COLOR SEGMENTATION OF TV IMAGES FOR AUTOMATIC OBJECT DETECTION

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Introduction

Images are the most important means of transmitting information. The concept of machine learning is to understand images and extract useful information from an image. Image segmentation is more widely used in object detection and high-level image analysis.

Currently, much attention is paid to color image segmentation and algorithms are created based on RGB images. The RGB Color model describes colors using three primary colors: P(red), g(green), and b(blue). Color image segmentation is widely used in video surveillance, face recognition, object detection, fingerprint recognition, and medical equipment.

The purpose of this work is to study the effectiveness of color segmentation algorithms for television images for automatic object detection.

Algorithm description

In this paper, we implemented a software algorithm for color segmentation for automatic object detection. For implementation, the MATLAB environment was chosen, designed to solve a wide range of engineering problems. The algorithm is based on the analysis of the RGB color space. The algorithm detects an object based on color. Select the colors of the desired object to determine the average value of their intensity and standard deviation. Image segmentation is performed based on knowledge about the object's pixel intensities and their possible variations. The purpose of segmentation was to highlight an object in the image. However, there were objects in the image whose pixel intensity values coincided with the pixel intensity of the object. As a result, other objects are highlighted in the segmented image in addition to the object. Knowing that the selected object occupies the largest area, we delete other objects that are smaller by area. We also delete objects on the segmented image of the object. Next, select the selected object with a rectangle. As a result, we get an image with the detected object. Algorithm based on color analysis in HSV space. The algorithm detects an object based on the tone. First, we translate the image from the RGB model to HSV. we will use the tone to search for the desired object. Knowing the color of the desired object in advance, the boundary values for the color space were selected experimentally. Theoretically, the pixel color should not depend on the brightness component in HSV spaces. Therefore, when searching for object pixels, only the color component H (tone) was taken into account. Next, we perform segmentation based on color analysis. After that, we delete unnecessary objects. As a result, we get an object with the specified tone.

Testing

In this section the algorithm of color image segmentation, the results are presented in the following figures. Figure 1 shows the original image in JPEG format in the RGB color space.

Fig.1. Original image   Fig.2. Segmented image   Fig. 3. After noise removal

Fig. 4. Selecting the selected object

Figure 4 shows that after segmentation based on color analysis, the required object was detected.
Let's look at the results of testing the algorithm based on color analysis in HSV space. Figure 5 shows that the color model was converted from RGB to HSV.
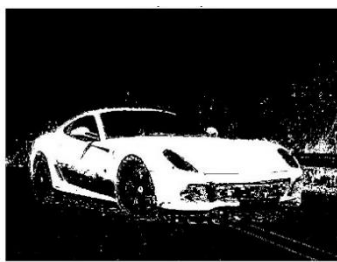

Fig. 5. Image in HSV color space
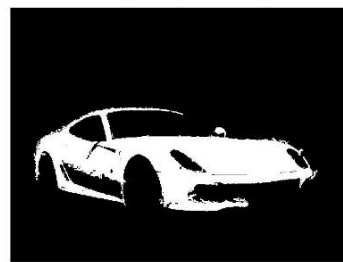

Fig. 6. Segmented image

Fig. 7. After removing noise in the segmented image

Fig. 8. Segmented image

Figure 8 shows that after segmentation based on tone analysis, the necessary object was found.

Conclusion

As a result of the study, the following tasks were performed:
— analysis of the software implementation of the object detection algorithm based on color segmentation of the image;
— implemented image color segmentation algorithms for automatic object detection in MATLAB.
— For fast object detection, we used the a priori method of color segmentation of images, the essence of which was to set a specific desired color. Advantages of using color as a feature for object detection –
— low computational complexity;
— high processing speed;
— resistance to changes in the scale of the object.

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