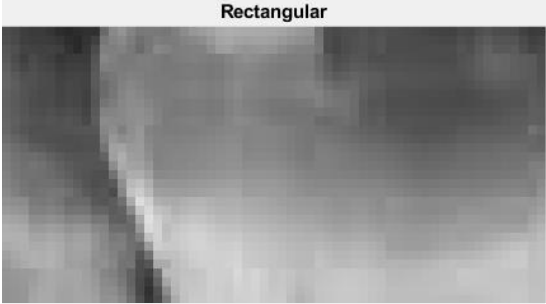
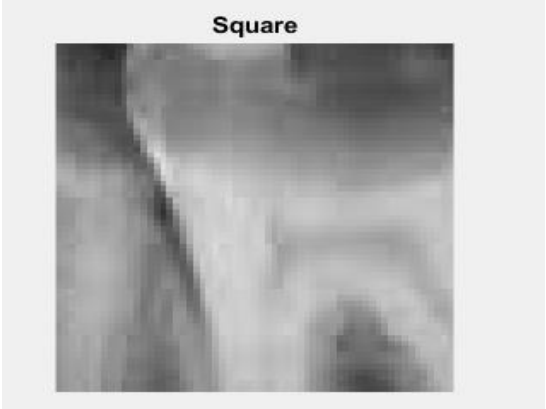
```
image = imread ('fill in the image data name');
cut = imcrop (image, [fill coordinates])
imshow (image), figure imshow (cut)
```
2. Cropping Using Square Crop
 

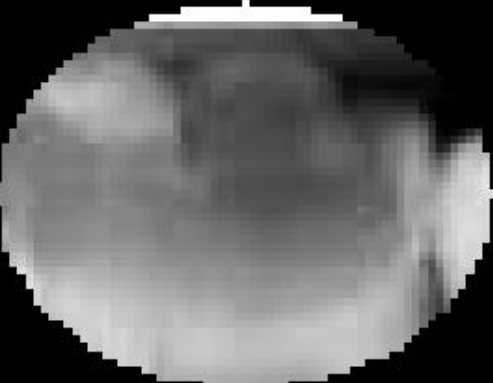
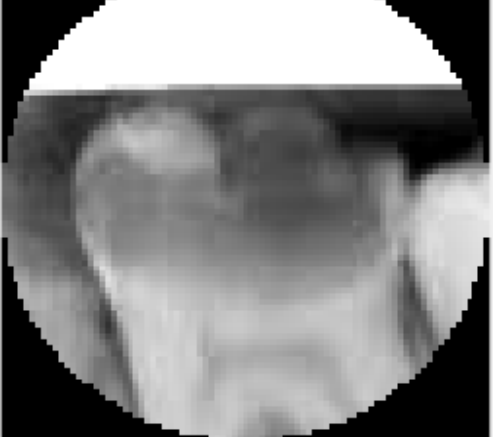
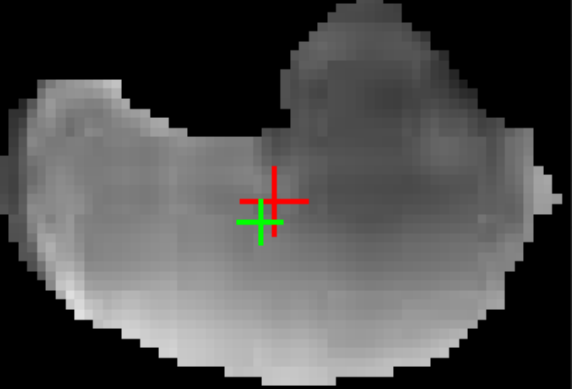
```
image = imread ('fill in the image data name');
cut = imcrop (image, [fill coordinates])
imshow (image), figure imshow (cut)
```
3. Cropping Using Circle Crop
 

```
image = imread ('fill in the image data name');
cut = imcrop (image, [fill coordinates])
imshow (image), figure imshow (cut)
```

- 4. Cropping Using Ellipse Crop  
 image = imread ('fill in the image data name')  
 cut = imellipse (image, .....);  
 position = wait;  
 imshow (image), figure imshow (cut)
- 5. Cropping Using Polygon Crop  
 image = imread ('fill in the image data name');  
 c = [fill coordinates];  
 r = [fill coordinates];  
 BW = roipoly (image, c, r);  
 imshow (image), figure imshow (BW) [9,10]

After conducting tests on the image of human teeth, the results obtained as in Table 1 follows:

No.	Cropping Techniques	Cropping Techniques Figure
1.	Rectangular	 <p style="text-align: center;"><b>Rectangular</b></p>
2.	Square	 <p style="text-align: center;"><b>Square</b></p>

No.	Cropping Techniques	Cropping Techniques Figure
3.	Ellipse	<p style="text-align: center;"><b>Ellipse</b></p> 
4.	Circle	<p style="text-align: center;"><b>Circle</b></p> 
5.	Polygon	<p style="text-align: center;"><b>polygon</b></p> 

In Table 1, there are 5 pictures of cropping techniques where image number 1 uses the rectangle cropping technique, which is a cropping technique to take the object image under study in a rectangular shape, visible image objects that are taken there are still noise carried along. Figure number 2 uses the cropping square technique, which is a cropping technique to retrieve the object image under study in the

shape of a box, here also shows the object image taken there is still noise carried along. Figure number 3 uses the ellipse cropping technique, which is a cropping technique to retrieve the object of the image studied in an oval shape. It is also seen that the object of the image taken still has noise carried along. Figure number 4 uses the cropping circle technique, which is the cropping technique to retrieve the object of the image under study in a circle shape, it is clear that the object of the image taken still has noise carried along. Figure number 5 uses a polygon cropping technique, which is a cropping technique to take the object of the image under study with irregular shapes with many coordinates/points in accordance with the object of the image under study, visible for irregular image objects suitable using this cropping technique [11].

The five cropping techniques shown in table 1 are cropping rectangle, square cropping, cropping circle and ellipse cropping in cutting periapical image objects of human teeth still carry noise beside them, while polygon cropping for irregular image objects with many coordinates is much more Good results compared to the others, thus the results of this study concluded that the method of cropping suitable for periapical image objects of human teeth is by cropping polygons. Comparison with the results of research conducted by Saluja. N, kumar. A, Amisha, Khanna. R, 'Cropping Image in Rectangular, Circular, Square and Triangular Form Using Matlab' with this research is the use of polygon cropping techniques for taking irregular image objects / with many coordinates [5].

The research of Chen J., Bai G., Liang S., and Li Z., 'Automatic Image Cropping: A Computational Complexity Study', which uses a rectangular and square cropping method by taking various models of object images and still having noise around the object image studied [12]. In the object image that is carried out by cropping in the form of an ellipse, there is still noise in the new image of cropping results in Hutter's research. M, Brewer, N, 'Matching 2-D Ellipses to 3-D Circles with Applications to Vehicle Pose Identification' [13]. Whereas for the object image carried out by the cropping circle method there is also noise surrounding the cropping image object in Ayyalasomayajula's research. P, Grassi. S, Farine. A, 'Rotation, Scale and Translation Invariant Image Retrieval Method Based on Circular Segmentation and Color Density' [14]. This study contains the use of polygon cropping techniques for taking irregular image objects / with many coordinate points so that they can be right on target and eliminate existing noise.

#### 4. Conclusion

Taking certain points with different caries images on the periapical image of human teeth requires many coordinate points because the periapical image of human teeth has many curves and complex layouts on an image. The results of the comparison of 5 cropping methods for extracting dental caries at certain locations in the periapical image of human teeth, showed that the best results were obtained using the polygon method. Polygon method can reach certain coordinate points on a periapical image of human teeth so that cropping results are better and other noise that is carried during the cropping process can be reduced.

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