

## Robotic Vision: Closest Parts

José Ramón Romero Chávez (A01700318)  
A01700318@itesm.mx  
Tecnológico de Monterrey, Campus Querétaro

### Background

To have a basic understanding of Sherlock UI and its implemented algorithms

### Objective:

Find the two closest elements in the image

### Implementation

- Once we have opened the image set, we have to pre-processing it.
  - Set region of Interest
  - Use threshold to change the image to complete binary image
  - Dilate-Erode in order to delete any imperfection of the image
- Using the script:
  - Iterate over the centroids
  - Using Pythagoras Theorem, find the distance between the elements
  - Store the minimum distance and the points involved
- Draw a line to match and compare those two points

### Results:

The screenshot shows a script editor on the left and a variable viewer on the right. The script is written in a C-like syntax and implements a brute-force algorithm to find the two closest points in a set. It iterates over all pairs of points, calculates the Euclidean distance using the Pythagorean theorem, and keeps track of the minimum distance and the corresponding points.

```
var arr = Vars.varA;
var size = Vars.varA.length;
var mins=100000000;
for (var i = 0; i < size; i++){
    var x=arr[i][0];
    var y=arr[i][1];
    for (var j = i+1; j < size-1; j++){
        var xc=arr[j][0];
        var yc=arr[j][1];
        var hyp = Math.sqrt(Math.pow(xc-x, 2)+Math.pow(yc-y, 2));
        if (hyp<mins){
            mins=hyp;
            Vars.p1.x=x;
            Vars.p1.y=y;
            Vars.p2.x=xc;
            Vars.p2.y=yc;
        }
    }
}
```

The variable viewer on the right shows the following variables and their values:

Name	Value
P[] varA	[[368.60, 37.69]
P p1	(368.60, 37.69)
P p2	(273.38, 40.02)
L varB	(0.00, 0.00)
L varC	(200.00, 200.00)

Below the variable viewer is a table of predefined items:

Predefined items	Description
VEngine object	Application level se
Vars object	Variable access
DigIn object	Digital inputs contr
DigOut object	Digital outputs con
System object	System level servic
Number object	Numeric constants

### Script

Result:

The screenshot displays a software interface with two main panels. The left panel, titled 'imgA: MONO8 640 x 480 - Image s...', shows a black image with several white circular objects. A green rectangular bounding box is drawn around one of these objects, and a red crosshair is visible on its center. The right panel, titled 'Program', shows a flowchart for a program named 'RectA'. The flowchart includes steps for thresholding, eroding, dilating, and calculating connectivity. Below the flowchart, a 'Variables' section lists several variables and their values.

**Program Flowchart:**

- RectA
  - Pre RectA.Threshold
  - Pre RectA.Erode
  - Pre RectA.Dilate
  - Alg RectA.Connectivity - Binary
    - N count
    - P centroid[0]
    - P[] centroid[]->varA
    - N[] area[]
    - N[] width[]
    - N[] height[]

**Variables:**

Name	Value	Comment
P[] varA	((368.60, 37.6...	
P p1	(368.60, 37.69)	
P p2	(273.38, 40.02)	