1. Last week we already have random walks of particles in the micro-channel. We notice that after 200 steps of random walk, particles form interesting texture corresponding the structure of the map. This gives us a hint that we can use these random walks to find approximate distribution of paths and obstacles of the map and then apply aggregation.
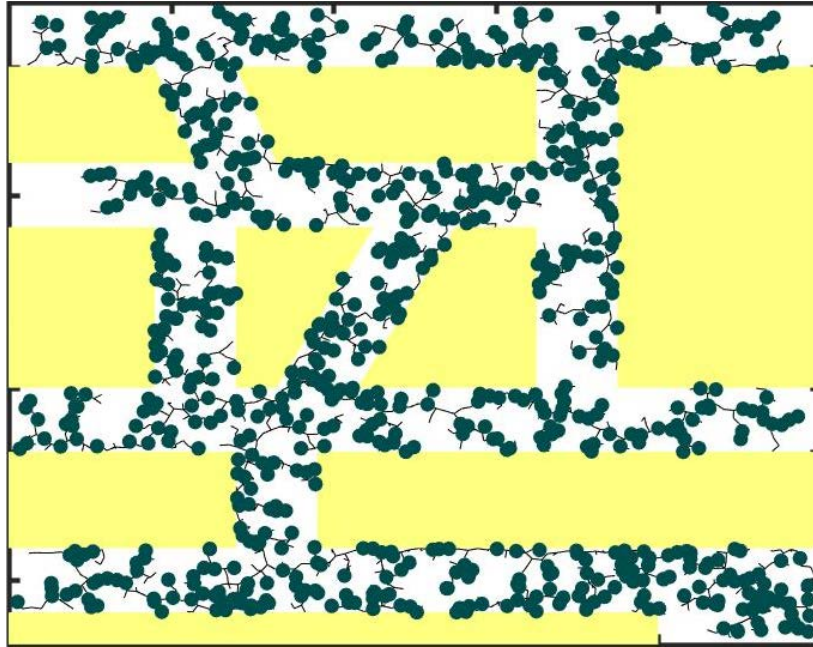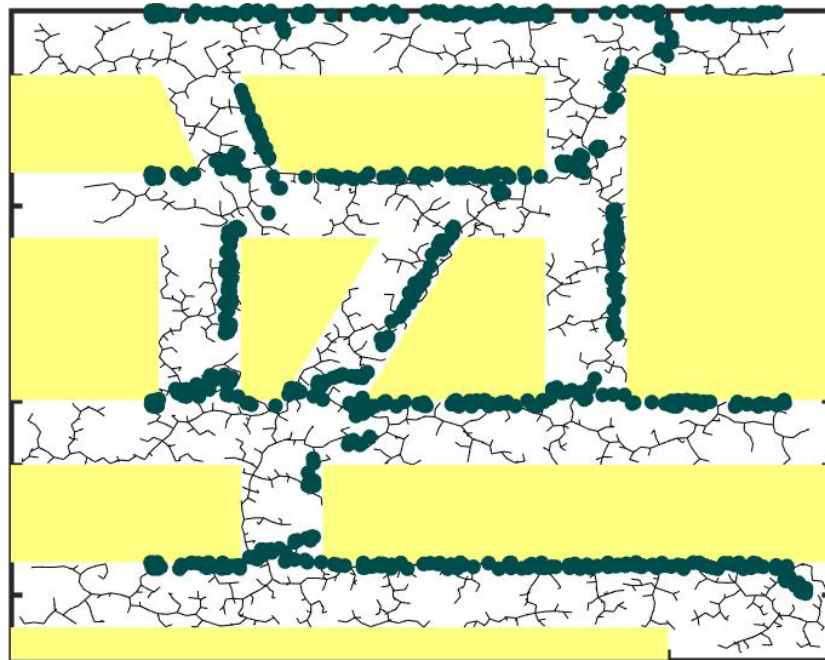
Fig. 1 Swarms before random walks

Fig. 2 Swarms after 200 steps random walks

2. Hough Transform

To specify these dominant textures, we use Hough transform to make statistics. The Hough transform gives starting and ending points of lines in the plot, and the slopes. And we can move particles following the dominant slope (angle), so as to find the free path in the micro-channel.
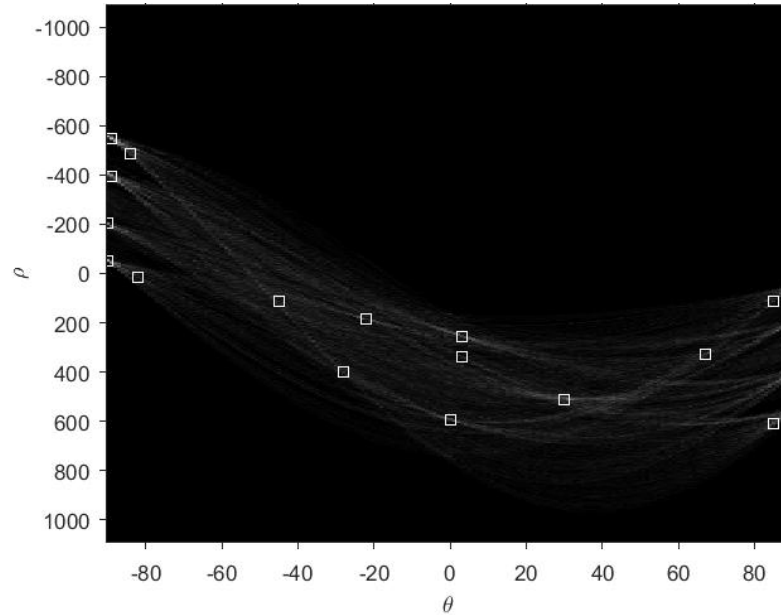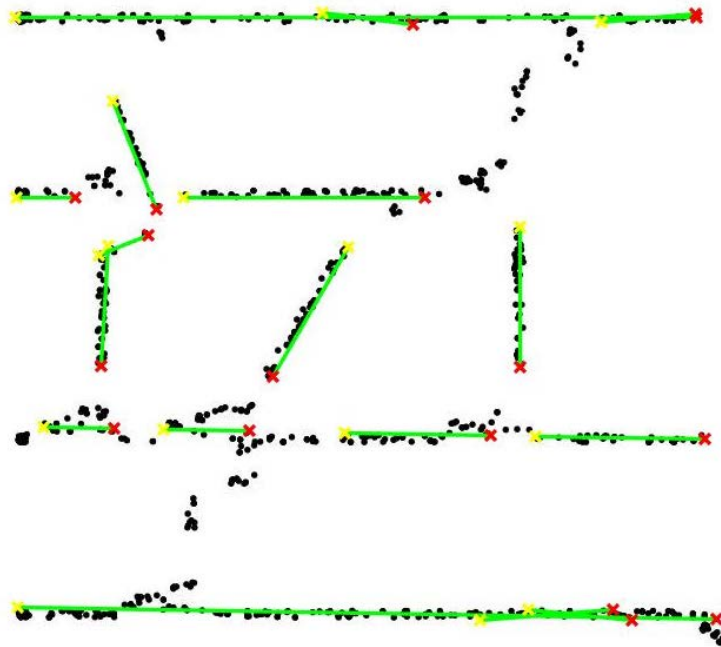
Fig. 3 Hough Transform of fig. 2

Fig. 4 Lines detected in Fig. 2 after Hough transform

3. Now we have entropy, cost function (provided by RRT), and dominant angle as three variables in the reward function. Next step would be how to use these key facts to improve manipulation.