

Assignment 1

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Exercise1. a) b): Elapsed time is 0.350650 seconds.

Table1.1: the parameter for $k = 5$

a	x	y	orientation
ai1	0.00250438198744826	-0.00432378702432522	0.000807837315929507
ai2	0.919758171529199	-0.00100147026158884	-0.0003190151029123
ai3	-0.00285535207851202	0.00144804828720766	0.998697948732513
ai4	-0.0007438465770773	0.467984381559631	0.000321416083203674
ai5	-0.00103415346607633	0.000568498345337269	
ai6	0.00137429795052544	-0.00252770680607277	
ai7	0.00248687885776969	-0.00102513134746689	
ai8	0.000136005129586942	1.92455105264461e-05	
ai9	-0.0002690815934465	-0.00167419363591913	
ai10	6.69261198540719e-05	-0.0006725380461257	
ai11	1.30609808751861e-05	-7.84620179300514e-06	
ai12	-0.00428157284345876	0.00347662125530497	
ai13	-4.51742614704263e-05	8.71551716809025e-06	

When $k = 2$

$P1 = 5$

$P2 = 3$

When $k = 5$

$P1 = 4$

$P2 = 1$

Exercise1. c)

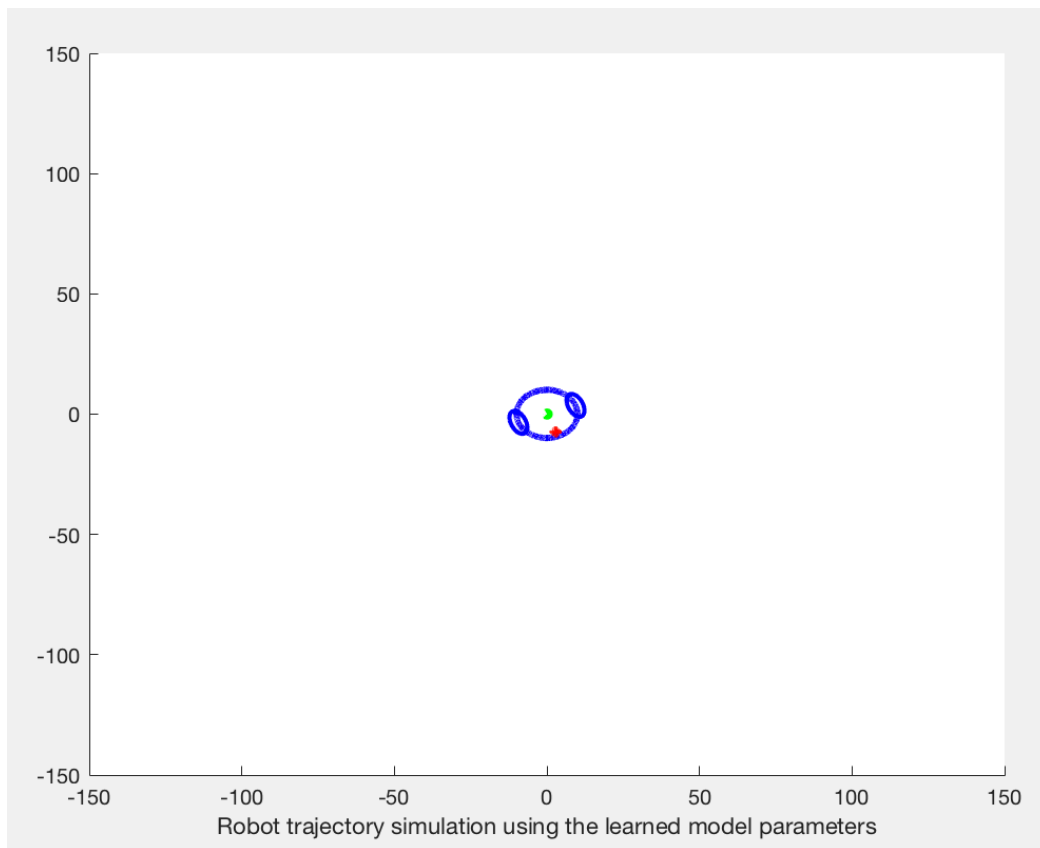


Fig1.1: $(v, w) = (0, 0.05)$

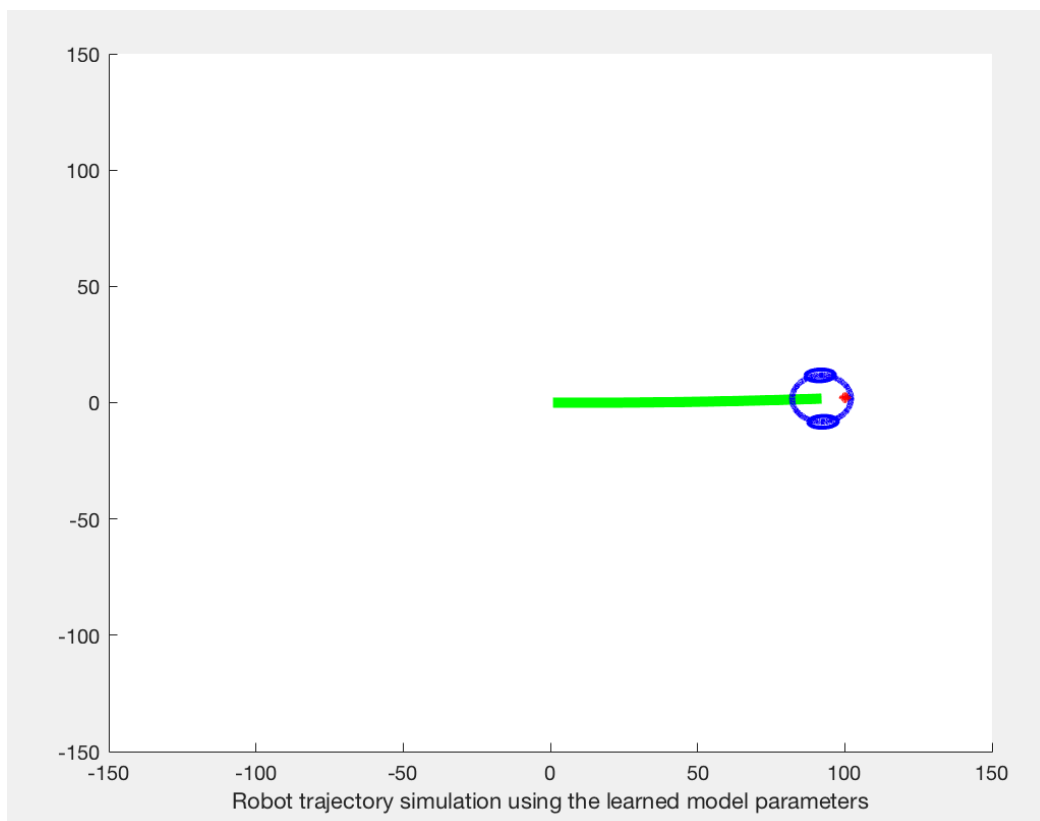


Fig1.2: $(v, w) = (1, 0)$

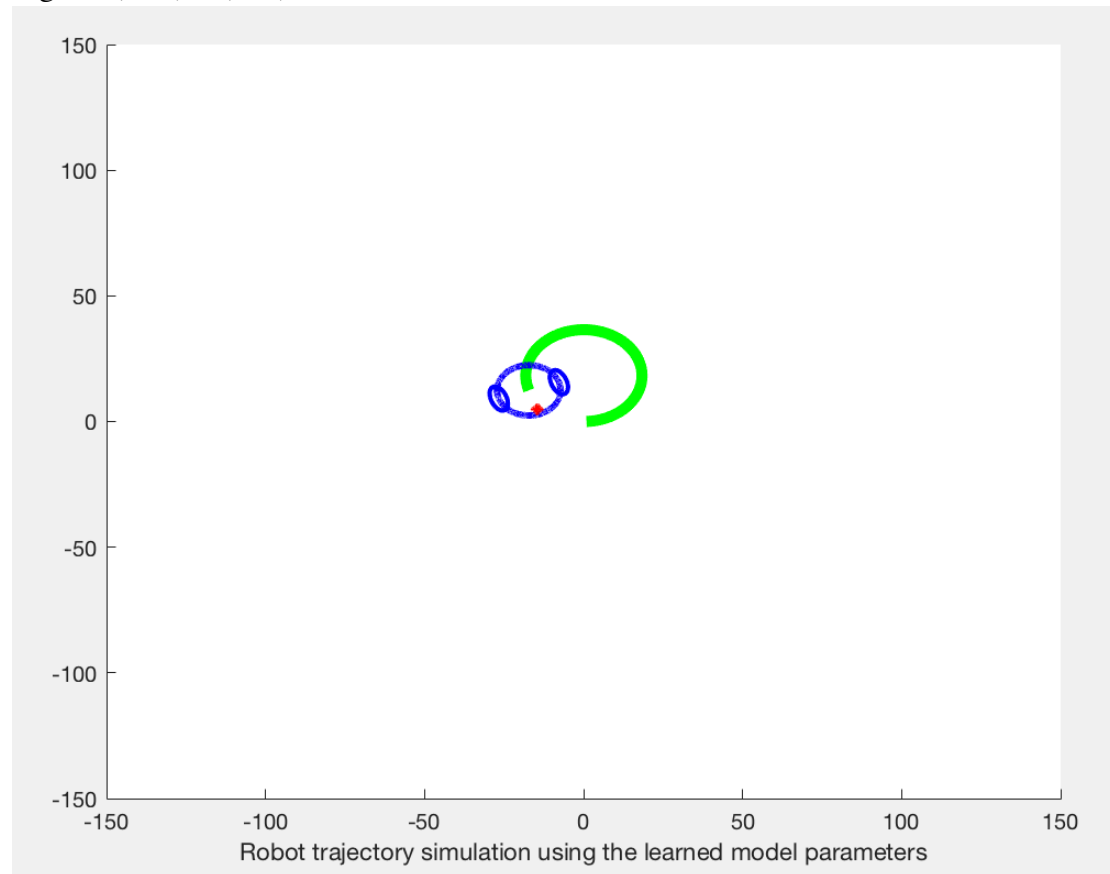


Fig1.3: $(v, w) = (1, 0.05)$

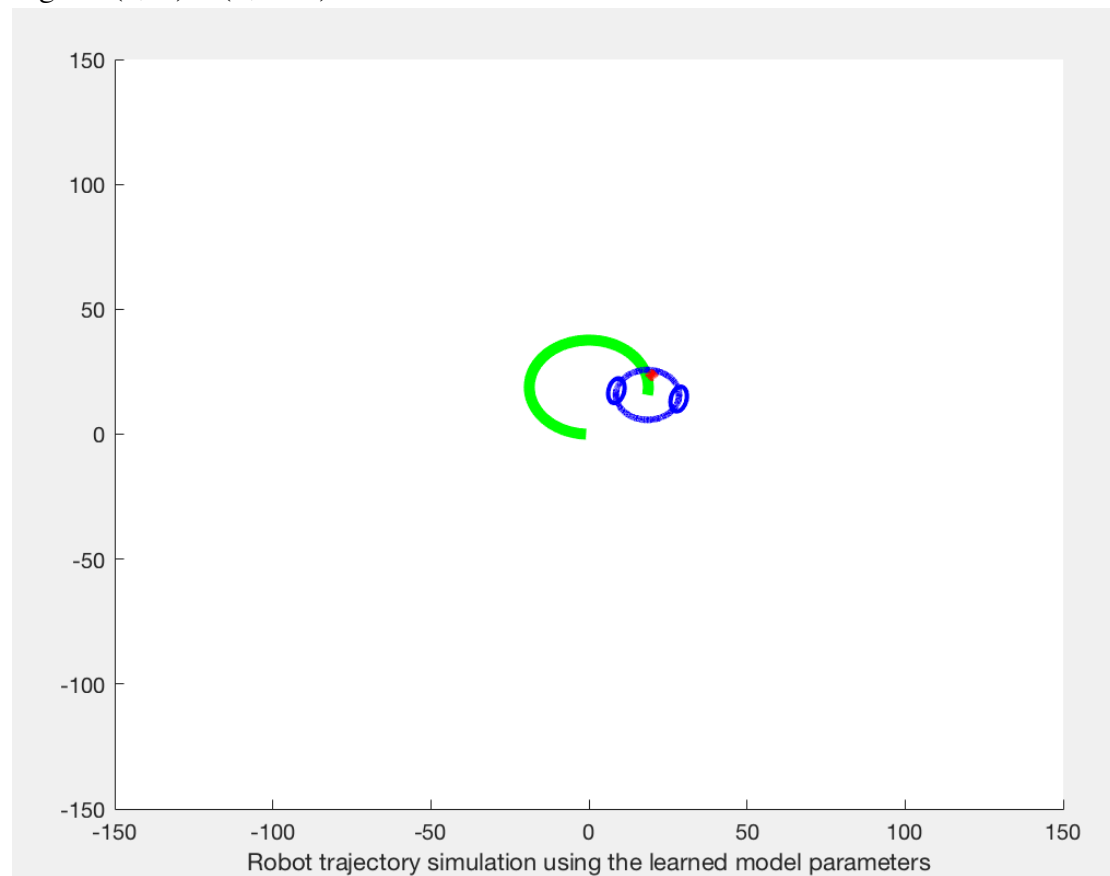


Fig1.4: $(v, w) = (-1, -0.05)$

Exercise 2: Elapsed time is 17.517029 seconds.

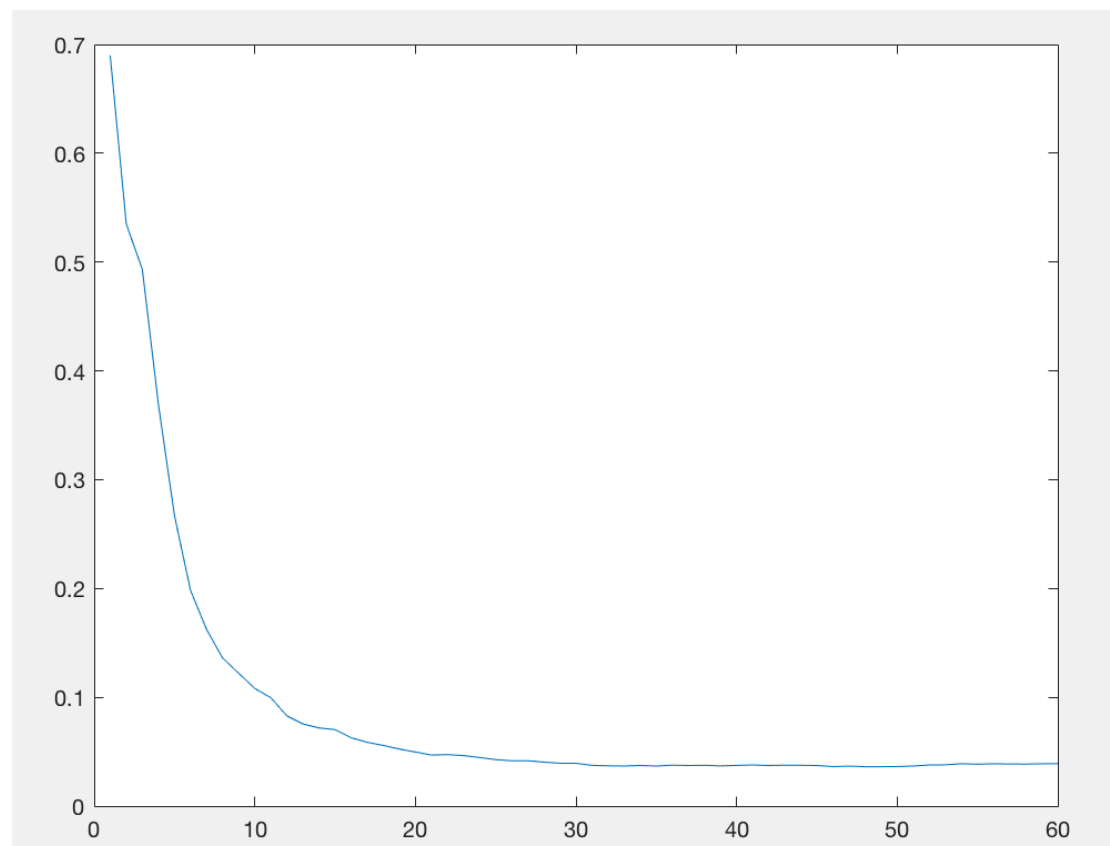
The optimal d value is 48

the classification error is 0.0362

Table2.1 Confusion Matrix

970	0	1	0	0	2	1	1	5	0
0	1098	11	1	2	1	1	0	21	0
3	0	1001	3	3	0	2	1	18	1
2	0	8	972	0	5	0	2	17	4
1	0	3	0	964	0	3	2	3	6
2	0	1	18	0	859	2	0	10	0
8	1	1	0	3	13	924	0	8	0
1	2	31	1	2	3	0	956	13	19
3	0	7	10	1	5	1	1	941	5
5	1	10	7	10	2	0	6	15	953

Fig2.1: the errors verse d from 1 to 60



Exercise3. a) b): Elapsed time is 0.716115 seconds.

Fig3.1: kmeans cluster for gesture 1, in which the big '*' are the cluster centers.

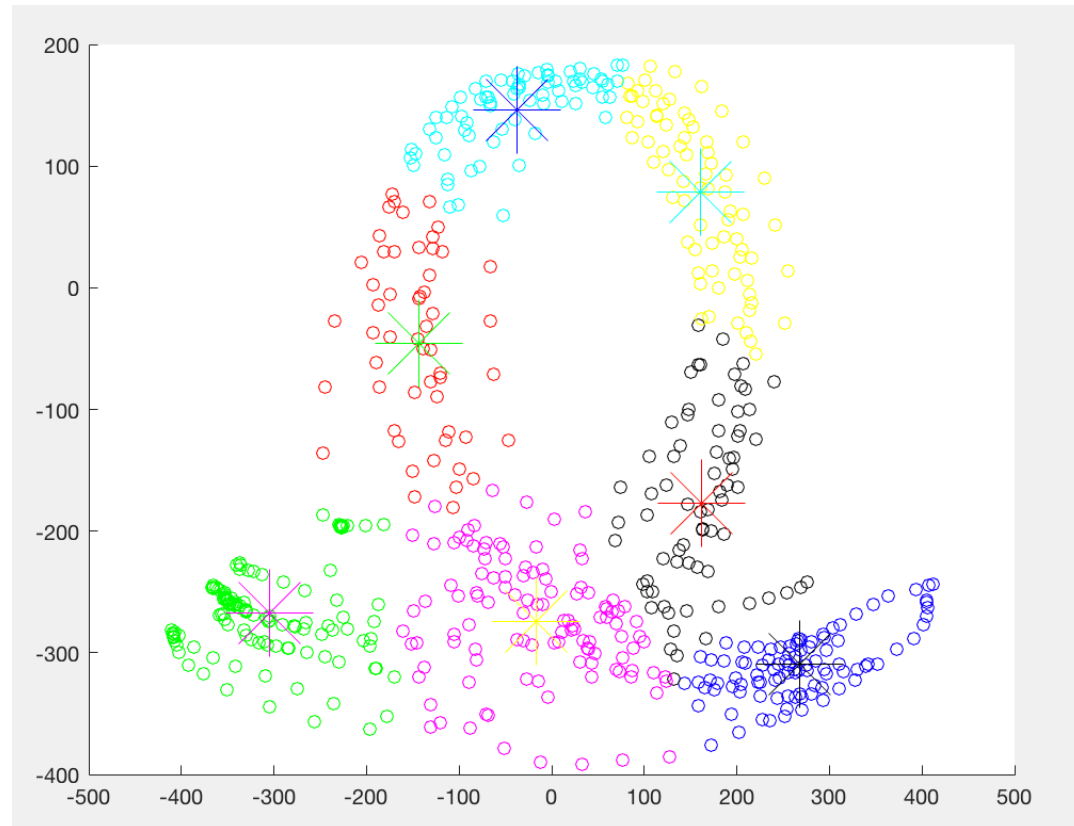


Fig3.2: nubs cluster for gesture 1, in which the big '*' are the cluster centers.

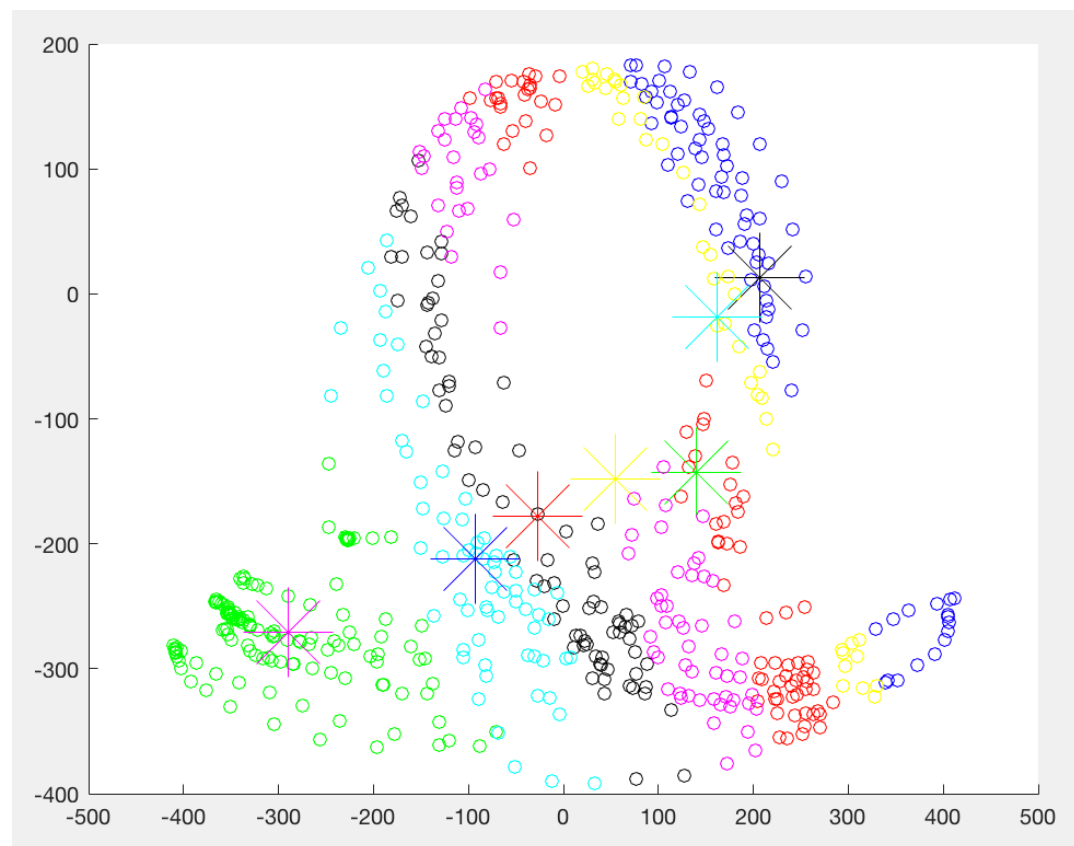


Fig3.3: kmeans cluster for gesture o, in which the big '*' are the cluster centers.

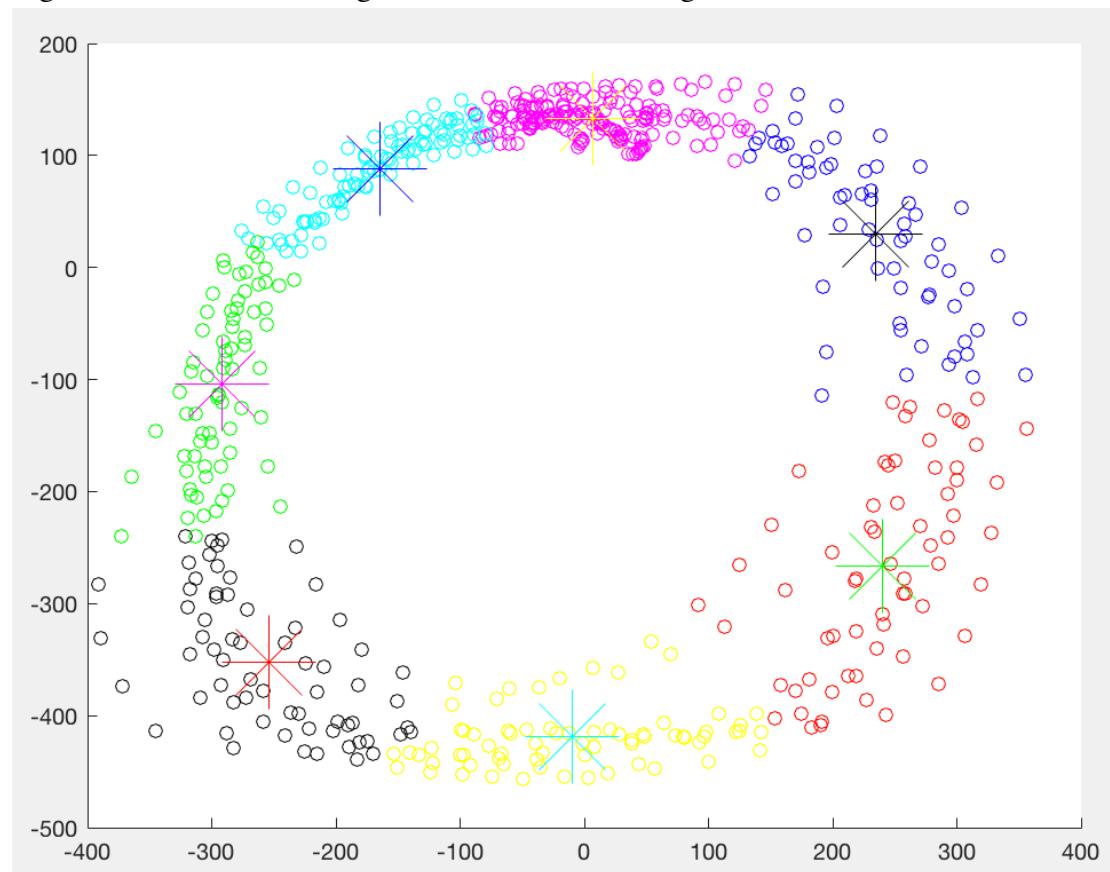


Fig3.4: nubs cluster for gesture o, in which the big '*' are the cluster centers.

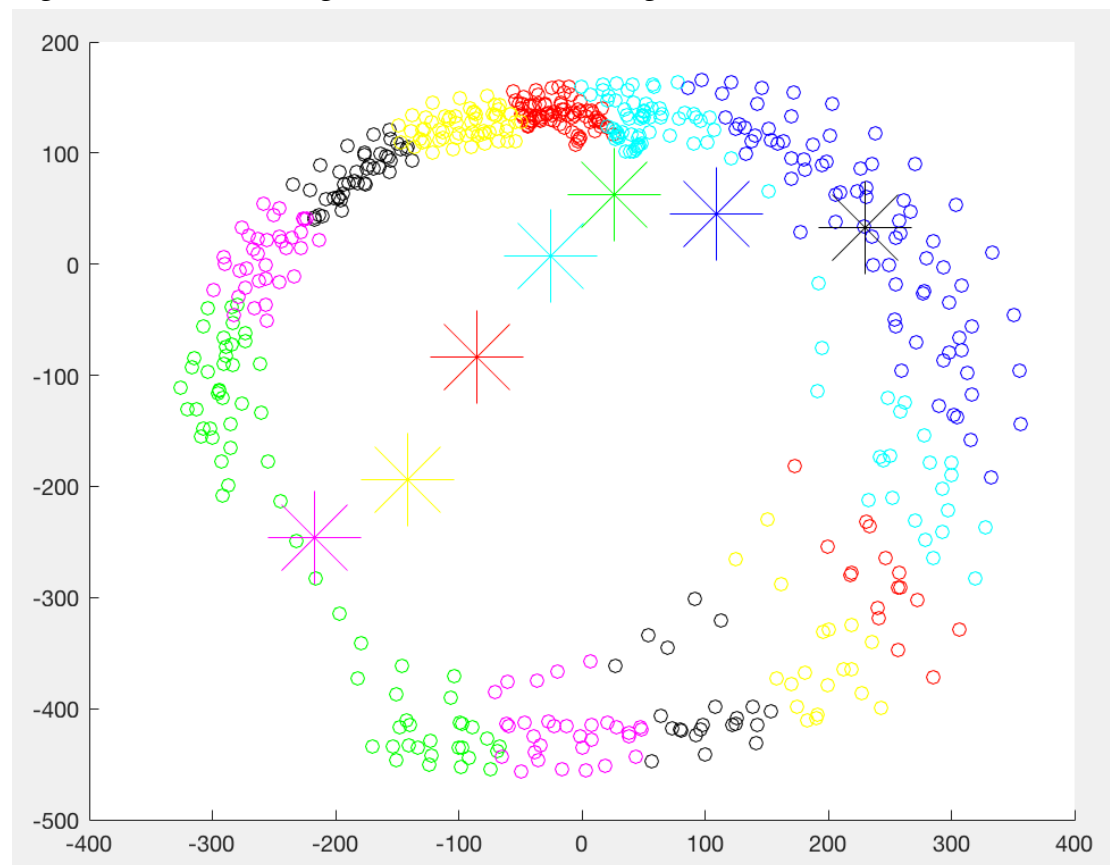


Fig3.5: kmeans cluster for gesture x, in which the big '*' are the cluster centers.

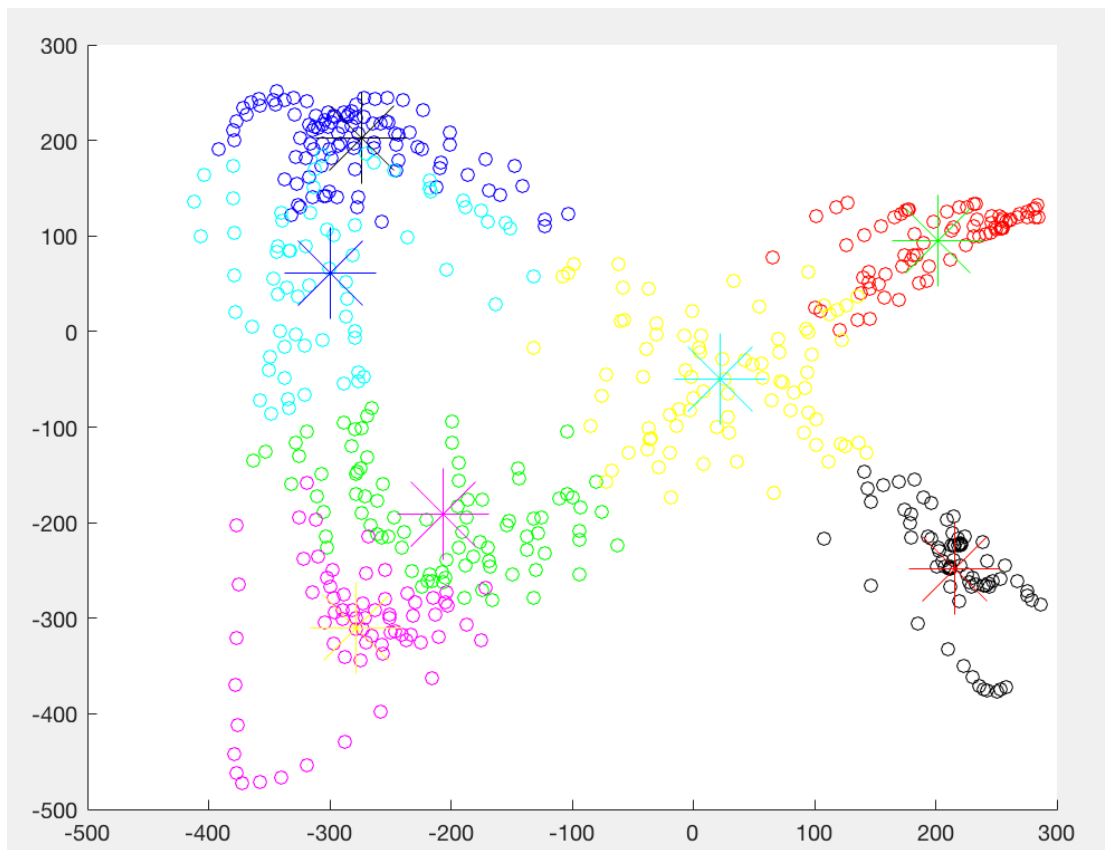


Fig3.6: nubs cluster for gesture x, in which the big '*' are the cluster centers.

