

김종윤

2023-28318

협동과정 인공지능 전공

소셜컴퓨팅

과제 4 - 5주차

1. Network Book Exercise 4.6 - Q2 ~ 4

1.1.Q2

1.1.1. a)

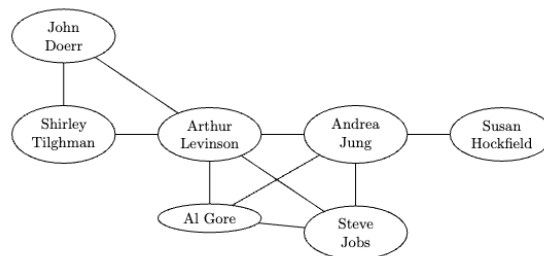


Figure 1: Projected graph of given affiliation graph, figure 4.4

1.1.2. b)

Let's assume there is a new affiliation between 'Al Gore', 'Steve Jobs' and 'Andrea Jung' which is not having focus on either 'Apple' or 'Disney'. Let's assume the new focus is 'OpenAI'.

This will not disrupt the affiliation networks as they already had relationship because of 'Apple'.

However, when reconstructing the affiliation network with new focus 'OpenAI' will be confusing as they had huge relationship of 4 people. This will lose information that the three people are having same focus 'OpenAI'.

1.2.Q3

1.2.1. a)

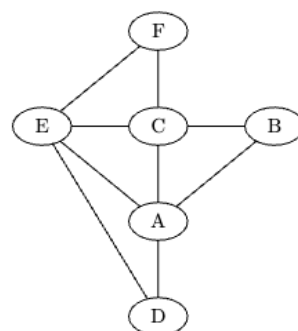


Figure 2: Projected graph of given affiliation graph, figure 4.21

1.2.2. b)

The node A is having focus on X, Y.

The node C is focusing on X, Z.

The node E's focus is Y and Z.

As the node A, C and E are having triadic closure, they all may have same foci, X, Y and Z, in some time after.

1.3.Q4

1.3.1. a)

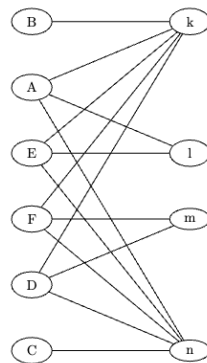


Figure 3: Affiliation network of given projected graph, figure 4.22

1.3.2. b)

To build the affiliation network with minimum foci, node should be considered in descending order of number of connection between other nodes.

Therefore, there can be a foci "k" and "n" which is constructed based on node B and C in projected network.

After put a foci "k" and "n", only two edges are left: A-E, F-D.

In conclusion, minimum 4 foci are needed to construct affiliation network from given projected network.

2. Schelling Segregation Model

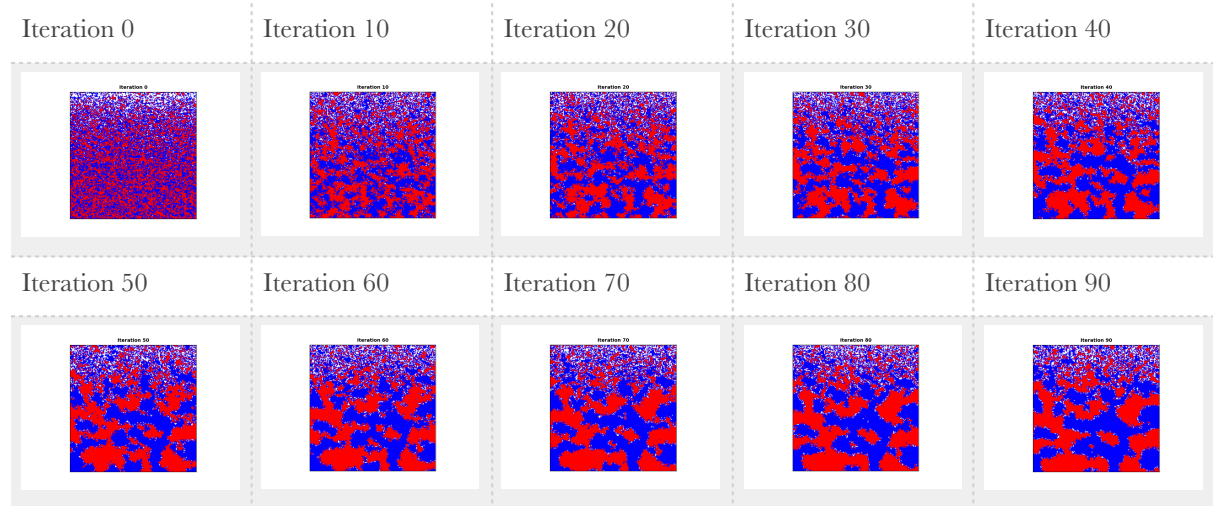
All the modelling for this assignment follows given settings.

World Space: 150 rows, 150 columns

2.1. Two Ethical Group, Equal ratio, 2500 empty cells

For this simulation, similarity threshold is set as 0.8 and maximum iteration is 100.

After iteration 10, each ethical groups start to gather together. Although the similarity threshold is high (0.8), each groups find comfort zone quickly.



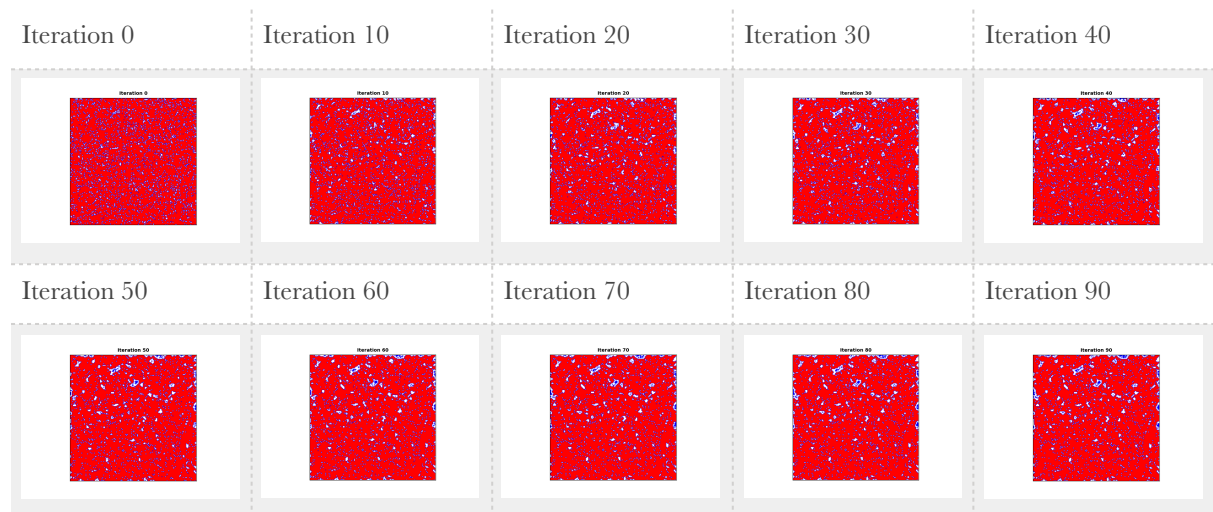
2.2. **Minority** Ethical Group

Let's assume there are two ethical group where one has ratio of 1% of overall population whereas the other consists 99% of the overall group.

Other settings such as number of empty house, similarity threshold and maximum iteration are set as same as section 2.1.

Because the minority ethical group consists 1% of total population, it is quite difficult to see the changes. However, even the minority group starts to gather after 20~30 iteration.

One thing noticeable is as the minority group has difficulty to find the comfort zone contrast to majority which is easy to find similar neighbour, the iteration keep runs until the maximum just for few members of minority.



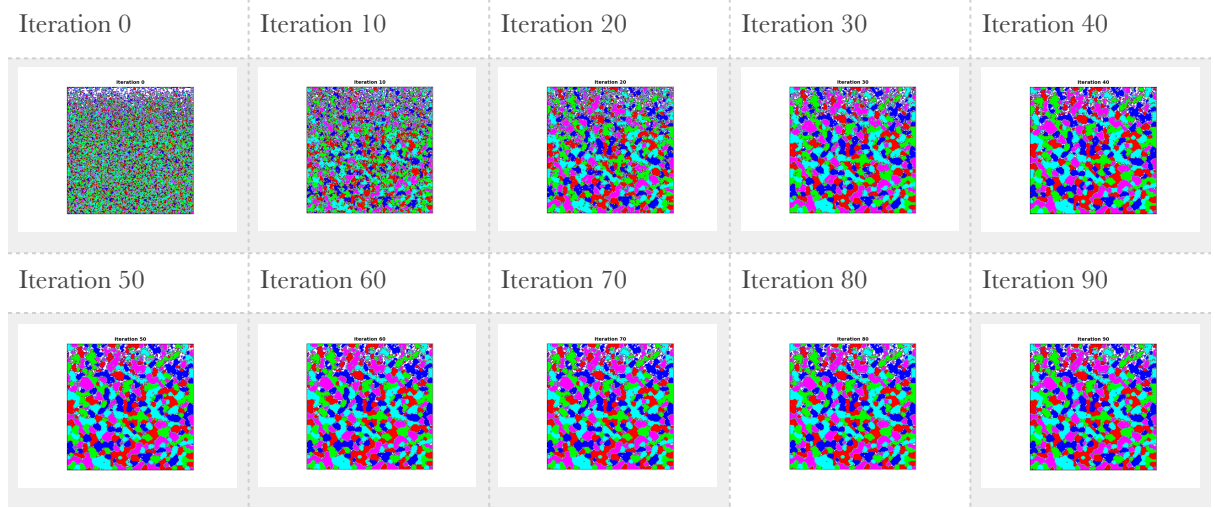
2.3. **Multiple** Ethical Group

Let's assume there are four ethical group where each group has equal ratio for non-empty houses, 25%. In addition, the similarity threshold is set a 0.5 as 0.8 takes extremely long time to converge to 0 change and even not converges.

Other settings such as number of empty house and maximum iteration are set as same as section 2.1.

Although there are multiple group, the groups starts to group together after 10~20 iterations.

However, the difficulty of finding satisfying place increases than two ethical groups, this leads to long iteration for few members.



2.4. Ablation Study

While conducting experiments in section 2.1 to 2.3, setting appropriate similarity threshold, number of empty houses, race ratios are difficult.

Where number of empty houses and race ratios can be easily set by following real data but setting this parameters also as hyper-parameter will find the relationship between each parameter and saturation of number of changes in each simulation step. While comparing figure 4-left and 5, increasing empty houses leads to faster saturation of number of changes which also means the populations in the world fit into comfort zone faster.

For race ratio, if the minority ethical group is 10 ~ 20%, then the group has extreme difficulty of finding comfort place. For 1%, because the majority group already fit into satisfying house, it is difficult to find comfortable house for minority group. Therefore, number of changes do not saturate from lower value.

The 50% race ratio drawn on the right of figure 4 is used as baseline although it is not a minority group.

By comparing four lines in figure 6, when there are more ethical groups, it takes more iterations to saturate the number of changes. In addition, smaller similarity threshold will lead to faster saturation trivially. (small similarity threshold means the people will fit into place even there are different group in neighbour)

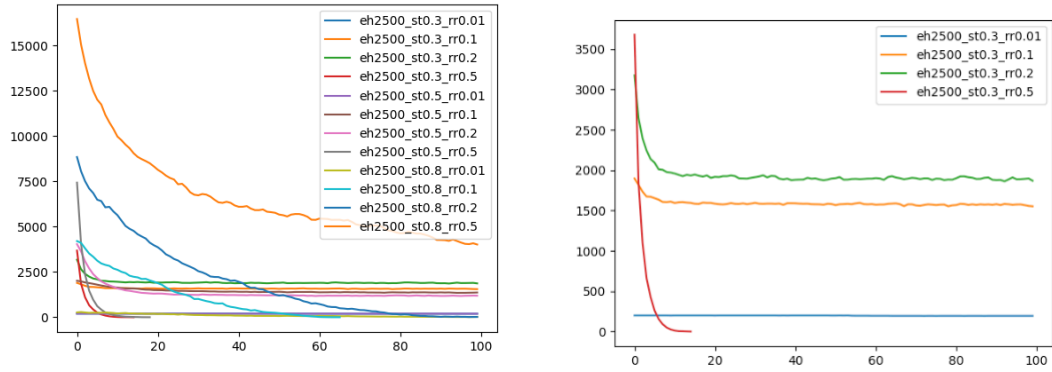


Figure 4: graph of number of changes (y-axis) - step (x-axis) for 2500 empty houses
 (eh: empty houses, st: similarity threshold, rr: one race ratio; as two race used only one is needed)
 (right: empty houses=2500, similarity threshold=0.3 only)

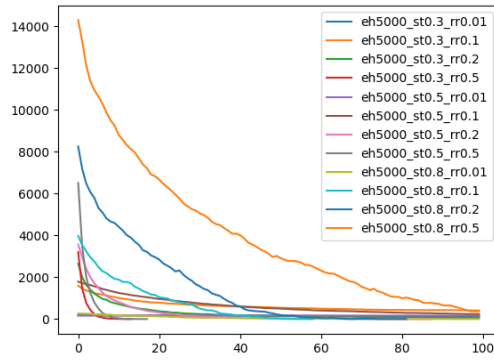


Figure 5: graph of number of changes (y-axis) - step (x-axis) for 5000 empty houses
 (eh: empty houses, st: similarity threshold, rr: one race ratio; as two race used only one is needed)

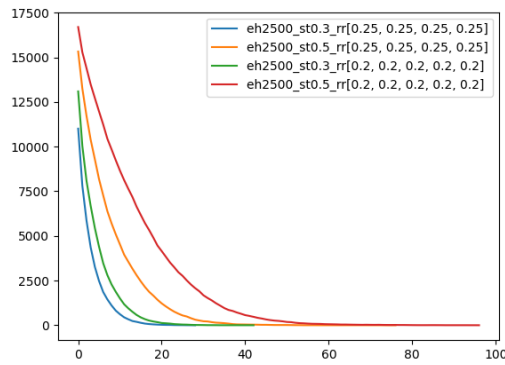


Figure 6: graph of number of changes (y-axis) - step (x-axis) for different size of ethical groups
 (eh: empty houses, st: similarity threshold, rr: race ratios)