

Image Segmentation for Animals in the wild Using Scilab Software

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ABSTRACT: Image segmentation is an effective computer vision method that expands on the concept of object. Recognition and brings in a whole new era of image data manipulation. This method offers up so many options and may be performed in several ways. However, in this paper, threshold and channel image separation were employed to perform two types of segmentation. Thresholding is a regional segmentation in and of itself. However, thresholding alone is insufficient to properly segment the image, necessitating the employment of additional image processing techniques, such as the morphological process, to provide sharper segmentation. Depending on the color diversity of the image's pixels, different segmentation parameters, such as the thresholding value and structuring element for the morphological process, are required for image segmentation. Overall, the two images have been successfully segmented via two distinct methods.

Keywords: Image segmentation, threshold, morphological process, computer vision, object detection

1. INTRODUCTION

There are several approaches to computer vision problems. The most widely used method is based on detecting the objects in an image, referred to as object detection [1][2]. However, detecting objects alone is not always sufficient [3]; these images must be processed at a much finer level. The concept of image segmentation will be introduced in this work. It is a strong computer vision method that expands on the concept of object detection and takes visual data manipulation to a whole new level [4]. The main objective of this work is to segment an animal in the wild.

Image segmentation is the process of splitting a digital image into subgroups known as image segments [5], which reduces the image's complexity and enables additional processing or analysis of each segment. Technically, segmentation is the process of assigning labels to pixels in order to identify objects, people, and other relevant image features [6].

Object detection is a popular usage for image segmentation. Rather than processing the full image, it is customary to first employ an image segmentation technique to identify objects of interest [7]. Then, the object detector may work on an already-defined bounding box from the segmentation process. This stops the detector from analyzing the full image, hence enhancing precision and decreasing inference time [8].

Segmentation of images is a fundamental component of computer vision technologies and algorithms. Numerous practical applications include medical image analysis, machine vision for self-driving cars, face identification and detection, video surveillance, and animal detection in the wild [9-12].

In this paper, the segmentation for animals in the wild is going to be implemented using scilab software.

2. Methodology

Two case studies were implemented in this work to segment two images. The first image contains a lion and a grass as shown in Figure. 1. (a), while the second image contains an elephant, grass, and sky Figure. 1. (b). The expected results are to make each of the animals, grass, and the sky in a different color.

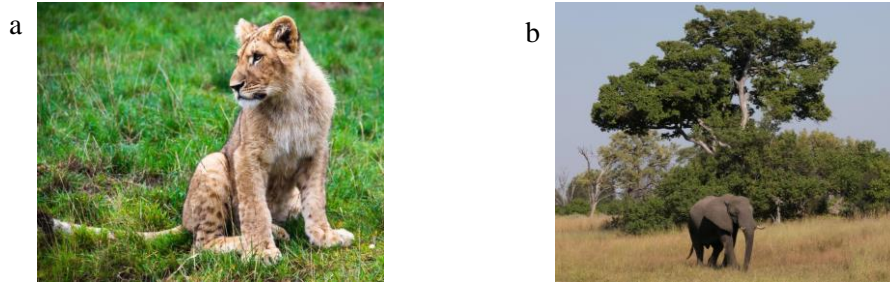


FIGURE 1. - (a) Image of a lion in the wild; (b) Image of an elephant in the wild

Scilab Software

Scilab is an open-source alternative to MATLAB [13]. It places less emphasis on syntactic compatibility with MATLAB; however, it is sufficiently comparable for some authors to assert that it is simple to transfer skills between them [14].

Scilab Image Processing toolkit or SIP, aims to perform imaging tasks like filtering, blurring, edge detection, thresholding, histogram manipulation, segmentation, mathematical morphology, color image processing, etc. These processes are important for problem-solving in a variety of real-world applications, from automobile motion planning to autonomous medical picture diagnosis [15].

SIP offers the following advantageous features: First: Input/Output of image files in a variety of formats, such as BMP, JPEG, GIF, PNG, TIFF, XPM, and PCX. Second: a multitude of features with an adaptable interface and error handling. Third: Function documentation with examples [16-27].

3. Results and Discussion

In this section, the results of the two case studies are shown on the output images.

Case Study 1

A few processes were done to segment the lion from the image as shown in Figure. 2. First, the image was contrasted by using (imadjust) in order for the lion's color to be contrasted, so the color of the lion is different from the background, to do so a thresholding process is applied which is the gray level of each pixel is compared to a specified threshold. If the gray level of each pixel was equal to or greater than the threshold, it is mapped to true. If the gray level is below the threshold, each pixel is mapped to false. As a consequence, a logical picture emerges. By doing this process, most of the background is removed. Image (3) shows the original image after being threshold using (im2bw) with a threshold value of 0.3. As it can be seen in this image, the background of grasses is almost completely removed and only the lion is left. The second step was eroding the image using (imerode) with a structuring element of ('rect',30,30) in order to remove the remaining grasses from the thresholded image as shown in image (4). Next, the image is dilated to expand the shape of the body of the lion so that the lion shape can be seen clearly as shown in image (5). Finally, the dilated image is filled using (imfill) in order to further improve the visibility of the lion's body. The image (6) shows the final result of the segmented lion from the original image thus the lion is successfully segmented.

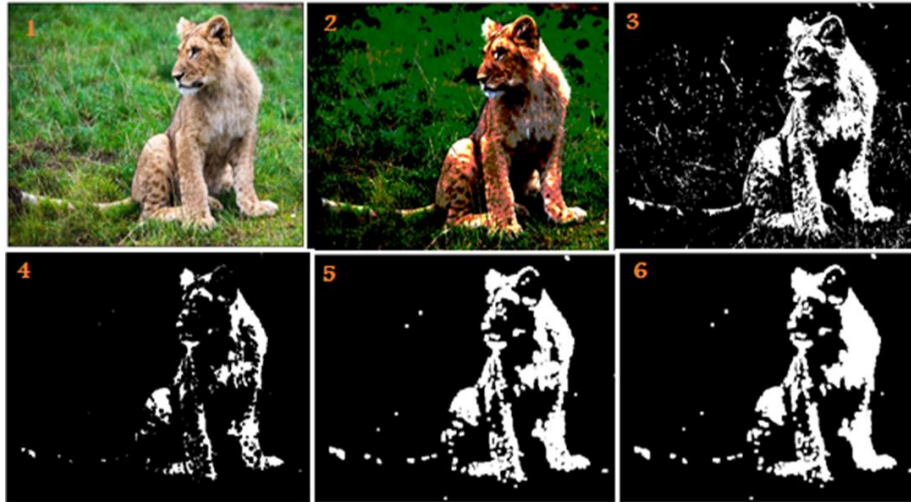


FIGURE 2. - The segmentation steps of the lion’s image

The same process is repeated for Image B as shown in Figure. 3. In image (2) the contrast of the image is contrasted in order to differentiate the colors in the picture so segmentation can be done. Image (3) shows the thresholding process and it can be seen only the elephant and the tree. The image was eroded to remove any unwanted spots as shown in image (4). Then the image was dilated to expand the elephant and the tree as shown in image (5), and lastly the image was filled as shown in image (6). It can be seen that in the last image the grasses are removed almost completely due to being filled by using imfill function.

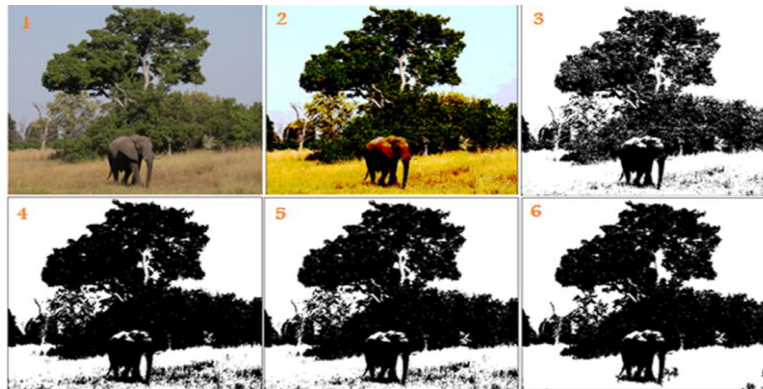


FIGURE 3. - Steps for segmenting the elephant’s image

Case Study 2

In this section, a different code has been applied to segment the same images based on pixel values. The images were read from the computer, and then each channel was separated (red, green, blue). And then extract the background for each channel. Finally, a comparison of pixel values was made to distinguish the animal from the land. Figure 4, and Figure. 5 show the steps as well as the final results of the two images.

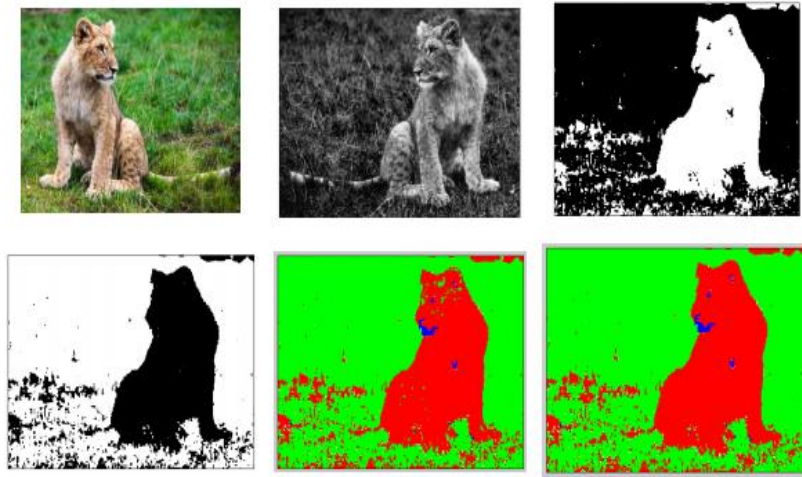


FIGURE 4. - Steps for segmenting the lion's image

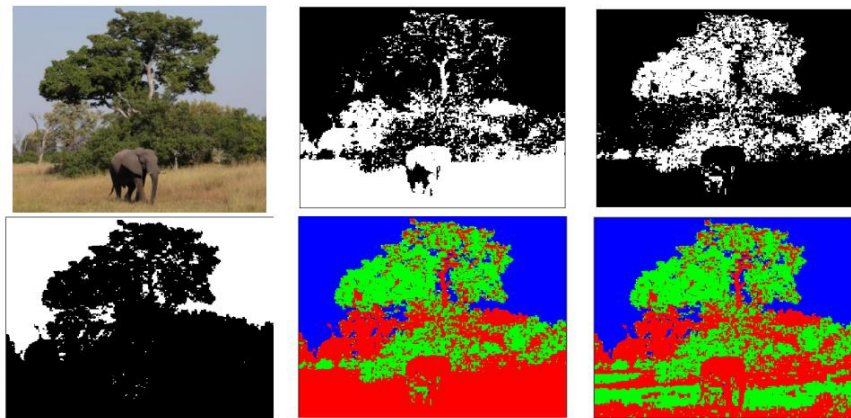


FIGURE 5. - Steps for segmenting the elephant's image

4. Conclusion

Taking object recognition one step further, image segmentation is a sophisticated computer vision method that allows for whole new kinds of manipulation of image data. There are many opportunities that this method can open, and there are a various ways to do image segmentation. However, in this paper, two types of segmentation were done, which is using thresholding and channel image separation. thresholding itself is a region-based segmentation. However, the use of only thresholding is not enough to fully segment the image, thus the need of combination with other image processing techniques such as the morphological process to further give clearer segmentation. Segmenting an image requires different parameters such as the thresholding value and structuring element for the morphology process depending on the pixels of the image whether it has diverse colors or not. On the whole, the two images have successfully been segmented using two types of technique.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest

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