Obtain the images Suzi1.bin and ct_scan.bin from the course web site. Each image has 256 \times 256 pixels and each pixel has 8 bits.

In this assignment you will perform object extraction (target extraction) by using simple thresholding followed by connected components labeling (blob coloring) with minor region removal. This is a special case of two classical image processing problems known as image segmentation and classification. Throughout the assignment, including the printing of your results, use a value of 255 (Hex 0xFF) for LOGIC ONE and a value of zero (Hex 0x00) for LOGIC ZERO.

Objectives:

1. Suzi1: the first objective is to produce a binary image \( J \) that is LOGIC ONE at pixels contained in the “girl” object of the original image and LOGIC ZERO at pixels contained in the background of the original image. The second objective is to produce a grayscale image \( K \) of the segmented “girl” object. At pixels where \( J \) is LOGIC ONE, \( K \) should be equal to the original Suzi1 image. At pixels where \( J \) is LOGIC ZERO, \( K \) should be 255.

2. ct_scan: the first objective is to produce a binary image \( J \) that is LOGIC ONE at pixels contained in the “torso section” object of the original image and that is LOGIC ZERO at pixels contained in the background of the original image. The second objective is to produce a grayscale image \( K \) of the segmented “torso section” object. This should be done exactly the same way it was for the Suzi1 image.

For each image, use the following procedure:

A) Study the image and select an appropriate threshold that will discriminate between the desired object and the background.

B) Form a binary image \( J \) by applying the threshold so that pixels likely to be part of the desired object are assigned the value LOGIC ONE, while those likely to be part of the background are assigned the value LOGIC ZERO.

**Hint:** for the Suzi1 image, this means that \( J(i, j) \) should be LOGIC ONE if the corresponding input pixel is below threshold. For the ct_scan image the opposite is true: you should set \( J(i, j) = \text{LOGIC ONE} \) if the corresponding input pixel is above threshold.

C) Apply connected components labeling with minor region removal to refine the segmentation in \( J \).

D) Construct the segmented object grayscale image \( K \).

Turn In:

- code listing.
- for each original image:
  - the original image,
  - the threshold value and how it was determined,
- initial thresholding result,
- blob coloring result before and after minor region removal (use a distinct gray scale for each blob),
- final binary image after blob coloring with minor region removal,
- the image $K$.

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