Shane Sarnac
CSCI 3202
Problem Set 4
Fall 2017

Problem 4.1

Output:

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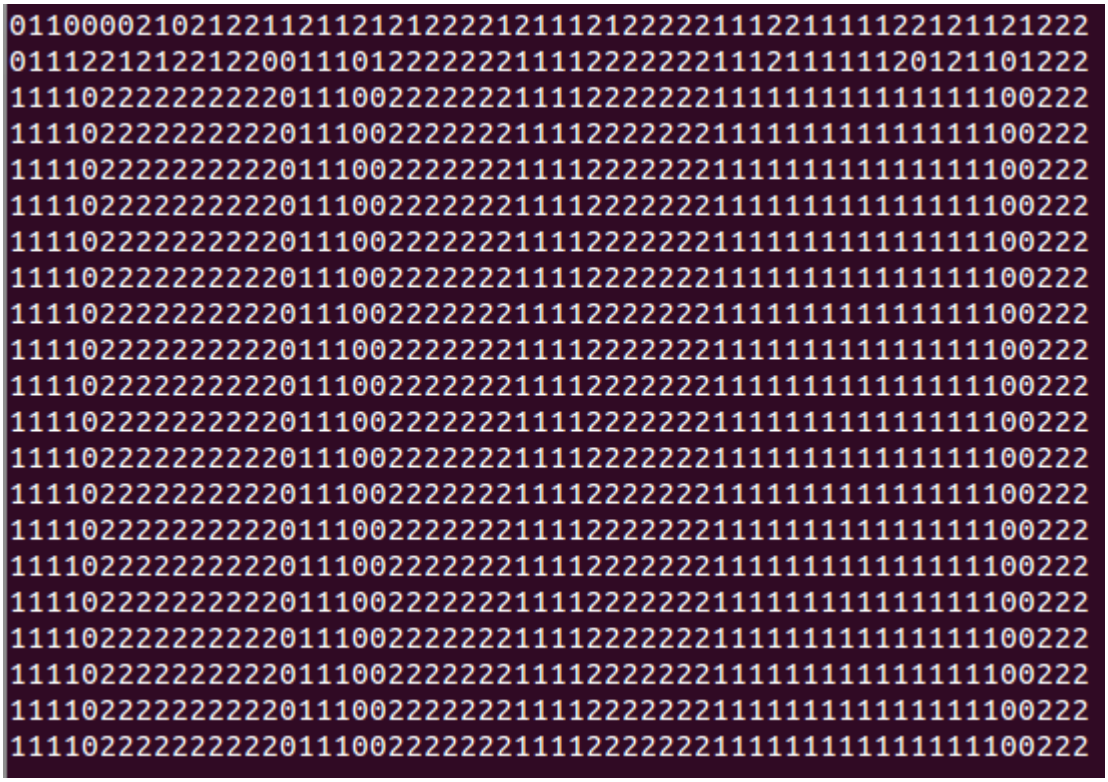
Iteration: 0, Weights = -0.8656469494051806,-0.4609708697328927,-0.5316674550785798,-1
Iteration: 5, Weights = -0.5915395889725564,-0.4444115615288309,-0.29933373144198683,-1
Iteration: 10, Weights = -0.19467641233814018,-0.38444928145530255,0.04627211206055163,-1
Iteration: 15, Weights = 0.2928292642736138,-0.3113176196883515,0.47404248808605826,-1
Iteration: 20, Weights = 0.6193647295933138,-0.351794759366568,0.7490838134825926,-1
Iteration: 25, Weights = 0.7705855078015033,-0.4635135872067986,0.8652260918048704,-1
Iteration: 30, Weights = 0.8508143280790135,-0.5701097861066806,0.9219655226447535,-1
Iteration: 35, Weights = 0.9017717488905633,-0.6545547627962289,0.9568444684090099,-1
Iteration: 40, Weights = 0.9373488120989167,-0.7186617742233319,0.9812127402487848,-1
Iteration: 45, Weights = 0.9632571962551736,-0.7669859842501556,0.999196765409892,-1
Iteration: 50, Weights = 0.9825035915602022,-0.8034910980378258,1.0127787809861089,-1
Iteration: 55, Weights = 0.9969561973032568,-0.8311799273883459,1.0231468048725996,-1
Iteration: 60, Weights = 1.0078822324660115,-0.8522643688634648,1.0311066780213263,-1
Iteration: 65, Weights = 1.0161804696813772,-0.868372934770187,1.0372386907588087,-1
Iteration: 70, Weights = 1.0225042007315759,-0.8807126331710964,1.0419731026696835,-1
Iteration: 75, Weights = 1.0273355337494832,-0.890185007890075,1.0456339740036686,-1
Iteration: 80, Weights = 1.031033932734453,-0.8974681719829538,1.0484676810899738,-1
Iteration: 85, Weights = 1.0338694238746993,-0.9030751691988965,1.0506626909271446,-1
Iteration: 90, Weights = 1.0360459879538455,-0.9073959898890731,1.0523637835012971,-1
Iteration: 95, Weights = 1.0377183775122096,-0.9107281964627358,1.0536825130596523,-1
```

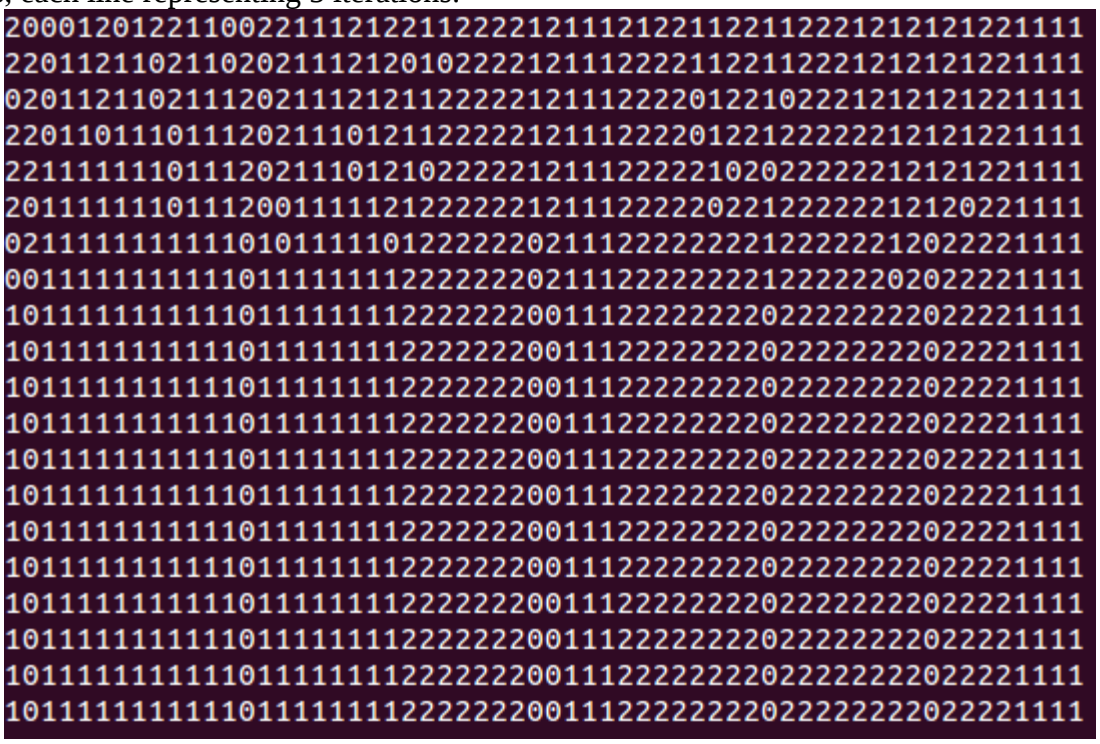
Note: The weights in the output given above are listed in the order: A, B, C, D. For this output, I let $\alpha = 0.5$, which allowed the weights to normalize quickly. While these edge weights are approaching the theoretical solution of (1,-1,1,-1), the errors remain pretty high and consistent, even with many iterations.

Problem 4.2

Output:



Note: Each line represents the city after 20 iterations for a total of 400 iterations. Note that the city becomes stable within the first 60 iterations. Consider the following which shows the city after 100 iterations, each line representing 5 iterations:



Much like the first output above, the city reaches a steady state within 60 iterations (albeit normalizing around 50 iterations). This shows that neighborhoods will form if it is assumed all people will want to have two neighbors be like them as the clusters are pretty clearly identifiable.