Curve Reconstruction: Implementation

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Viewer

- Run the program Viewer provided by your TA James.
- Click Mode and choose Insert Point in the submenu.
- You can now click within the window to specify the input points.
  - Each left click creates an input point.
  - You can create the points in any order you like.
- To move a created point, click Mode and choose Edit point in the submenu.
- You can switch at will between point creation and point editing.
- Finally, click File and choose Save As to save the points created to a file.

Input File

The output of Viewer is an ASCII file.

Format:

```
<number of points>
<point coordinates>
<point coordinates>
...
```

Example:

```
10
-0.461864 0.386047
-0.046610 0.176744
0.351695 0.506977
0.927966 0.348837
0.953390 -0.269767
0.461864 -0.390698
-0.038136 0.000000
-0.377119 -0.386047
-1.033898 -0.279070
-0.961864 0.223256
```

Angle Checking

Given three points p, q and r, how to determine if the angle $\angle pqr$ is acute or not?

Dot Product

Let $p = (p_x, p_y)$, $q = (q_x, q_y)$ and $r = (r_x, r_y)$ be the three points.

$$\vec{qp} = (p_x - q_x, p_y - q_y) \qquad \vec{qr} = (r_x - q_x, r_y - q_y)$$

The dot product is $\langle \vec{qp}, \vec{qr} \rangle = |qp| \cdot |qr| \cdot \cos \angle pqr$. The dot product can also be written as

$$\langle \vec{qp}, \vec{qr} \rangle = (p_x - q_x)(r_x - q_x) + (p_y - q_y)(r_y - q_y)$$

Thus $\angle pqr \leq \pi/2$ if and only if $\langle \vec{qp}, \vec{qr} \rangle \geq 0$, which can be checked using the above formula.

Program Output

The curve reconstruction program produces an ASCII ouptut file.

Format:

```
<index> <index>
<index> <index>
<index> <index>
...
```

Example:

```
0 46
0 1
11 16
2 116
2 48
3 4
3 48
...
```

Output Display

- Click File and choose Open in the submenu to open the input file again.
- Click File and choose Connectivity in the submenu to open the output file of your program.
- You will see the edges connecting the input points.