

Osmond Gunarso

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CSS 499

End of term report

## Algorithm

### *Data types*

The FLuTE simulation is comprised of two primary data types people and communities. A person is a representation of an actual person in the simulation. They carry with them information about where the agent lives, what their age is, and information needed to calculate the likelihood of getting infected. In the FLuTE simulation most of the data used in computation is carried in the agent as opposed to being kept in the places which is the norm. The community represents a few different types of communities: schools are daytime communities made entirely of children; work groups are daytime communities made of adults from different neighborhoods; neighborhoods are communities of 1/4 of the total community size; household clusters which are clustering's of about 4 families.

### *Computation*

Execution of the FLuTE simulation happens in two distinct steps: day and night. During the day time people migrate to their daytime communities if they have them. These are schools for children and work groups for adults. Each member of the community then comes into contact with every other member of the community enabling the spread of the virus. Individuals can then increase or decrease the likelihood of infection based on vaccination policy, age, or how aggressive the virus being simulated is. It is during the daytime step where people will migrate to communities outside of their tract or home community. It is through these migrant workers that a virus can be spread between large communities. The case where an individual has been quarantined or is unemployed will result in the person not having a daytime community, preventing them from becoming infected during the day. The night time step then involves a similar process as the daytime step. The simulation will iterate through every member of the nighttime community and check if they are in the same household, cluster, and neighborhood and increase the likelihood of infection based on which groupings the individuals share.

## MASS

Parallelization of the FLuTE simulation will involve parallelizing the spread of the infection between individuals. Because individuals cannot directly communicate to each other in the MASS library either the spread of infection needs to be handled by the place, as in the community class will loop over the available individuals and assign infection status accordingly, or each individual will leave its infection status in the community and then evaluate the status of other members in the community. It is possible, with the second implementation that we will see an increase in performance because more of the work may be parallelized. It is also a strong possibility that the number of collisions caused by the sheer number of agents will cause the simulation to slow down. In order to get a proper sense of the performance metrics of either implementation we will need to benchmark both simulations, the goal for the upcoming spring quarter.

## Metrics

### *Performance*

$R_0 = 1.6$ ; 283 communities; 124 tracts

- 2 proc 117 seconds
- 1 proc 117 seconds

$R_0 = 1.6$ ; 5597 communities; 2049 tracts

- 2 proc 2424 seconds
- 1 proc 2340 seconds

### *Distribution*

<b>USA</b>	<b>LA</b>	<b>Seattle</b>
0 has 1891 tracts & 4121 communities.	0 has 1 tracts and 3 communities.	0 has 1 tracts and 3 communities.
1 has 1922 tracts & 4514 communities.	1 has 0 tracts and 0 communities.	1 has 0 tracts and 0 communities.
2 has 2195 tracts & 5148 communities.	2 has 0 tracts and 0 communities.	2 has 0 tracts and 0 communities.
3 has 1634 tracts & 4157 communities.	3 has 2048 tracts and 5594 communities.	3 has 123 tracts and 280 communities.
5 has 1852 tracts & 3854 communities.		
7 has 2153 tracts & 5323 communities.		
8 has 1106 tracts & 2678 communities.		
10 has 2026 tracts & 4170 communities.		
11 has 1982 tracts & 3955 communities.		
12 has 1974 tracts & 4148 communities.		
13 has 2098 tracts & 4615 communities.		
14 has 1832 tracts & 3463 communities.		
15 has 2228 tracts & 4223 communities.		
16 has 1982 tracts & 4228 communities.		
17 has 1972 tracts & 4032 communities.		
18 has 2111 tracts & 4545 communities.		
19 has 1839 tracts & 3545 communities.		

<p>21 has 2037 tracts &amp; 4949 communities.</p> <p>22 has 1986 tracts &amp; 3783 communities.</p> <p>23 has 2061 tracts &amp; 4034 communities.</p> <p>24 has 2021 tracts &amp; 4128 communities.</p> <p>25 has 2025 tracts &amp; 4193 communities.</p> <p>26 has 1936 tracts &amp; 4333 communities.</p> <p>27 has 2056 tracts &amp; 4980 communities.</p> <p>28 has 1887 tracts &amp; 4489 communities.</p> <p>30 has 2020 tracts &amp; 4380 communities.</p> <p>31 has 2027 tracts &amp; 4213 communities.</p>		
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