Student Name：**Jiachen Luo (001061582) Hongyao Tao(001067209)**

**INFO 6205**

**Program Structure & Algorithms**

**Spring 2021**

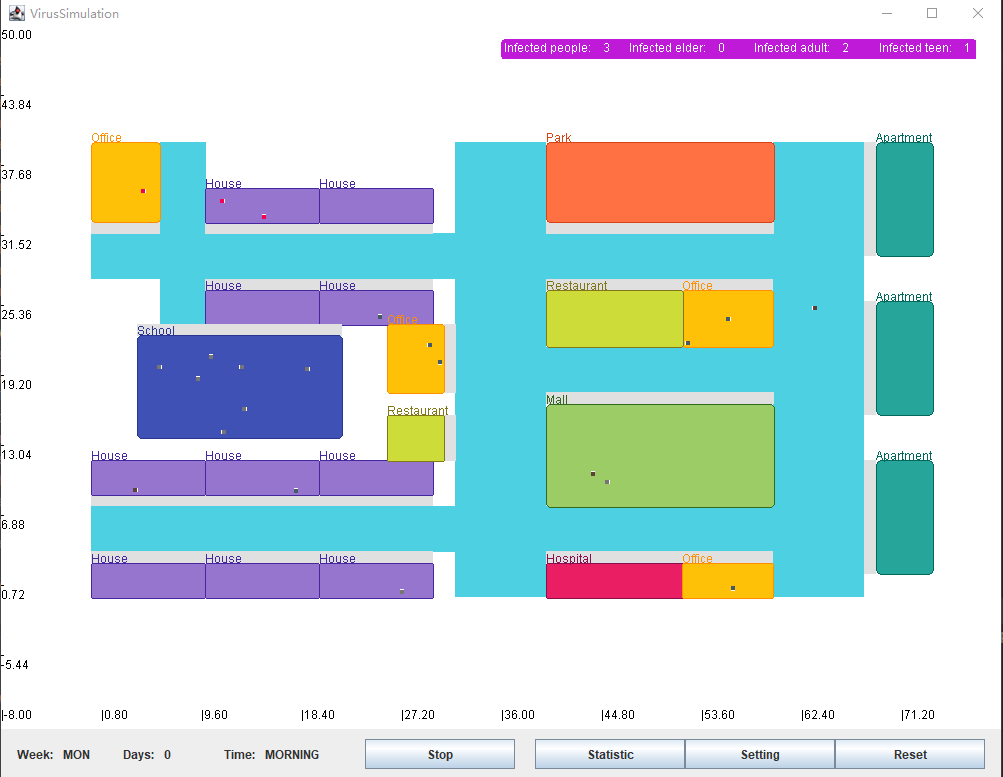
**Final Team Project**

**Task:**

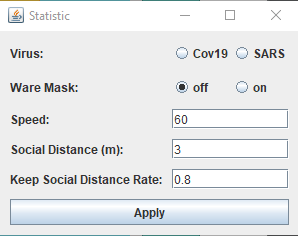
Understand how to do simulations and draw conclusions from observations. Describe the worst-case growth of any algorithms. Compare at least two viruses with different k/R factors. Provide unit tests for all formulas. Defined parameters via a configuration file.

**Output (GUI):**

The GUI interface of the project is shown in the figure. The statistic option can draw a statistical graph to describe the relationship between k-factor and time. Setting option can change the basic parameters. It can also display the system time in the model and the details of the number of infected people

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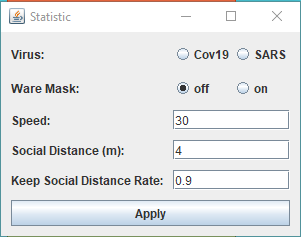
P1. GUI interface



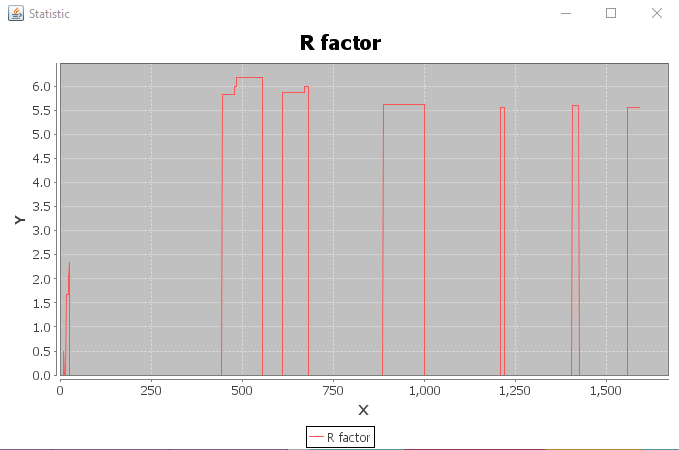
P2. Setting interface

**Graphical representation:**

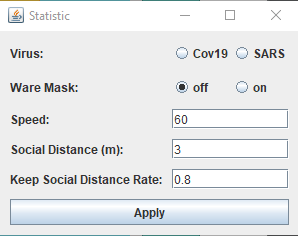
(1)



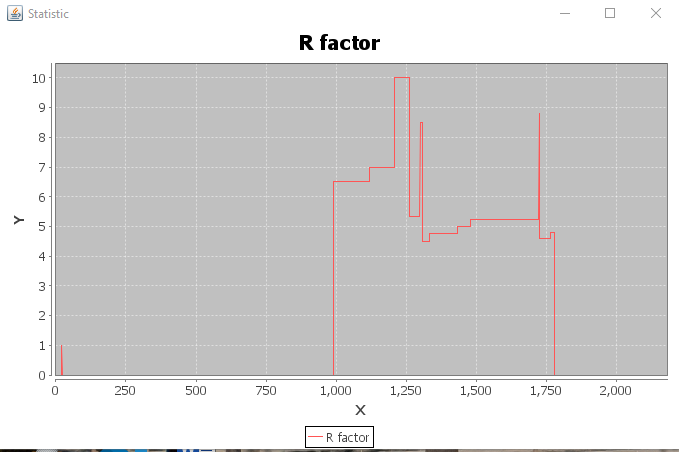
P3. Conclusion 1.1



P4. Conclusion 1.2



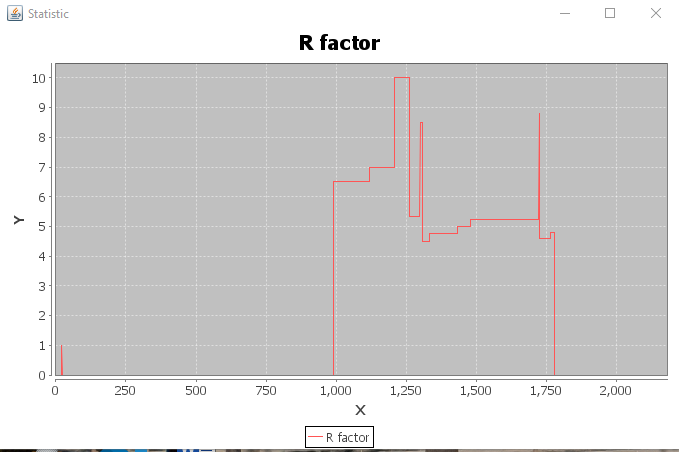
P5.Conclusion 1.3



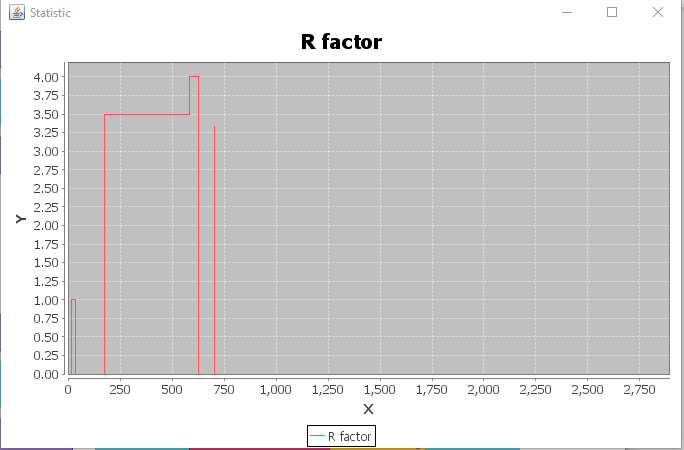
P6. Conclusion 1.4

It can be seen from the two sets of pictures that when people move faster, social distance is closer and keep social distance rate less frequently, the value of k-factor is larger and the infection rate is higher.

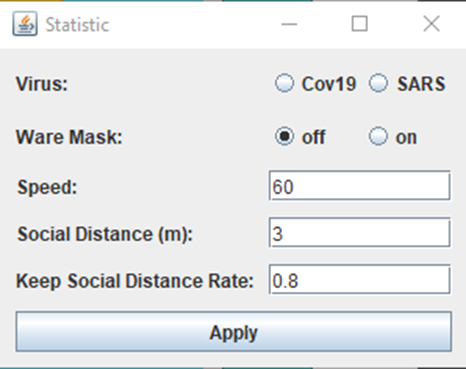
(2)



P7. Conclusion 2.1



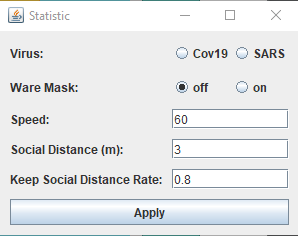
P8. Conclusion 2.2



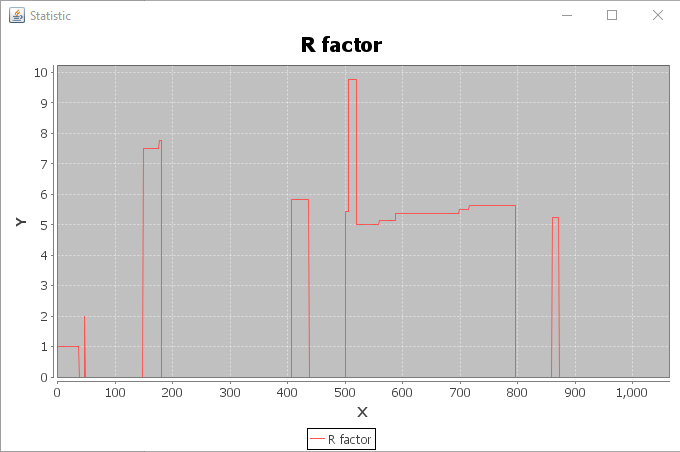
P9. Conclusion 2.1

The statistical table in the second conclusion comes from the same set of data. The reason for the different results is that the infected people are all gathered in a certain office on the map and have not moved to other buildings for a long time, so it can be noticed that the factor (infection rate) drops to 0 at the end of P8. On the contrary, P7 had a very high infection rate during a certain period, because pathogens entered the school (the largest building on the map while maintaining the highest population). Hence it is necessary to isolate the infected people.

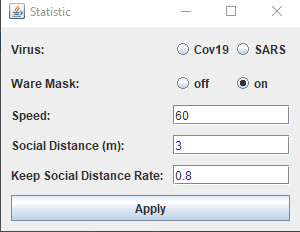
(3)



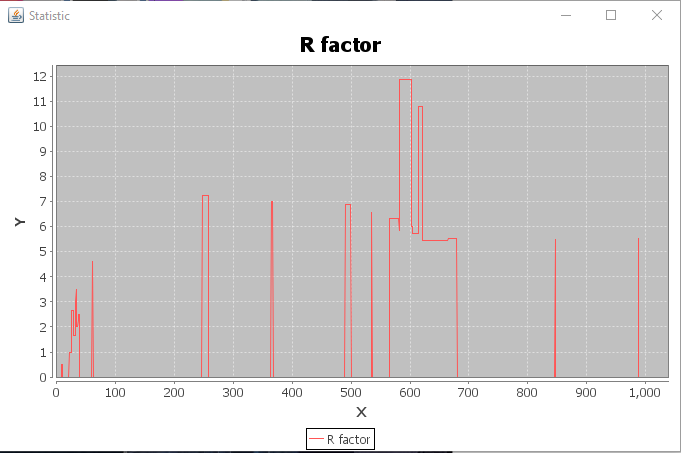
P10. Conclusion3.1



P11. Conclusion3.2



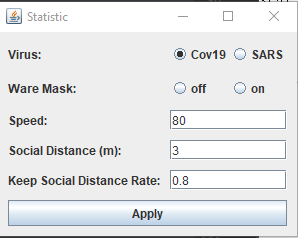
P12. Conclusion3.3



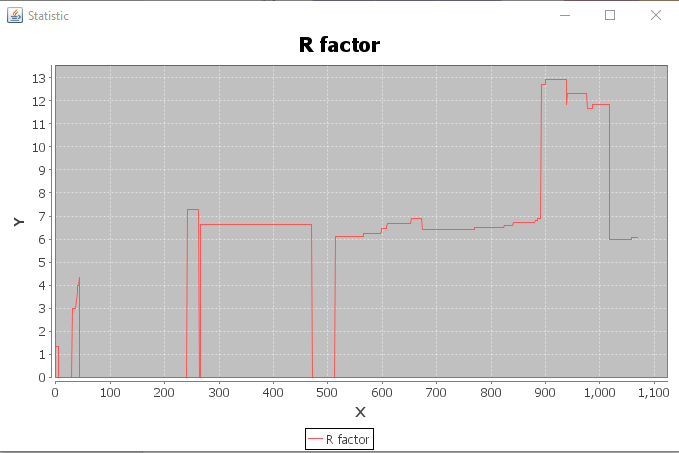
P13. Conclusion3.4

Through the above two sets of pictures, it can be concluded that the infection rate in the same time period is lower when wearing a mask.

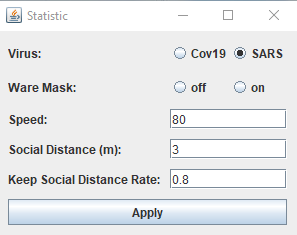
(4)



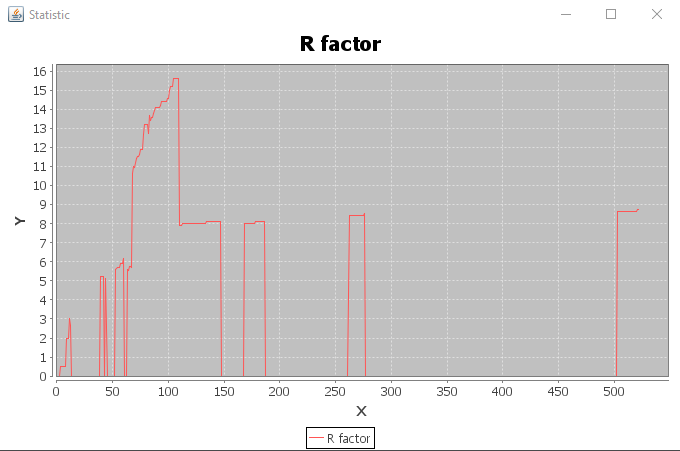
P14. Conclusion4.1



P15. Conclusion4.2



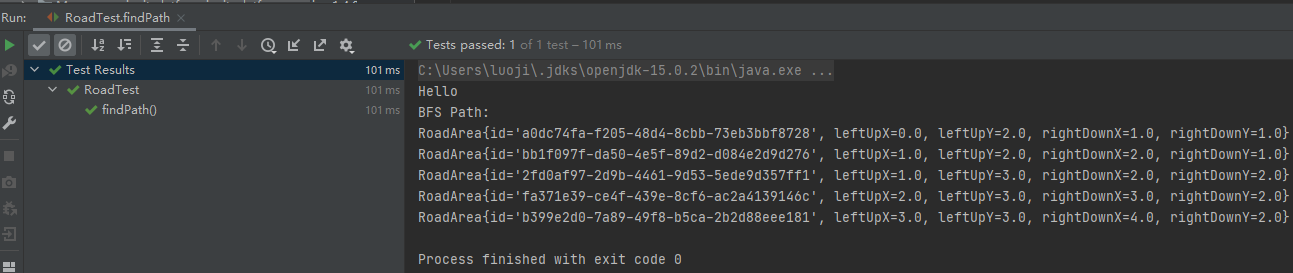
P16. Conclusion4.3



P17. Conclusion4.4

It can be seen that under the same conditions, the SARS infection rate is higher than COVID-19.

**Unit tests result:**



P18. Unit tests of BFS finding path

**Conclusion:**

After testing the model many times by changing the basic parameters, we can get the conclusion that in order to reduce the probability of virus infection, we need to reduce the number of times we go out and keep a safe distance from other people as much as possible when we go out. Areas need to be isolated and protected.