Homework-7

Q1:

You are given a picture with 5 point at the following (x, y) corrdinates:

(1, 3), (2, 1), (2, 5), (3, 3), (3, 5)

Apply the Hough Transform algorithm to search for circles in the parametric representation

Quantize r^2 into three values: 2 ,3, 4.

Quantize x0 into four values: -1, 1, 3, 5

Quantize y0­ into four values: -1, 1, 3, 5

Follow these steps:

Initialization:

Prepare and initialize to 0 the three-dimensional accumulator space. You can visualize it (and write it in your notebook) as 3 two-dimensional arrays. The first for r^2 = 2, the second for r^2 = 3, and the third for r^2 = 4.

Voting:

for each point (x, y) of the five picture points

for each possible value of x0

for each possible value of y0

compute r^2 from the equation

if r^2 is in the range 2-4 vote by incrementing the corresponding cell

(Notice that this requires calculating r^2 80 times.)

Choose a winner determine the cell with max number of votes.

a. What are the values of the accumulator space after the voting place?

Solution:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| R^2 = 2 | x0 = -1 | 1 | 3 | 5 |
| y0 = -1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| R^2 = 3 | x0 = -1 | 1 | 3 | 5 |
| y0 = -1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| R^2 = 4 | x0 = -1 | 1 | 3 | 5 |
| y0 = -1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 |
| 3 | 1 | 1 | 2 | 1 |
| 5 | 0 | 2 | 1 | 1 |

b. What is the most likely circle?

Solution:

From the above table can we see, the most likely solution will be:

1) x0 = 3, y0 = 3, r^2 = 4

2) x0 = 1, y0 = 5, r^2 = 4

A close up of a mans face

Description automatically generated