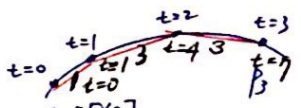
2dll : 2 weeks

Uniform :

m = Chord length.



$p_0 = \begin{bmatrix} x_0 \\ y_0 \end{bmatrix}$

$x = x(t)$

$y = y(t)$

2019 Numerical Analysis Computer Project #2

I. Generate $n+1$ sample points p_i in a heart-shape geometry, shown in the bottom figure.

A. Let t be the parameter, and x- and y-coordinates of the sample points be functions of t.

t: 度

x: 公尺

y: 公尺

2D空間取樣座標

$$x_i = x(t_i),\ y_i = y(t_i),\ i = 0,\ldots,n.$$

T[i]	t_0	t_1	t_2	…	t_{n-1}	t_n
X[i]	X_0	X_1	X_2	…	X_{n-1}	X_n
Y[i]	Y_0	Y_1	Y_2	…	Y_{n-1}	Y_n

Draw the geometry in a piece of paper and create the sample points by yourselves.

II. Assign the parametric values t_i of the sample points by using the following 2 methods:

A. Chord-length: $l_i = \|\overline{p_i p_{i+1}}\|, i = 0,\ldots,n-1$. Define $t_0 = 0, t_i = t_{i-1} + l_{i-1}, i = 1,\ldots,n.$

B. Uniform: $t_0 = 0, t_1 = 1,\ldots,t_n = n.$

III. Try n=5, 11, and 17. (20%)

A. Print out the sample points of the 2 data sets. Use the afore-mentioned parameterization methods to define t_i.

t=0, t=0.09, t=0.14 … t=7

IV. Generate two Newton's polynomial from the data sets. (40%) forward divide difference. 在圖上顯不矣.

A. Print out the coefficients of the polynomial. Use the polynomial to generate 100 points and connect these points to form a geometry. Draw the results.

V. Answer the following questions and explain your answers. (40%)

上網/實驗/看書

A. Which parameterization method is better? Why? Chord-length.

B. As n increases, will the shape of the geometry improve? Why?

C. Are the locations of the sample points important? 重要, location怎麼取? (奇除不可的數? 如何免服?)

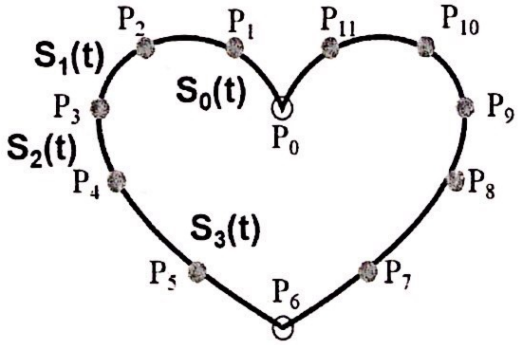
加分題

VI. Let n=11 and use uniform parameterization to generate a data set, as shown in the figure below. Generate 4 cubic Lagrange polynomial by using subsets of the data set: (20%)

3次式

$S_0(t) \in \{p_0, p_1, p_2, p_3\}, S_1(t) \in \{p_1, p_2, p_3, p_4\},$
$S_2(t) \in \{p_2, p_3, p_4, p_5\}, S_3(t) \in \{p_3, p_4, p_5, p_6\}.$ Uniformly generate 100 points:

$t \in [0,2]$, using $S_0(t)$; $t \in [2,3]$ using $S_1(t)$; $t \in [3,4]$ using $S_2(t)$; $t \in [4,6]$, using $S_3(t)$. Generate the other part of the geometry using the same method and draw the results.



可用映射法(或直接畫)把另一半畫出來