Some Results

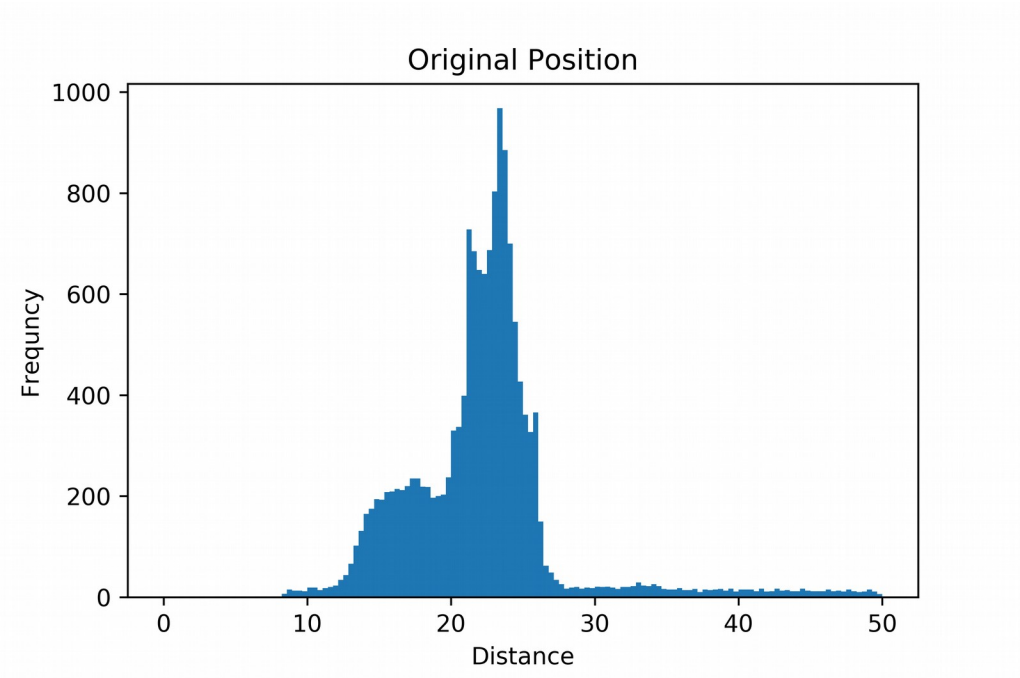
We solve the equation Ax=b by lsqr, it consist of two parts:

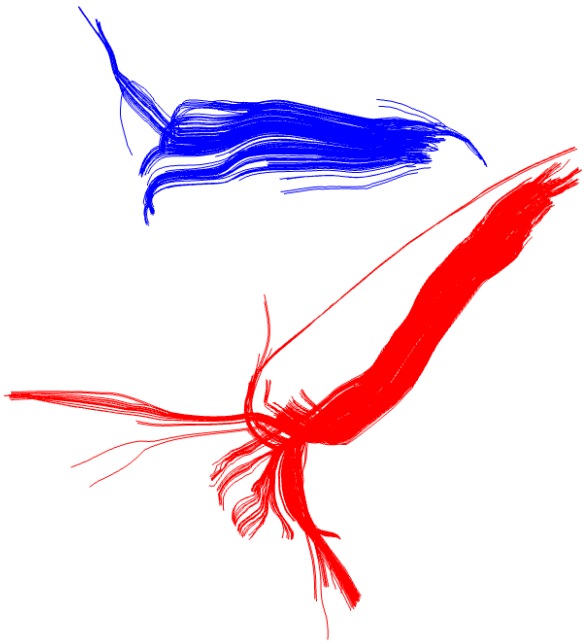
1. Distance part which is summation of all distances between each point and the closest point with respect to distance threshold
   $E_d(X)=\|W(DX-U)\|_F^2$
2. Stiffness part which is
   $E_s(X)=a\|(M\otimes G)\|_F^2$

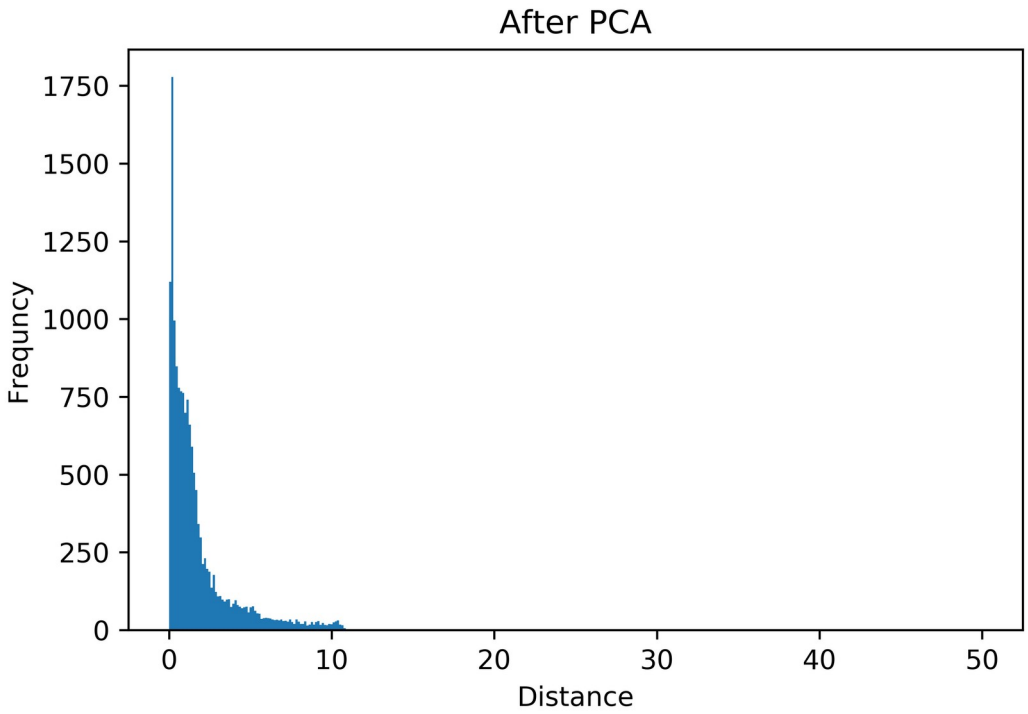
Experiment 1:

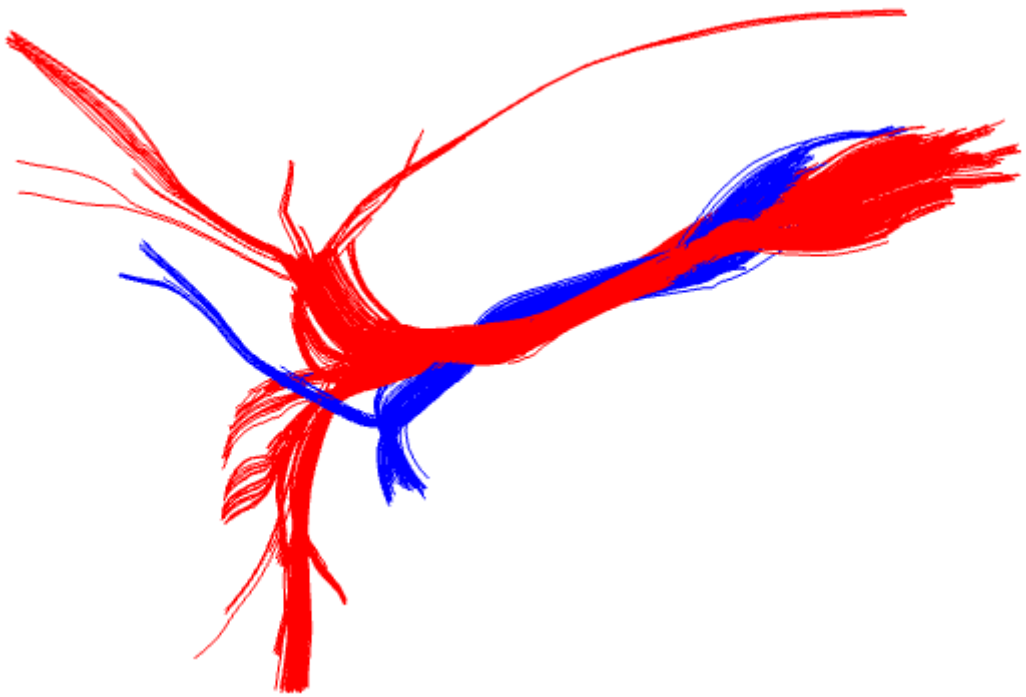
moving part = 150019/m_ex_atr-right_shore

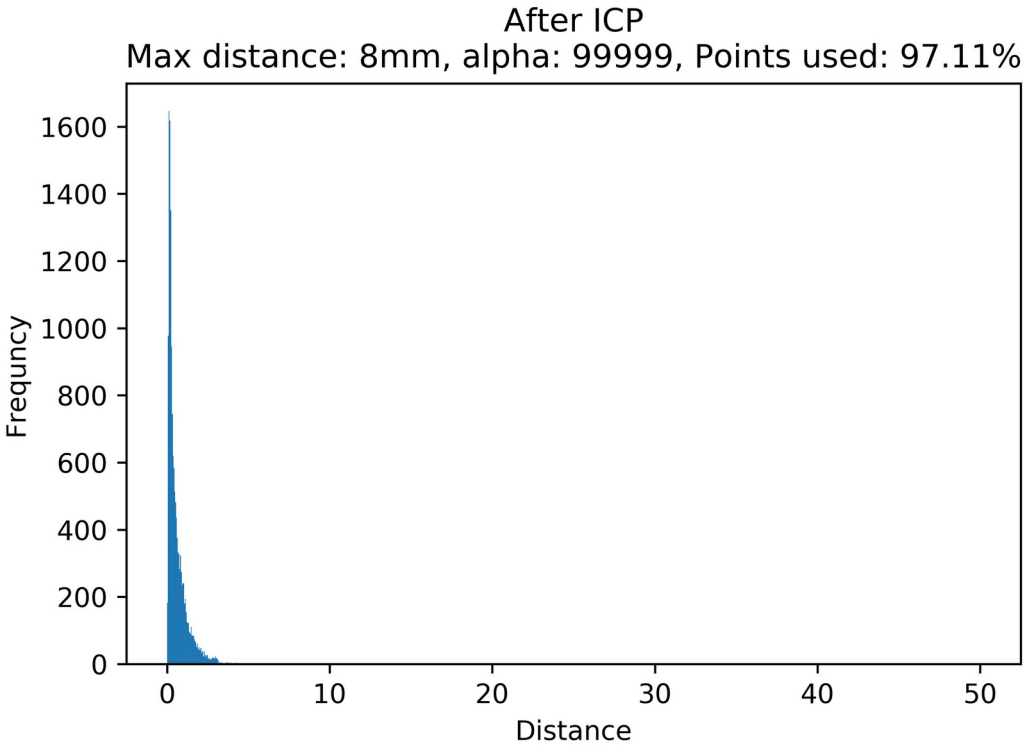
static part = 132118/m_ex_atr-left_shore

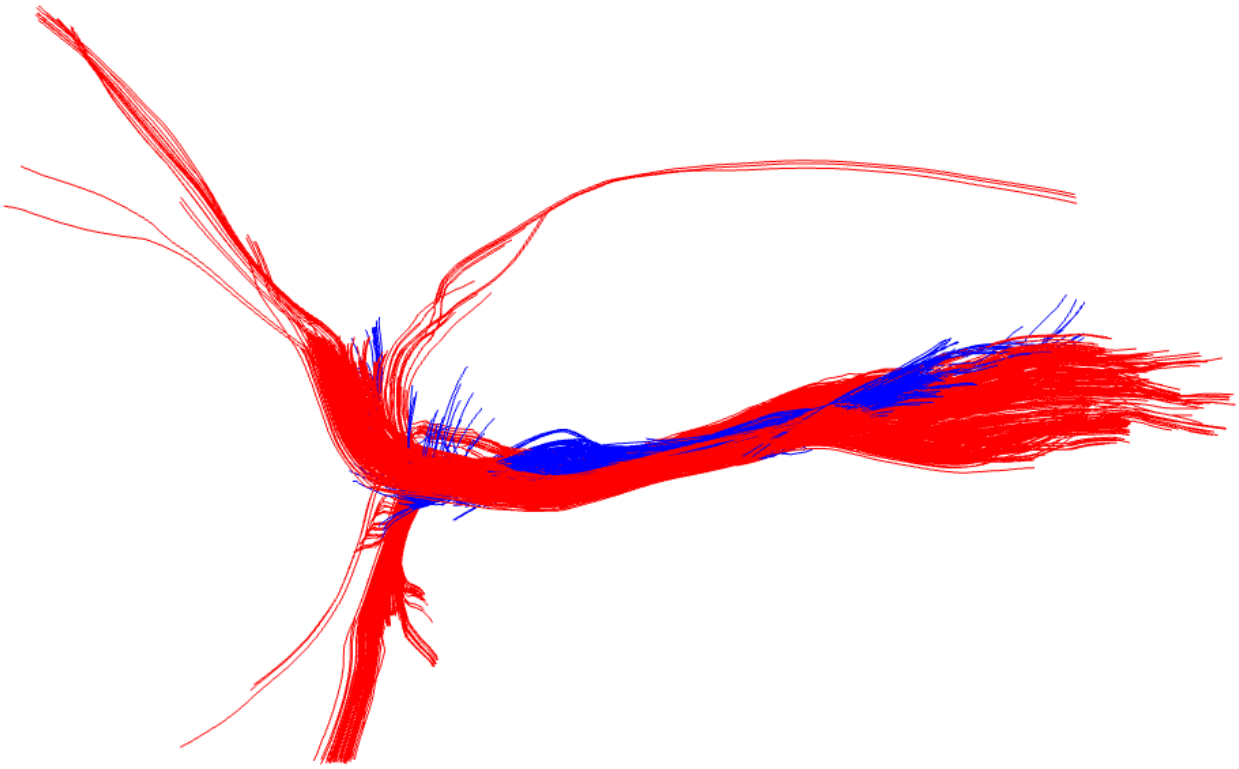





After PCA
Frequncy
1750
1500
1250
1000
750
500
250
0
0
10
20
30
40
50
Distance

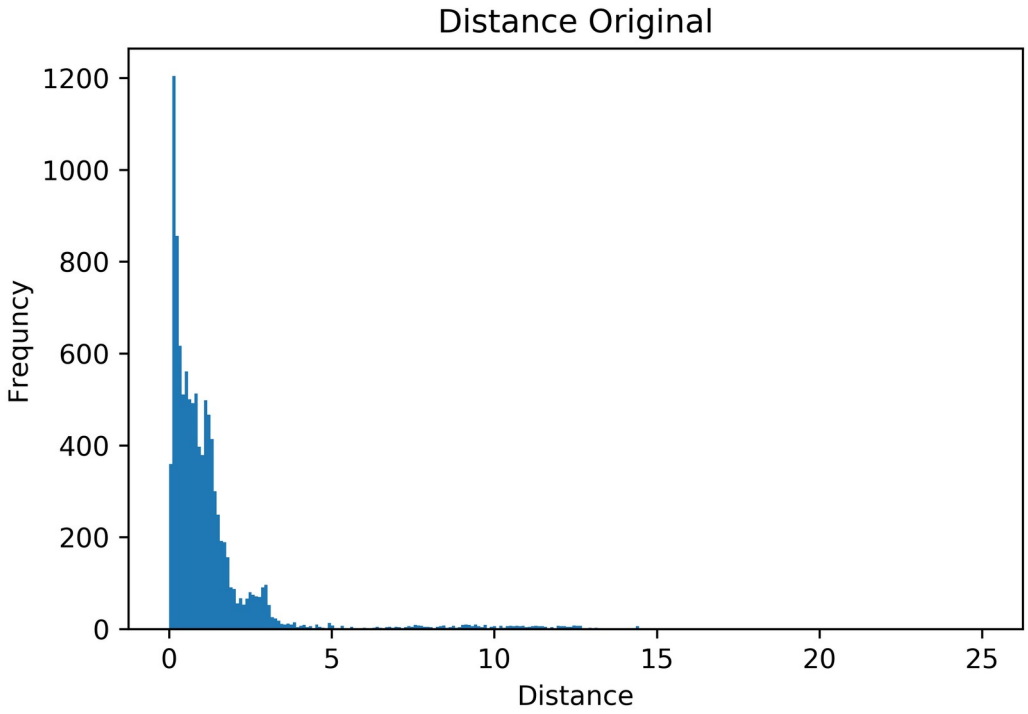


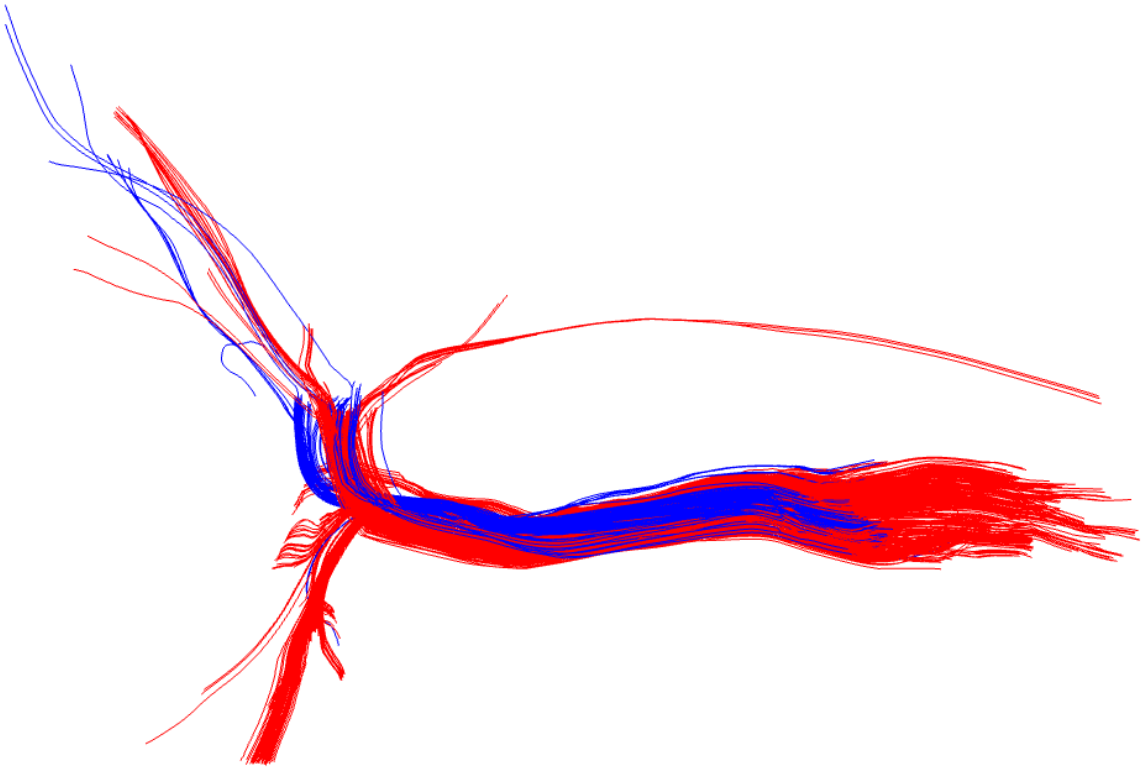

After ICP
Max distance: 8mm, alpha: 99999, Points used: 97.11%
Frequncy
1600
1400
1200
1000
800
600
400
200
0
0
10
20
30
40
50
Distance

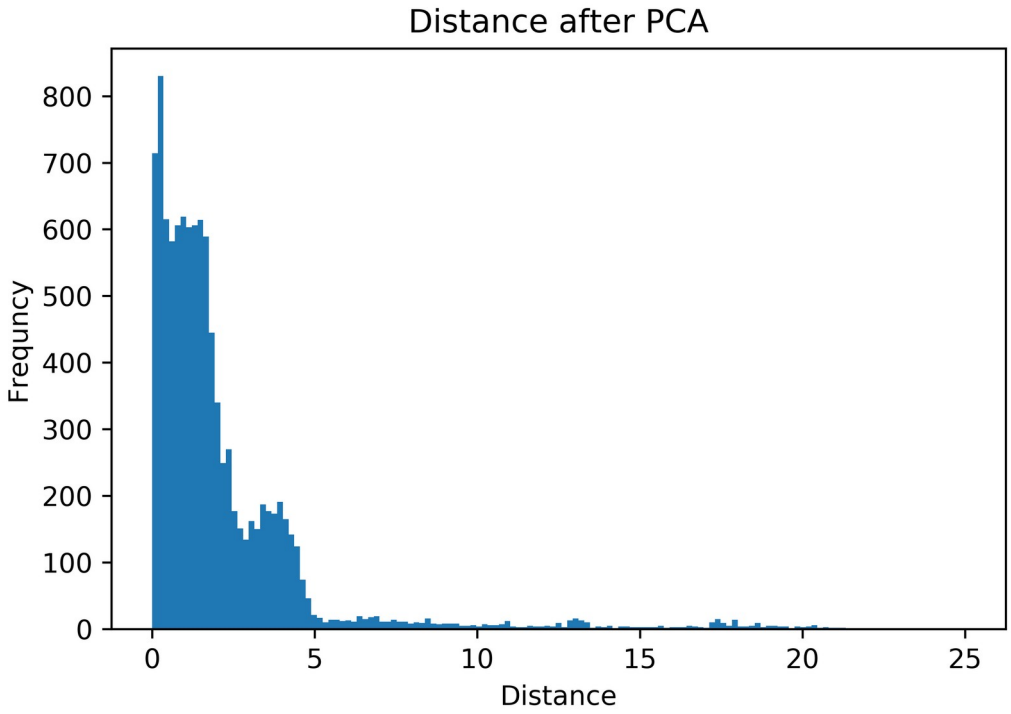


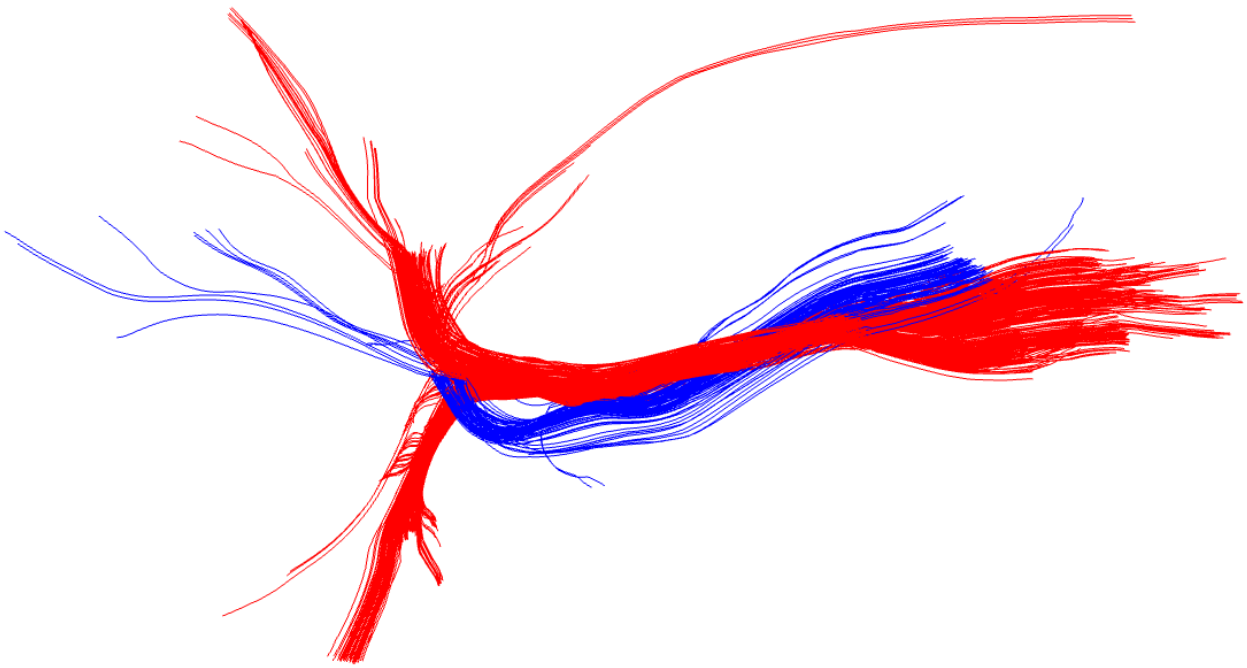
Experiment 2:

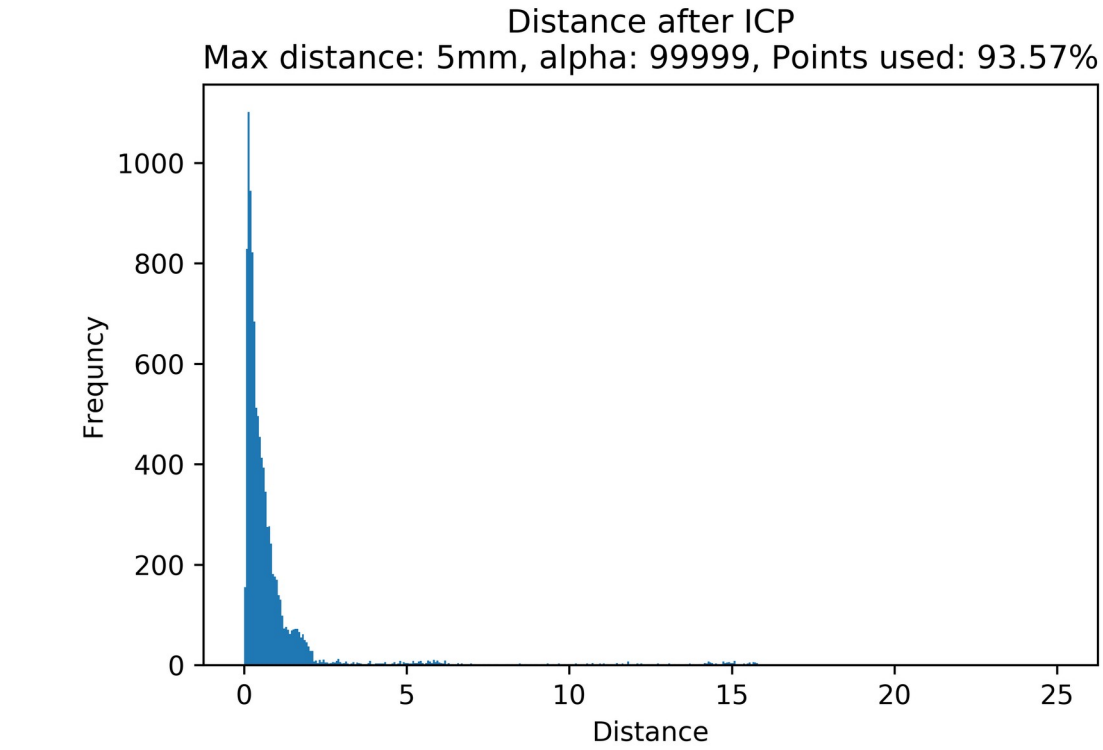
static = 132118/m_ex_atr-left_shore
moving = 150019/m_ex_atr-left_shore

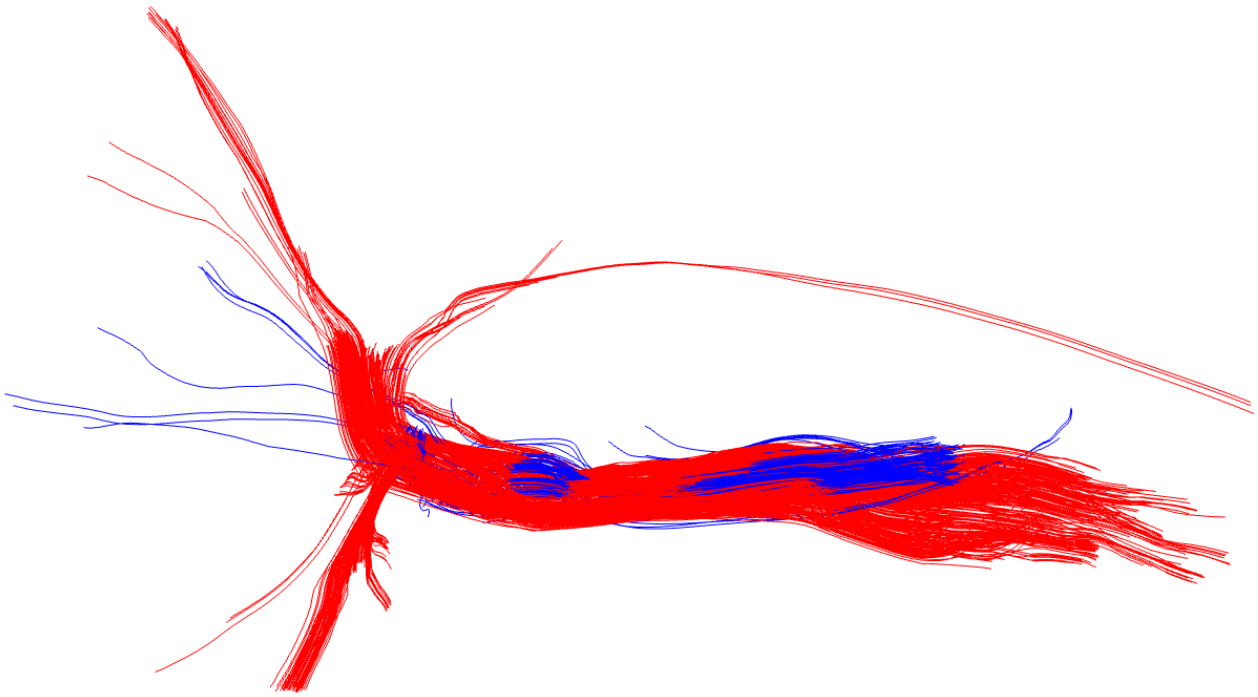


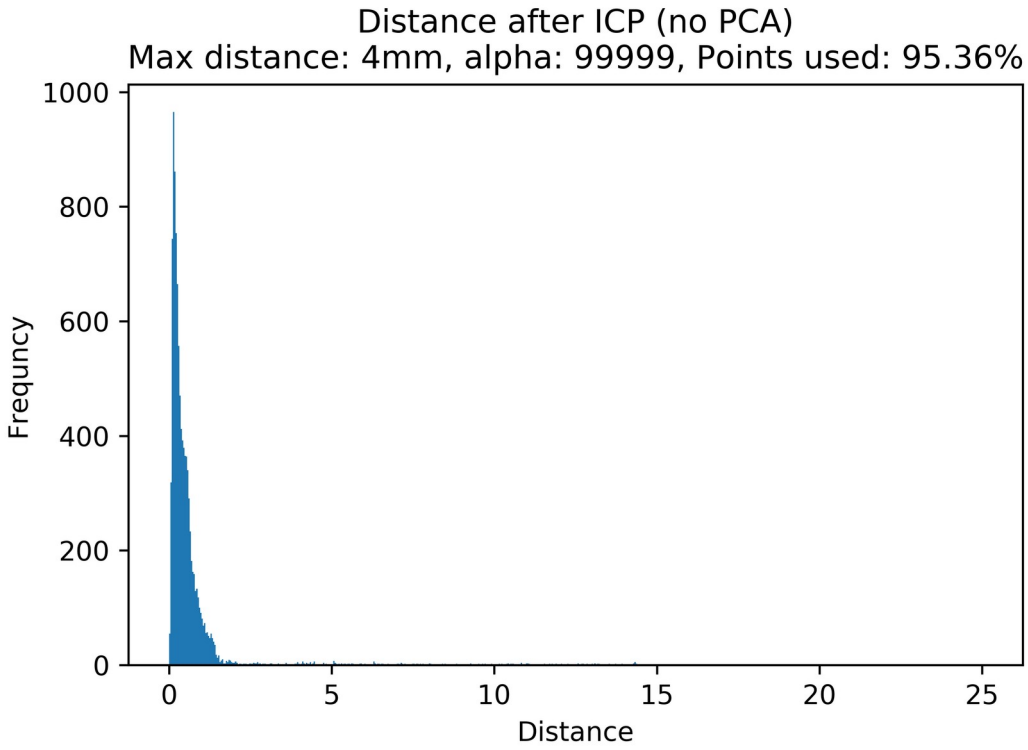


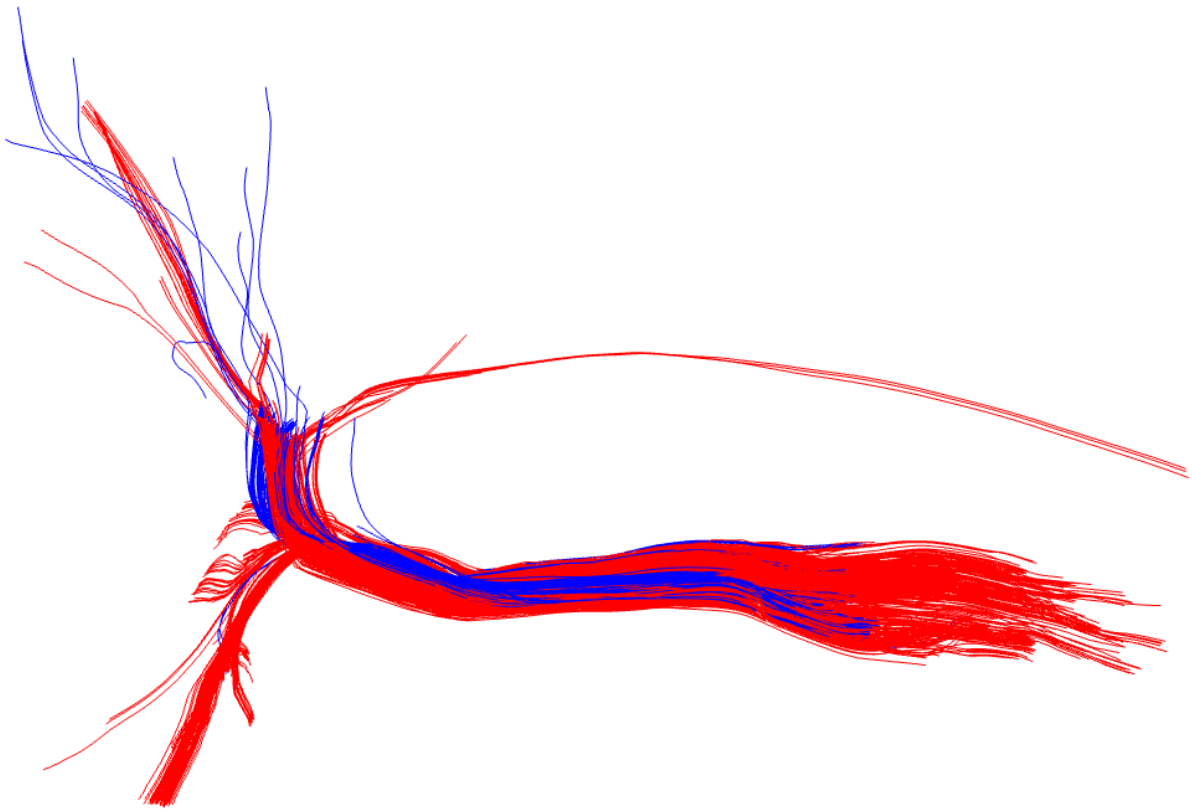

Distance after PCA
Frequncy
800
700
600
500
400
300
200
100
0
0
5
10
15
20
25
Distance



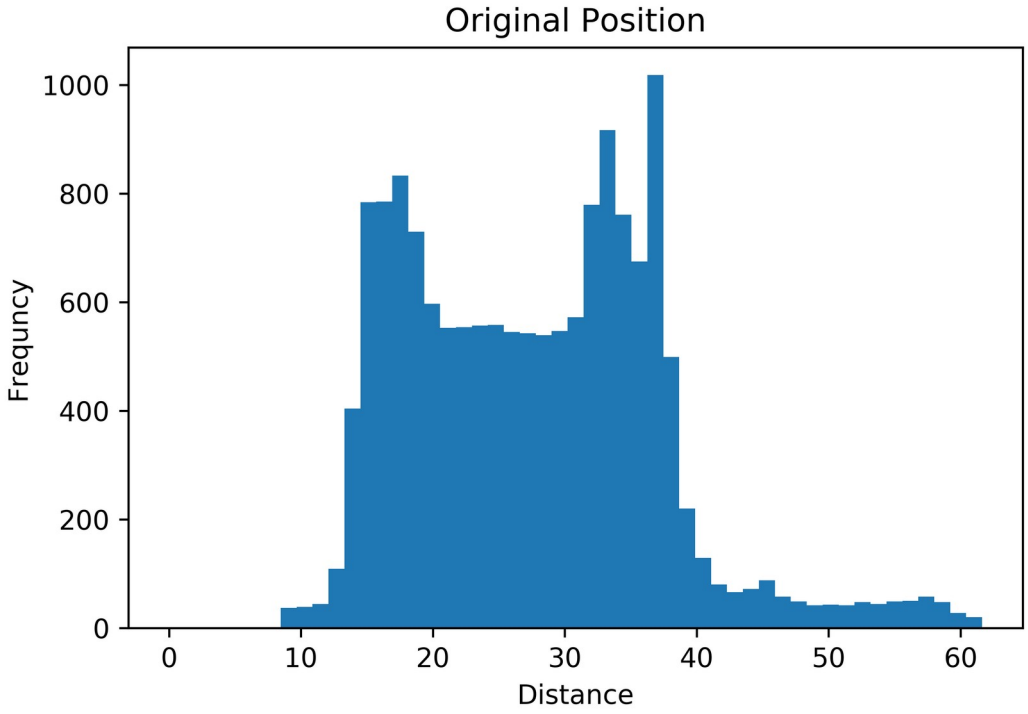

Distance after ICP
Max distance: 5mm, alpha: 99999, Points used: 93.57%
Frequncy
1000
800
600
400
200
0
0
5
10
15
20
25
Distance

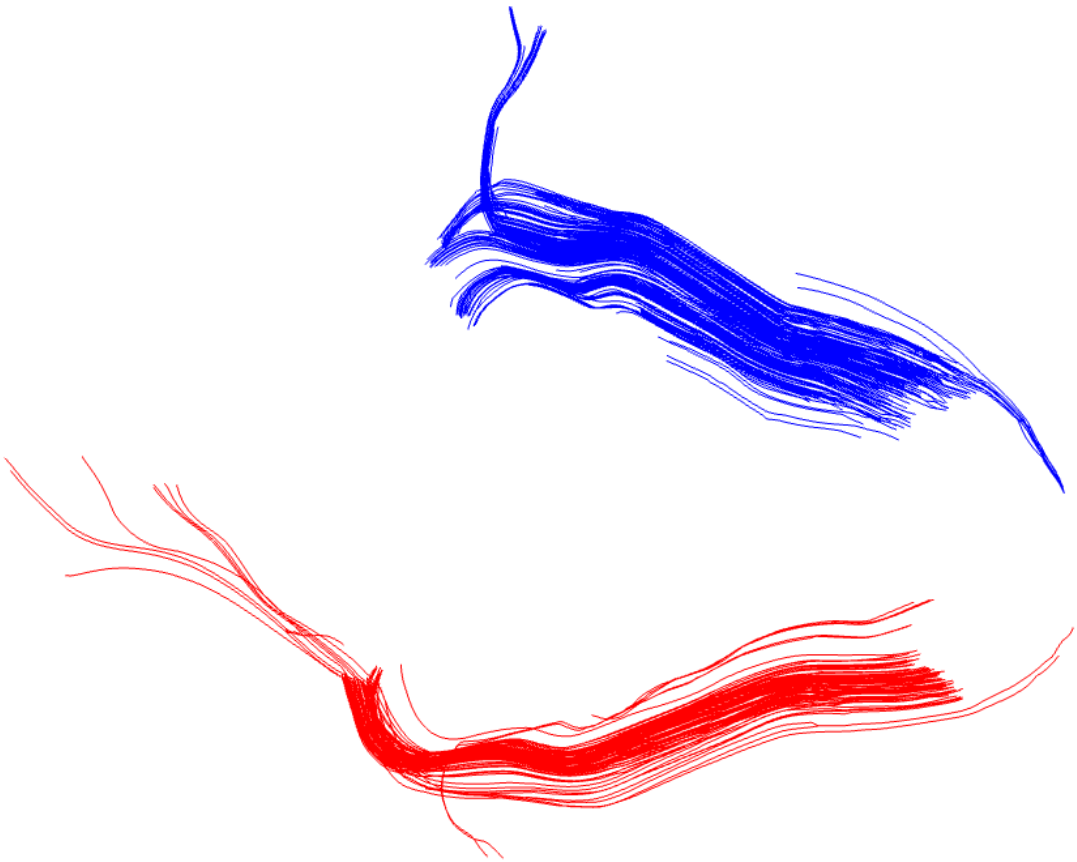


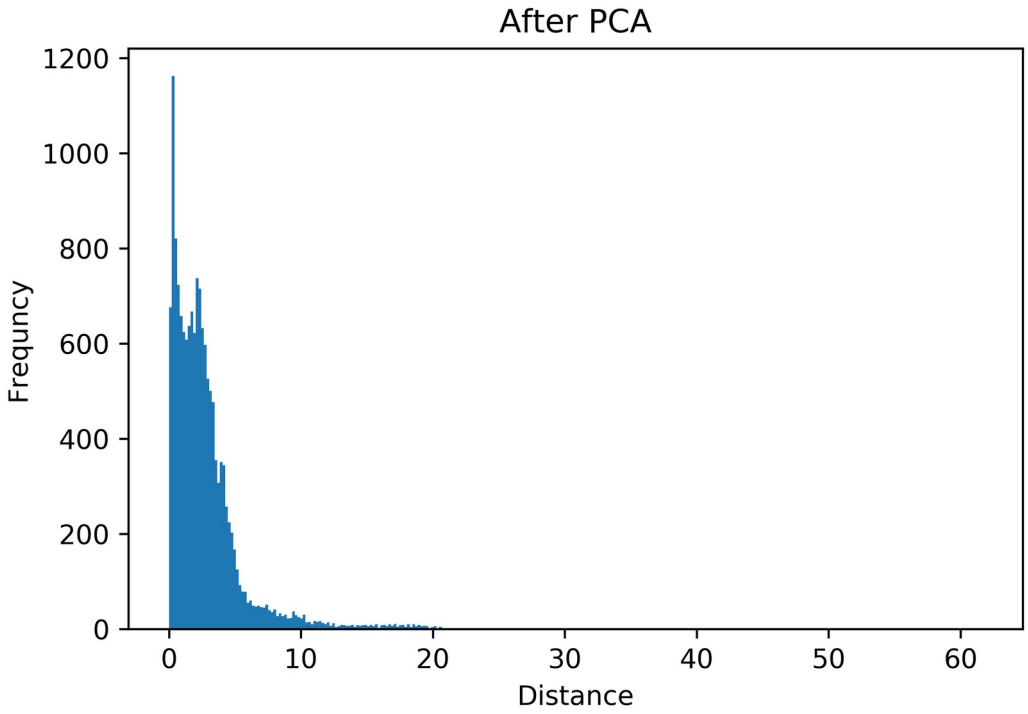

Distance after ICP (no PCA)
Max distance: 4mm, alpha: 99999, Points used: 95.36%
Frequncy
Distance
0
200
400
600
800
1000
0
5
10
15
20
25

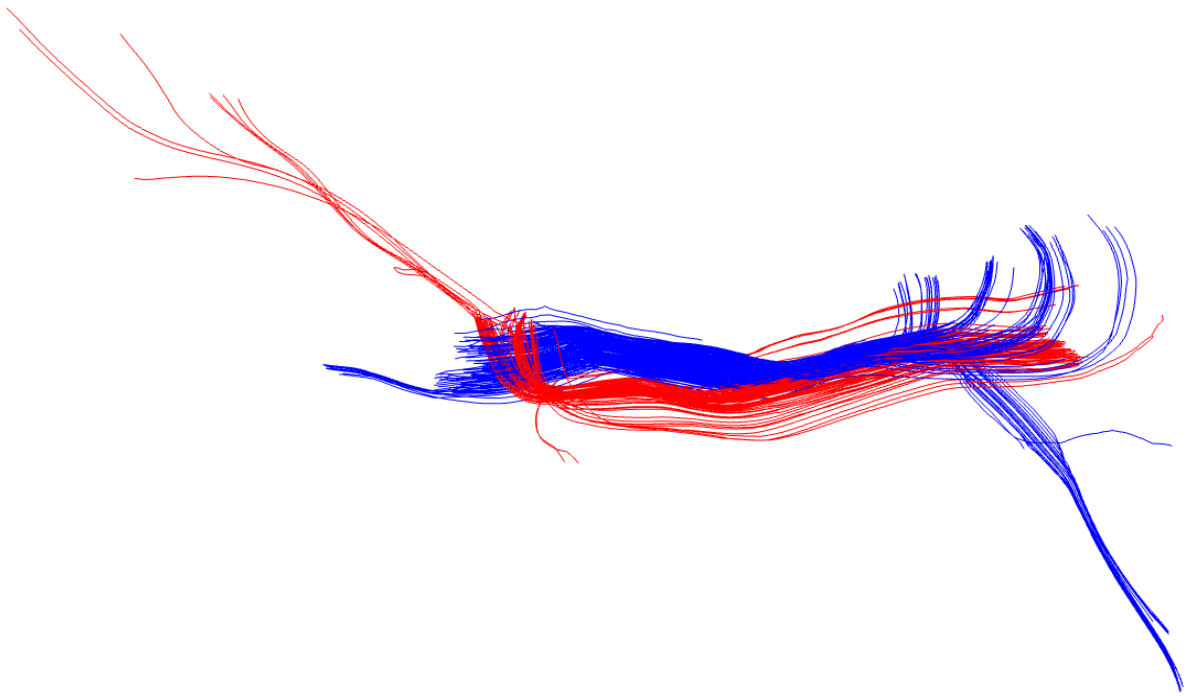


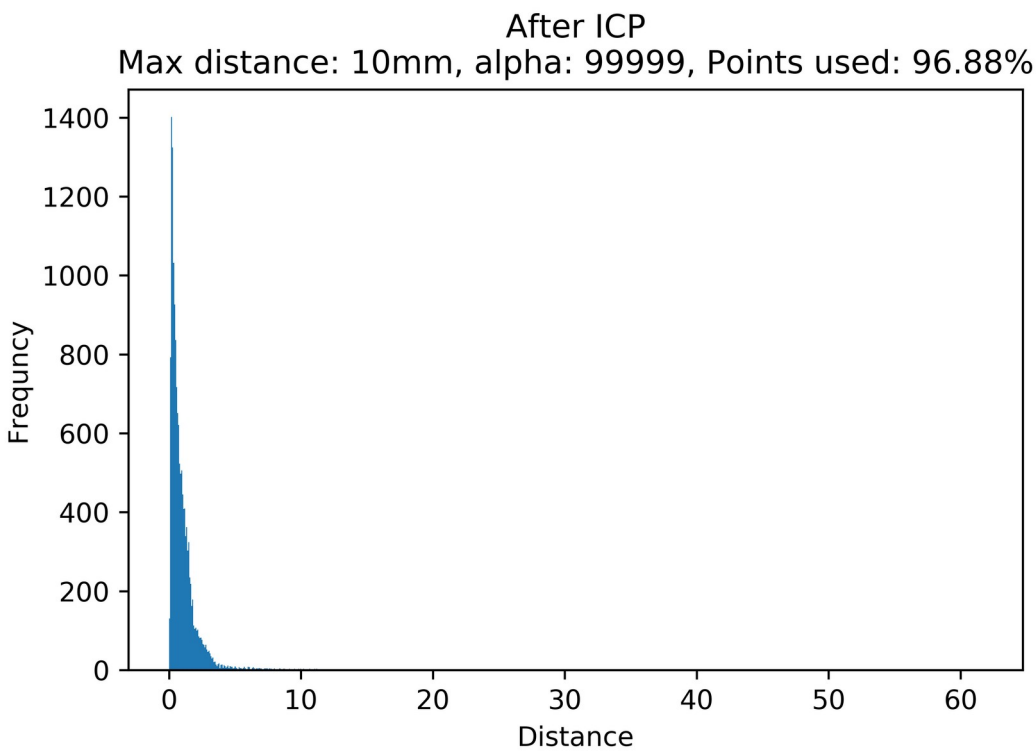
Experiment 3:
static = 150019/m_ex_atr-left_shore
moving = 150019/m_ex_atr-right_shore

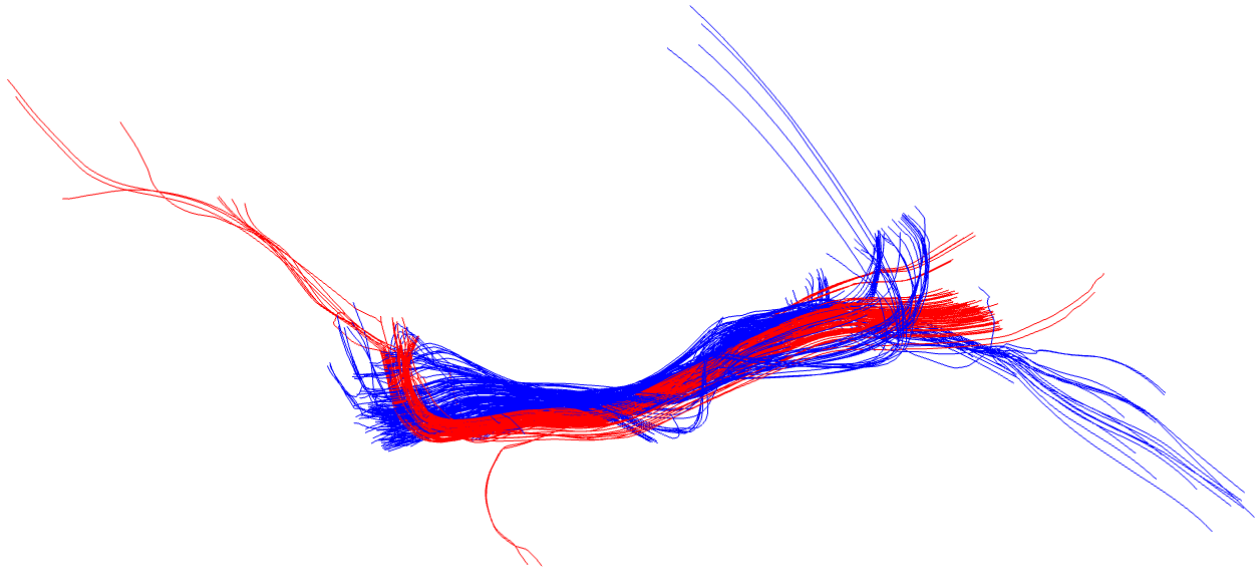




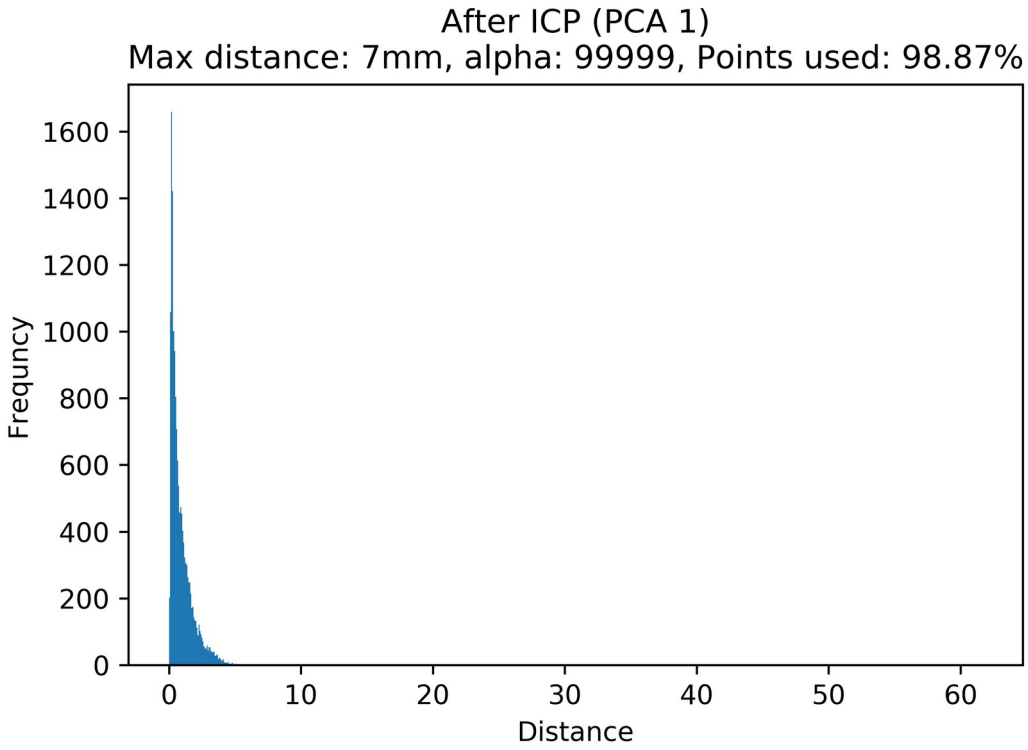

After PCA
1200
1000
800
600
400
200
0
Frequncy
0
10
20
30
40
50
60
Distance

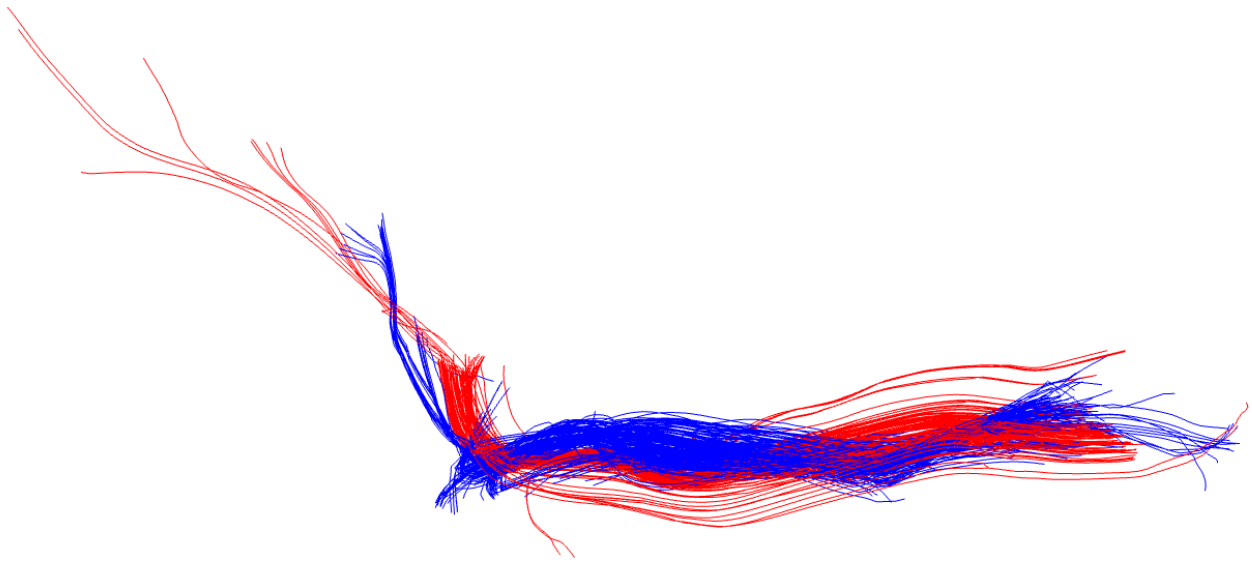



After ICP
Max distance: 10mm, alpha: 99999, Points used: 96.88%
Frequncy
Distance
0
200
400
600
800
1000
1200
1400
0
10
20
30
40
50
60

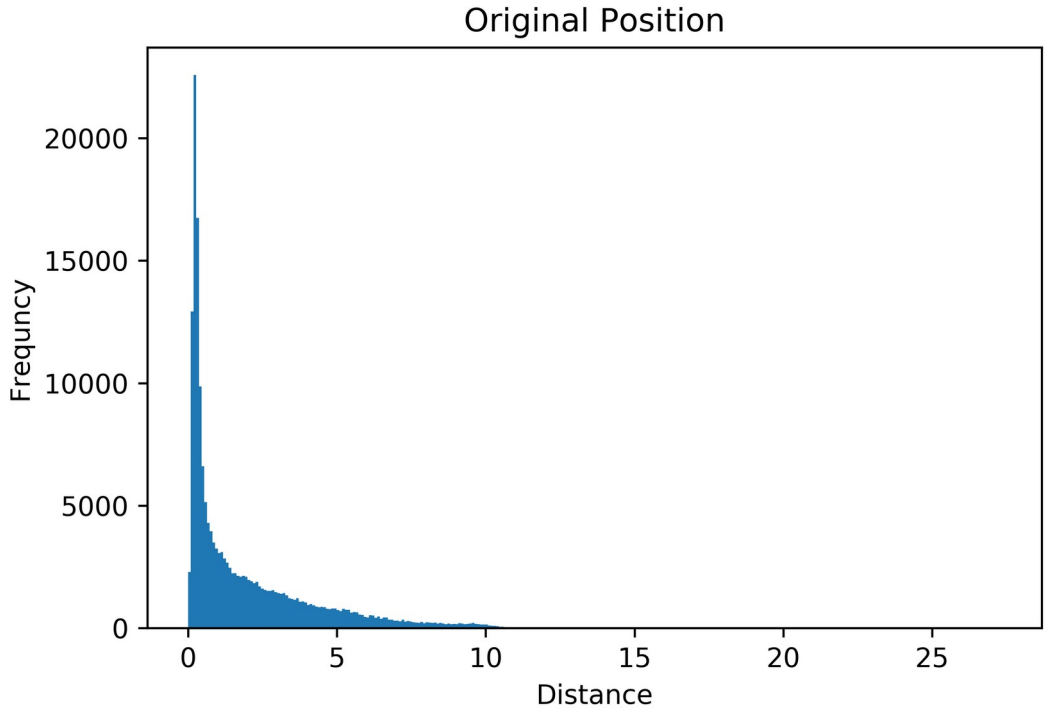


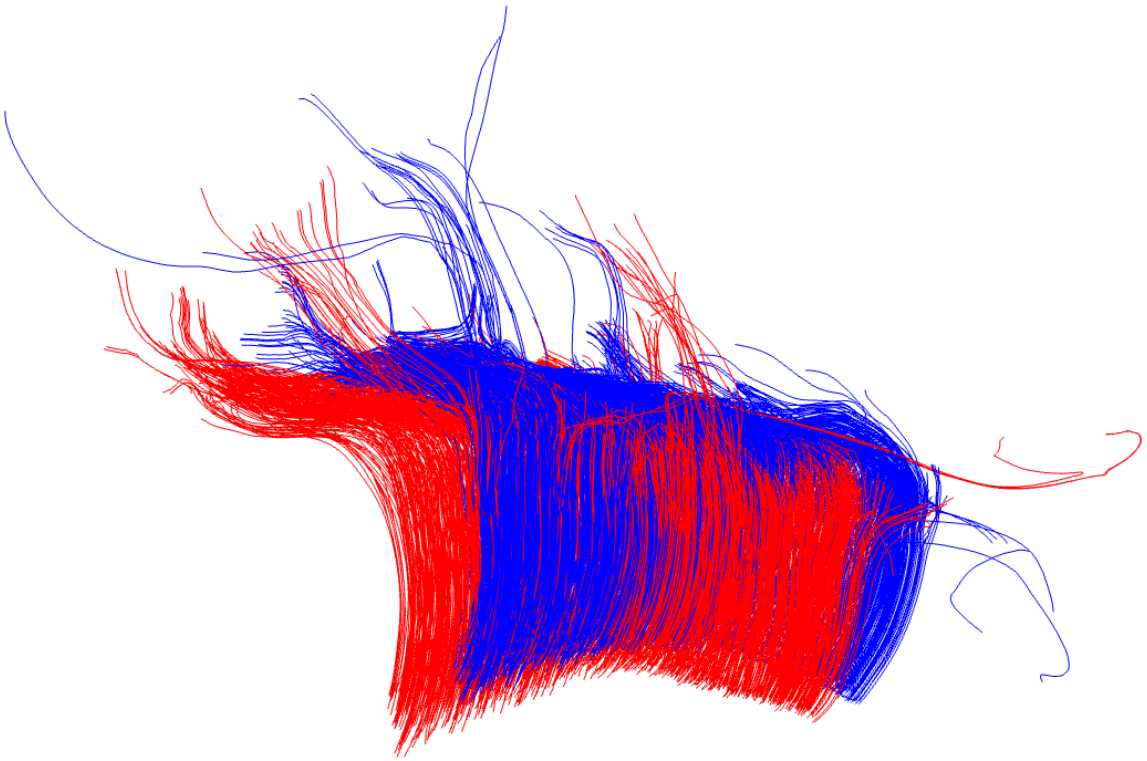
PCA without scaling to the $[-1, 1]^3$ cube

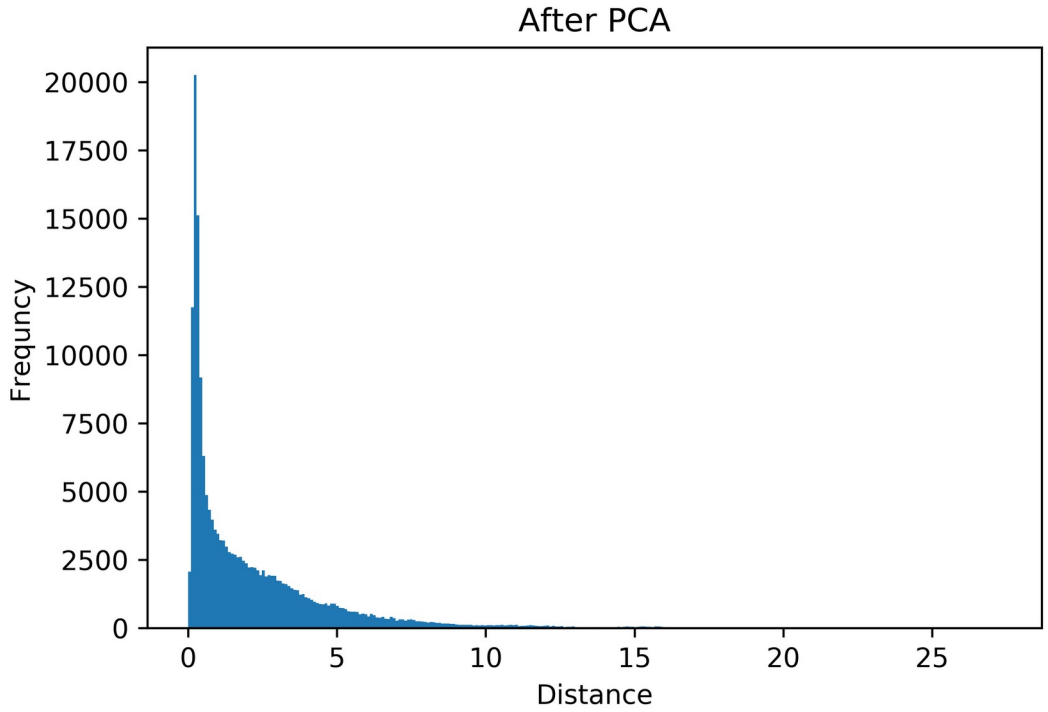


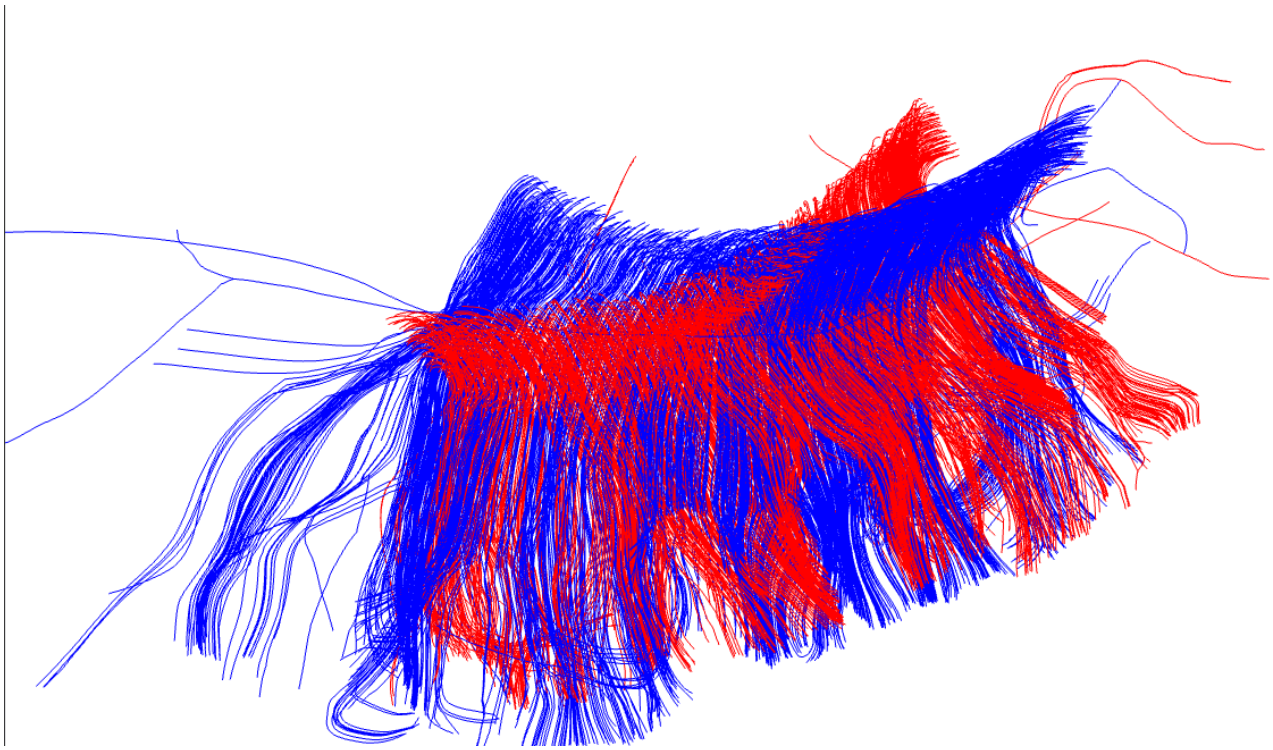


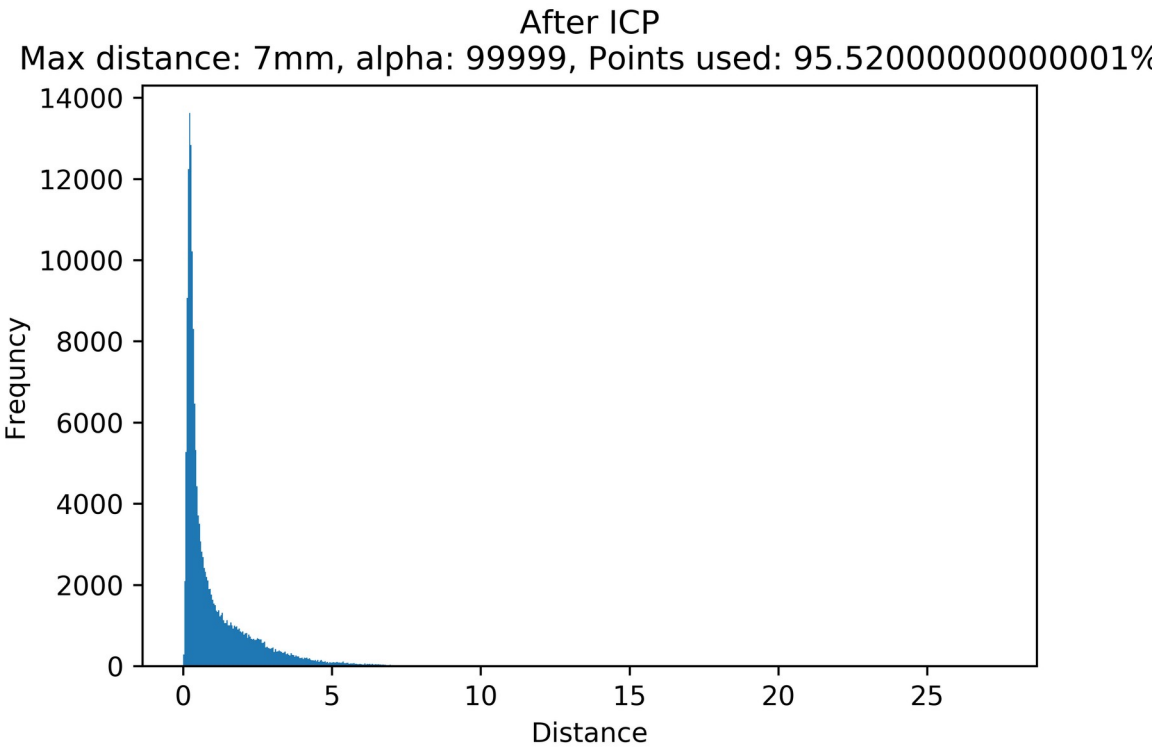
Experiment 4: it toke 5:47 time to solve it
static = 197348/m_ex_cc-body-left_shore
moving = 150019/m_ex_cc-body-left_shore






After PCA
Frequncy
Distance
20000
17500
15000
12500
10000
7500
5000
2500
0
0
5
10
15
20
25




After ICP
Max distance: 7mm, alpha: 99999, Points used: 95.520000000000001%
14000
12000
10000
8000
6000
4000
2000
0
Frequncy
0
5
10
15
20
25
Distance