COLOMBIA POTENCIA DE LA VIDA

TIC

Reading

Image Segmentation

TALENTO TECH

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Universidad Tecnológica de Pereira

Image segmentation: a comprehensive

In the world of digital processing and computer vision, image segmentation is the process of dividing the image into multiple segments or regions, each of which corresponds to a different object or part of the image.

1. Basics of image segmentation:

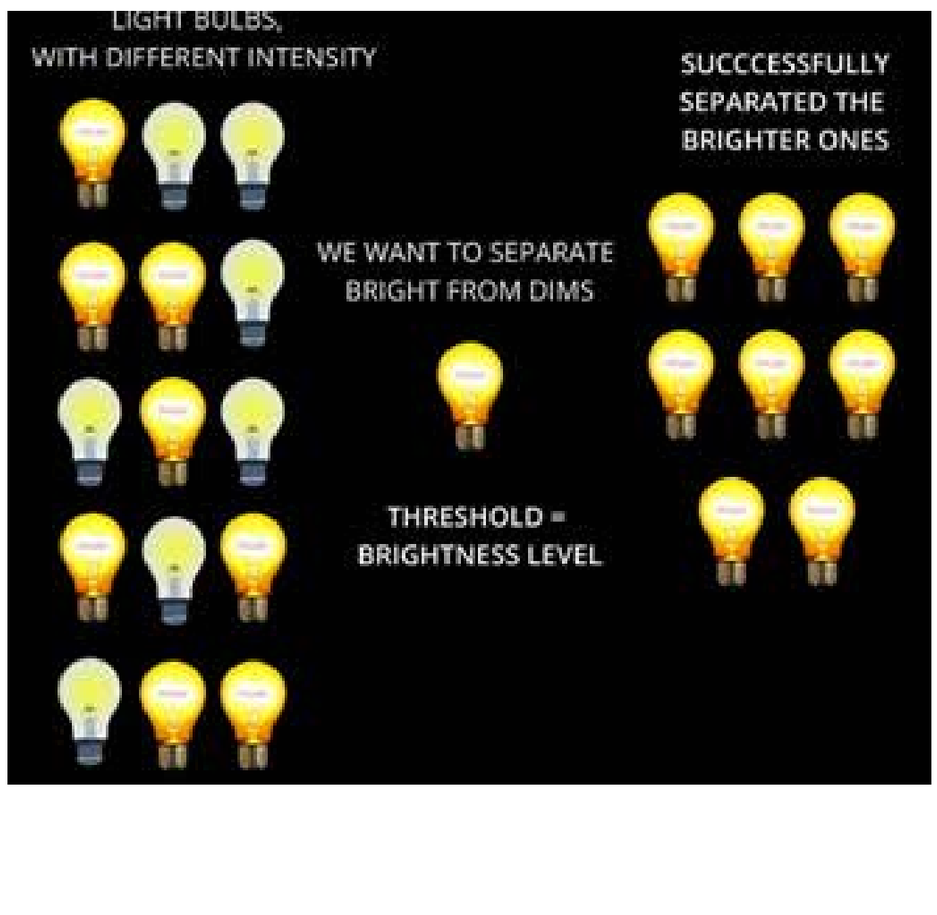
Let’s take a closer look at why image segmentation is necessary now that we have seen its description. What does it exactly do?

Think of image segmentation as a magic highlighter for a computer. You know how when you read a book, you can use a highlighter to mark the most important parts? Image segmentation does something similar for a computer with pictures. It helps the computer pick out and focus on specific things in a picture, like finding hidden treasures in a treasure map.

Now, think about a colonoscopy, the example we saw in the introduction part. Doctors use a tiny camera to look inside your intestines, right? Well, imagine there’s something weird, like a polyp, that they need to find. Image segmentation helps the computer recognize the polyp as a separate thing from the rest of your intestines. It’s like giving the computer super eyes to spot that problem area.

So, in simple terms, image segmentation is like highlighting the important stuff in a picture so that a computer can better understand and help us find things like polyps during a colonoscopy.

2. Types of image segmentation:



THRESHOLDING

Think of thresholding as a way to split things based on their brightness. Imagine you have a bunch of light bulbs of different intensities. You want to separate the very bright ones from the dim ones. You decide on a certain brightness level, like a dimmer switch setting.

So, if we're talking about polyp detection, it's like saying, 'Hey, computer, let's find those polyps.' You set the brightness level just right, and the computer goes through the image. Everything that matches that brightness becomes the polyp, and everything else fades into the background. It's like a spotlight on what you want to find."

REGION-BASED SEGMENTATION:

Region-based segmentation is like grouping similar things together. Imagine you have a bunch of differently colored candies on a table, and you want to put all the red ones in one bowl and all the blue ones in another. You do this by looking at each candy's color and grouping them based on similarity.

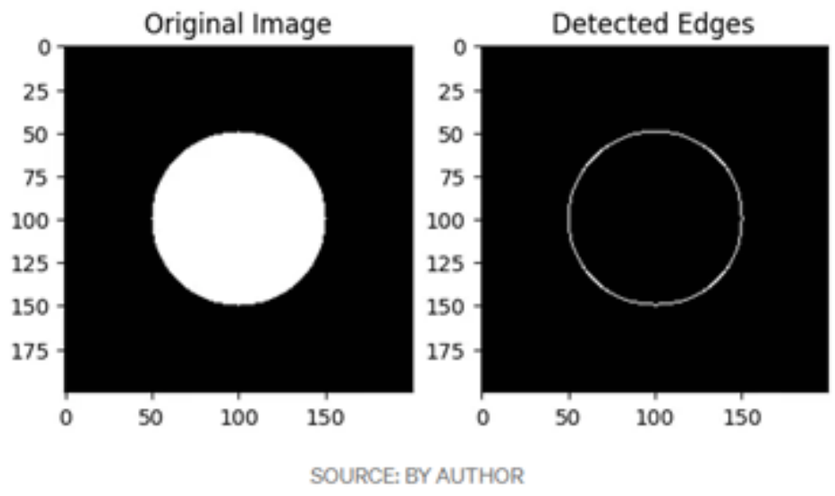
In image segmentation, it's similar. Instead of candies, we have pixels in an image. We group together pixels that are similar in terms of color or intensity. It's like sorting puzzle pieces by their shape or color to build a complete picture.

SOURCE: BY AUTHOR

EDGE-BASED SEGMENTATION:

Edge-based segmentation is like finding the outlines of objects in a coloring book. Imagine you have a coloring book page with different shapes, but there are no lines to tell you where one shape ends and another begins. To color neatly, you need to trace the edges of each shape with a dark pen first.

In image segmentation, edge-based methods do something similar. They look for the "edges" or boundaries in the image. These edges are like the dark lines in the coloring book. By finding these edges, we can figure out where one object stops, and



SOURCE: BY AUTHOR

SEMANTIC SEGMENTATION:

Semantic segmentation is like giving each pixel in an image a label or a tag, describing what object, or thing it belongs to. It's like coloring a coloring book, but instead of just coloring the shapes, you label them with what they are.

SOURCE: BY AUTHOR

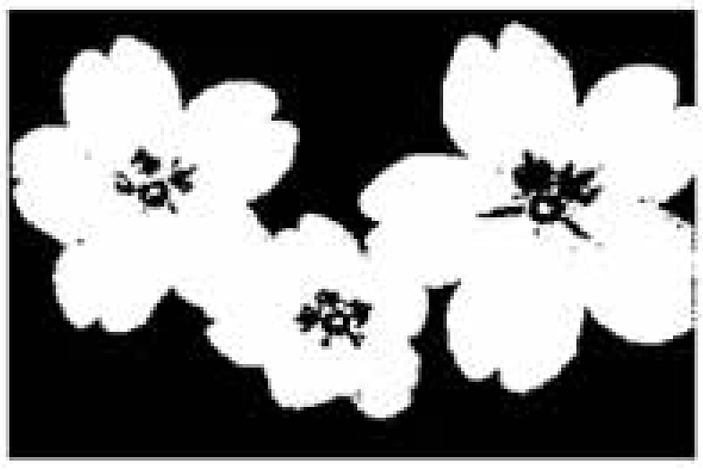
INSTANCE SEGMENTATION:

Instance segmentation is like giving each object in a picture its own name and boundary. Imagine you have a photo with several horses in it, and you want to not only know where each horse is but also give them a unique label. It's like saying, "Hey, there's Horse 1, Horse 2, and so on."

Now, relating it to polyp detection, think of colonoscopy images with multiple polyps. Instance segmentation would not only help locate each polyp but also distinguish them individually.

In short, the code takes an image, converts it to grayscale, and then separates objects from the background using a brightness threshold. It finds the outlines of these objects, assigns different colors to each, and displays the original image with the objects highlighted by colored boundaries. This is a basic example of instance segmentation, which helps distinguish individual objects within an image.

SOURCE: BY AUTHOR



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Adapted from:
https://medium.com/@datasciencemeetscybersecurity/image-segmentation-a-comprehensive-guide-c5ccded8af70