Computational Fabrication

Assignment 3b Report

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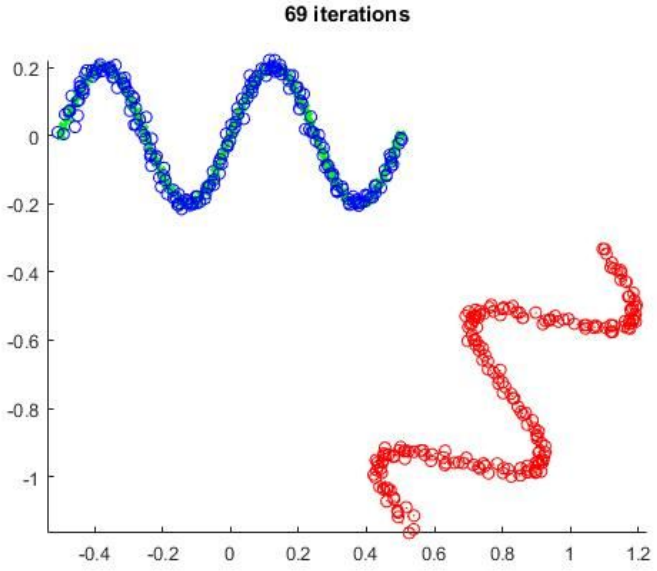
Task 1 & 2:

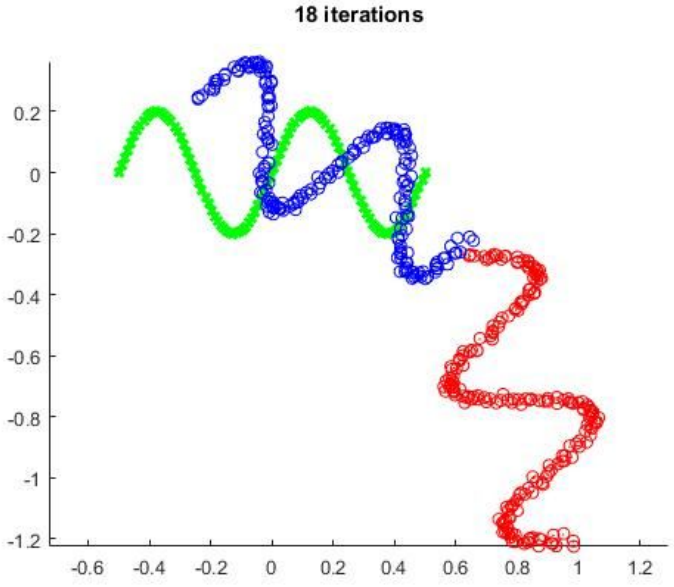
- **Sine curve**
  - **worked:**

(noise=0.01, thresh=1e-5, iterMax=70, nsamples=100, medianMult=inf, theta = randBetween(-90.0,90.0)*pi/180.0)



  - **didn't work:**

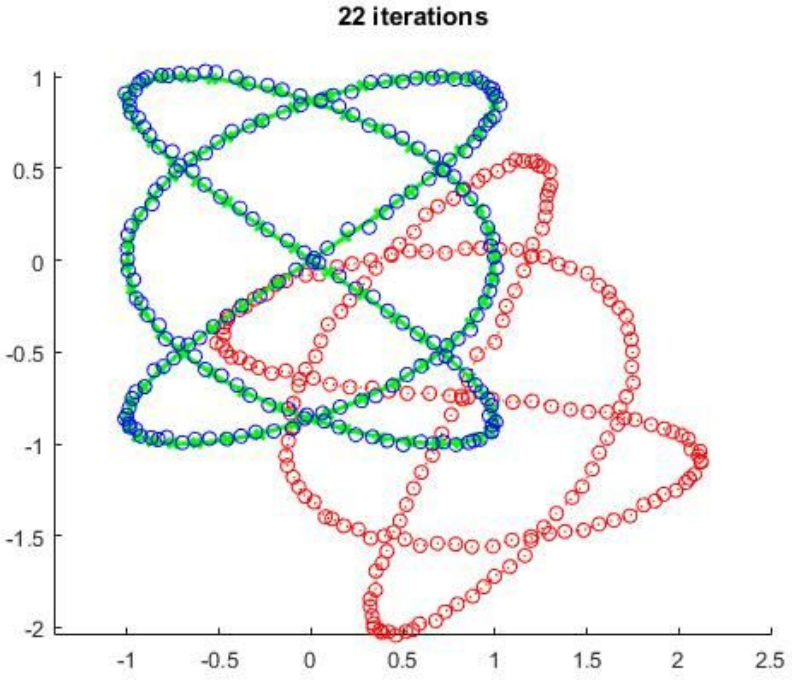
(noise=0.01, thresh=1e-5, iterMax=70, nsamples=200, medianMult=inf, theta = randBetween(71.0,119.0)*pi/180.0)



I only changed the value of theta. It turned out that ICP failed between theta(70*pi/180, 120*pi/180).

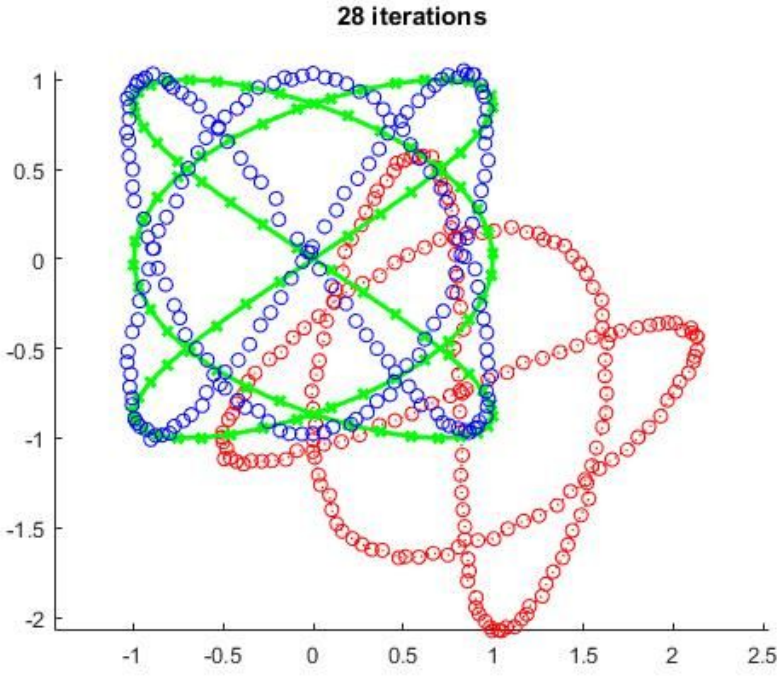
- **Lissajous curve**
    - **worked:**

(noise=0.01, thresh=1e-5, iterMax=100, nsamples=100, medianMult=inf, **theta = randBetween(-45.0,45.0)*pi/180.0**)



    - **didn't work:**

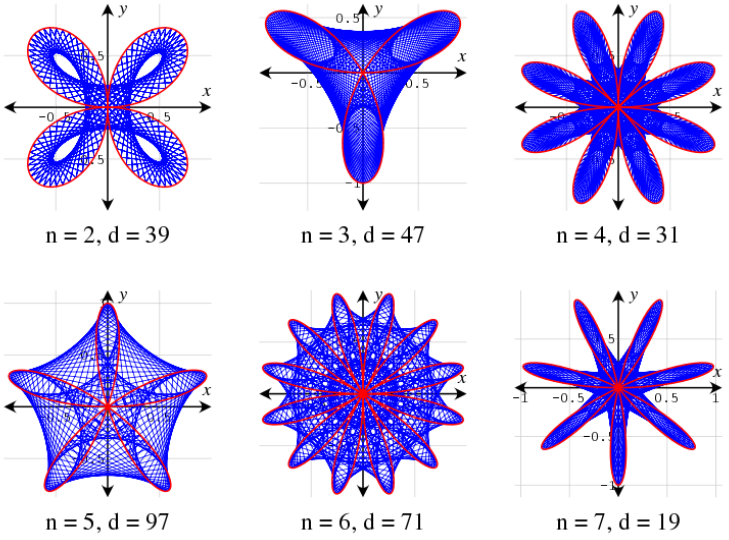
(noise=0.01, thresh=1e-5, iterMax=100, nsamples=100, medianMult=inf, **theta = randBetween(-90.0,90.0)*pi/180.0**)



I only changed the value of theta, so I think there might be a problem with it. I set theta to 45*pi/180 and it worked. Then I changed it to 46*pi/180, it failed again. It turned out that ICP failed between theta(45*pi/180, 137*pi/180).

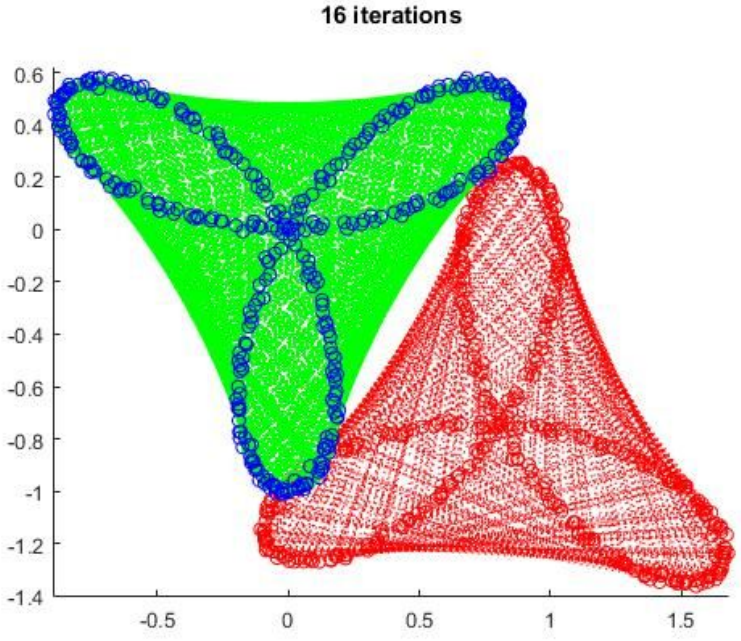
- **Maurer Rose curve**
  - **Description:**

    A Maurer rose of the rose r = sin(nθ) consists of the 360 lines successively connecting the above 361 points. Thus a Maurer rose is a polygonal curve with vertices on a rose (From Wikipedia, Maurer_rose).



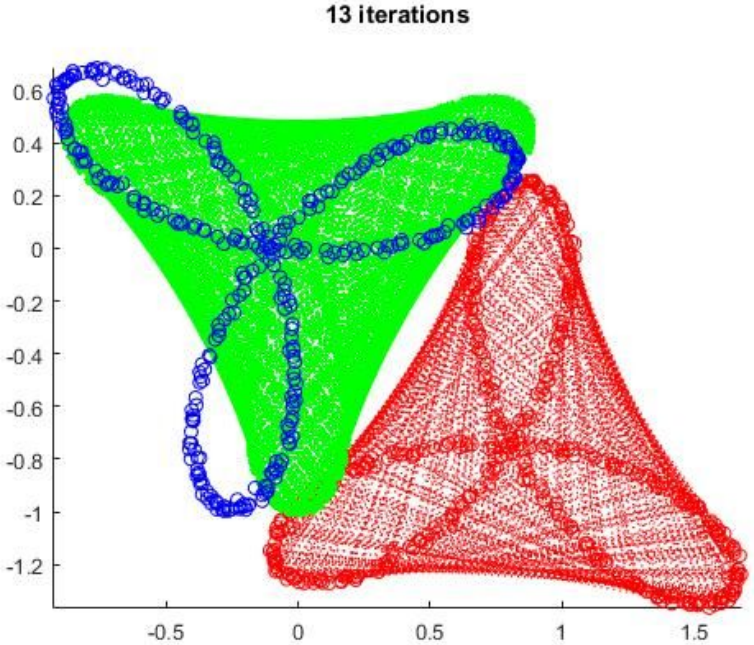
- **worked:**

(noise=0.01, thresh=1e-5, iterMax=60, nsamples=70, medianMult=inf, theta = randBetween(-180.0,180.0)*pi/180.0, targetPts = generatePts(caseNumber,360,[1 1 3 47]);, sourcePts = generatePts(caseNumber,360,[1 1 3 47]);)



- **didn't work:**

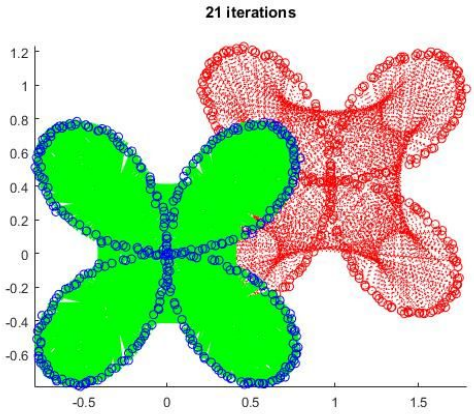
(noise=0.01, thresh=1e-5, iterMax=60, nsamples=70, medianMult=inf, theta = randBetween(-90.0,90.0)*pi/180.0, targetPts = generatePts(caseNumber,360,[1 1 3 47]);, sourcePts = generatePts(caseNumber,360,[1 1 3 47]);)



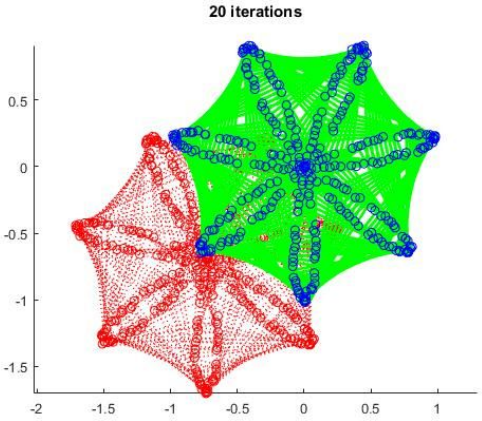
At first, I find it strange that even when I choose a very large number of sample points, the ICP didn't work as expected. Then I find it is because the range of theta is small. When I changed it to(-180.0,180.0), the ICP worked again.

- **Some other roses:**

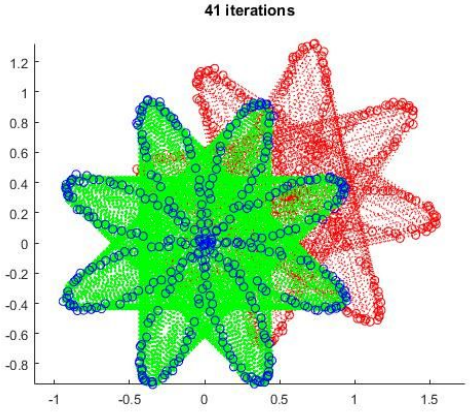
(noise=0.01, thresh=1e-5, iterMax=60, nsamples=300, medianMult=inf, theta = randBetween(-180.0,180.0)*pi/180.0)



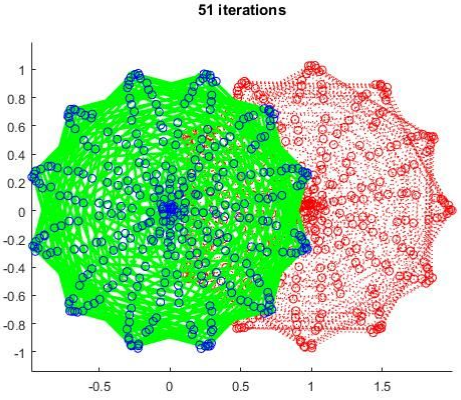
n=2, d=39



n=7, d=19



n=4, d=31

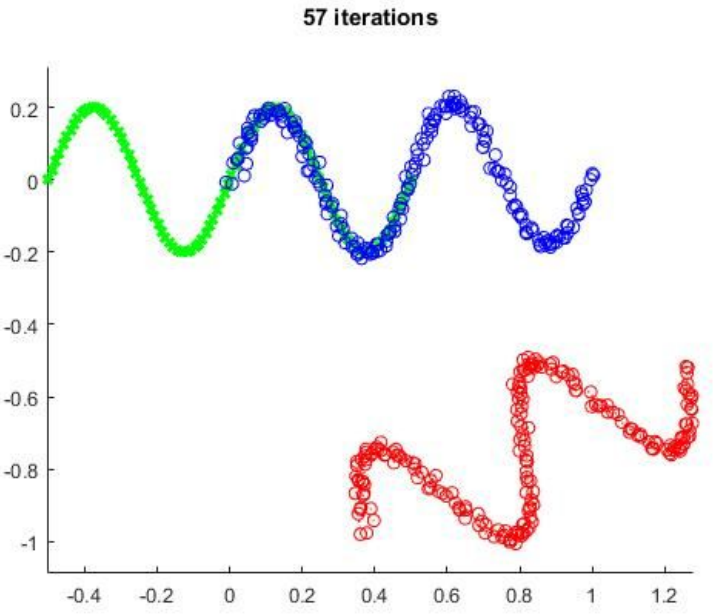


n=6, d=71

Task 3:

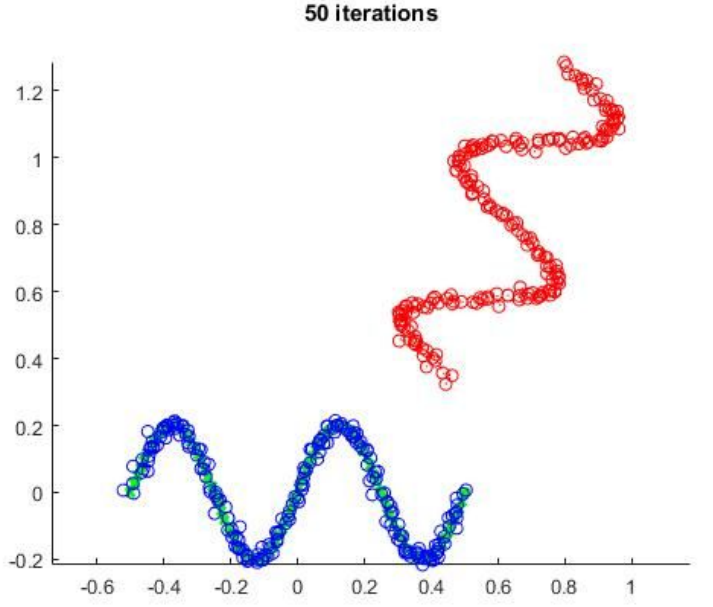
- **Partial match**

(noise=0.01, thresh=1e-5, iterMax=60, nsamples=100, **medianMult=2**, theta = randBetween(-45.0,45.0)*pi/180.0)



- **medianMult is too big:**

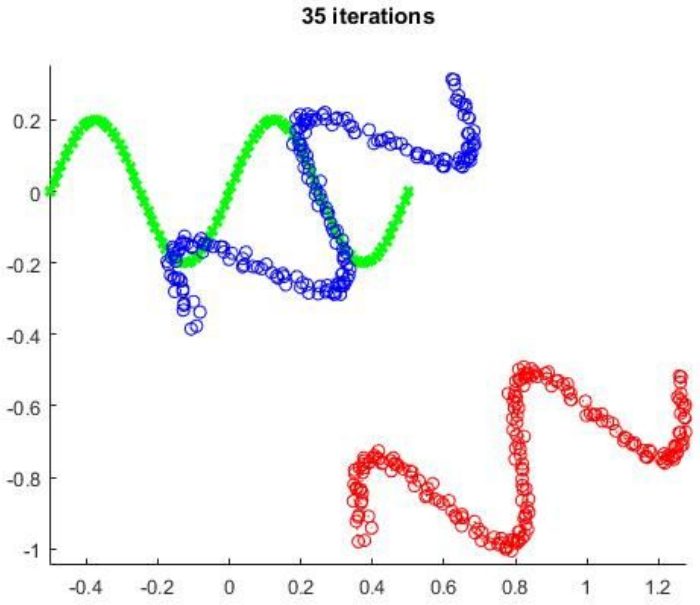
(noise=0.01, thresh=1e-5, iterMax=60, nsamples=100, theta = randBetween(-45.0,45.0)*pi/180.0)
medianMult=5;



When medianMult is too big, ICP will reject 0 points. This implies that no pairs will be rejected, which means that we cannot achieve partially matching between these two shapes.

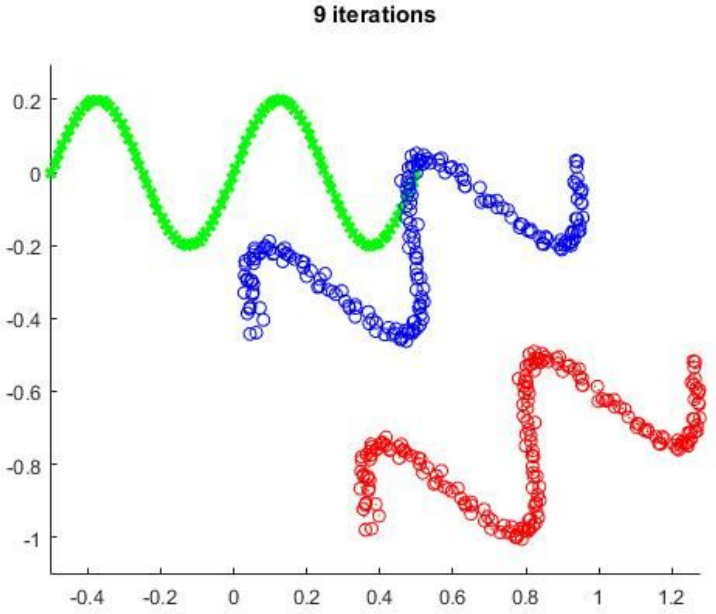
- **medianMult is too small:**

(noise=0.01, thresh=1e-5, iterMax=60, nsamples=100, theta = randBetween(-45.0,45.0)*pi/180.0)
medianMult=2;



The ICP rejected 169 out of 200 points in total.

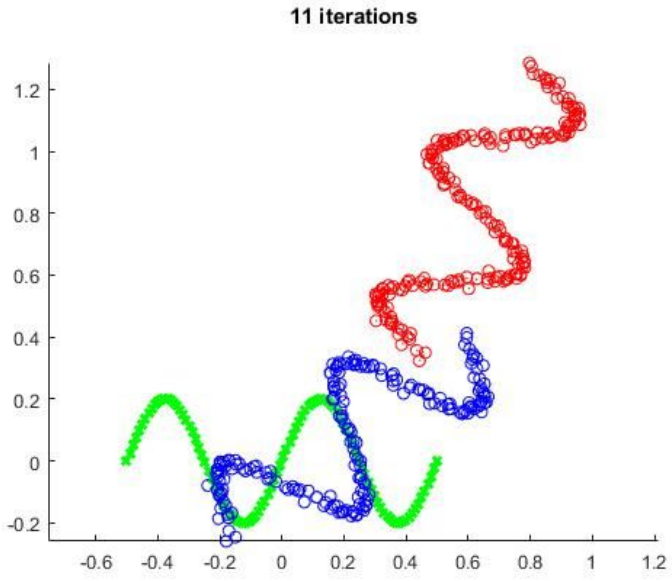
Then I changed medianMult to 1.
medianMult=1;



The ICP rejected 199 out of 200 points in total.
As a result, if the medianMult is too small, we can only match a very small part of these two shapes.

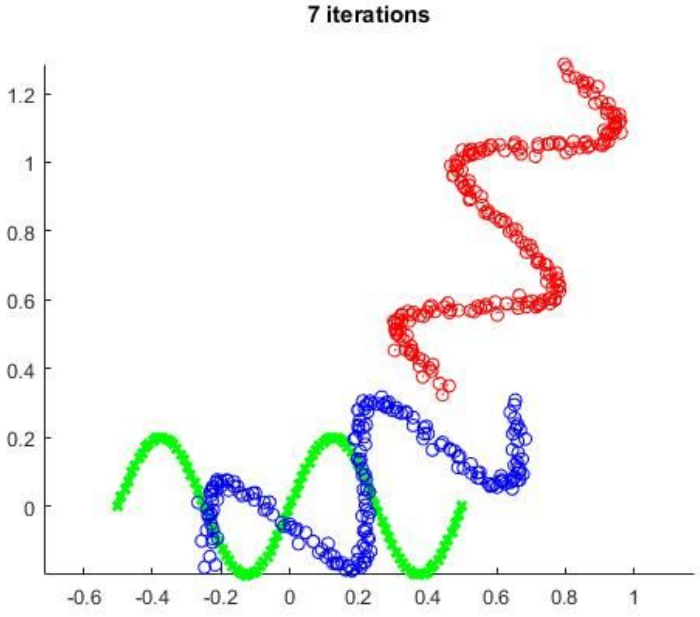
- **the number of samples is too small:**

(noise=0.01, thresh=1e-5, iterMax=60, **nsamples=40**, theta = 70*pi/180.0, medianMult=2;)



It rejected 33 points. But they still matched partially.

Then I change nsamples to 10.
nsamples =10;



It rejected 6 points.
The matching became worse than before. Because it managed to match just a few points from the source points.

Comments:
Having fun generating Maurer Rose curve!