Evacuations and overcrowding assignment

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The aim of this assignment is to propose some improvements to the actual model of evacuations to avoid the initial problem that is the overcrowding of people in the doors. This is going to be simulated in NetLogo.

Parameters:
agents: 1000 (Default)
knowledge: 248 (Default)
speak-prob-threshold: 75 (Default)
min-speak-prob: 35 (Default)
max-speak-prob: 50 (Default)
min-reaction-time: 0 (Default)
max-reaction-time: 0 (Default)
min-age: 20 (Default)
max-age: 20 (Default)
standOnExit?: On (Default)

Without Sign:
We move the exit to the corner of the building and try with the default setting. It works but takes a lot of time to finish.

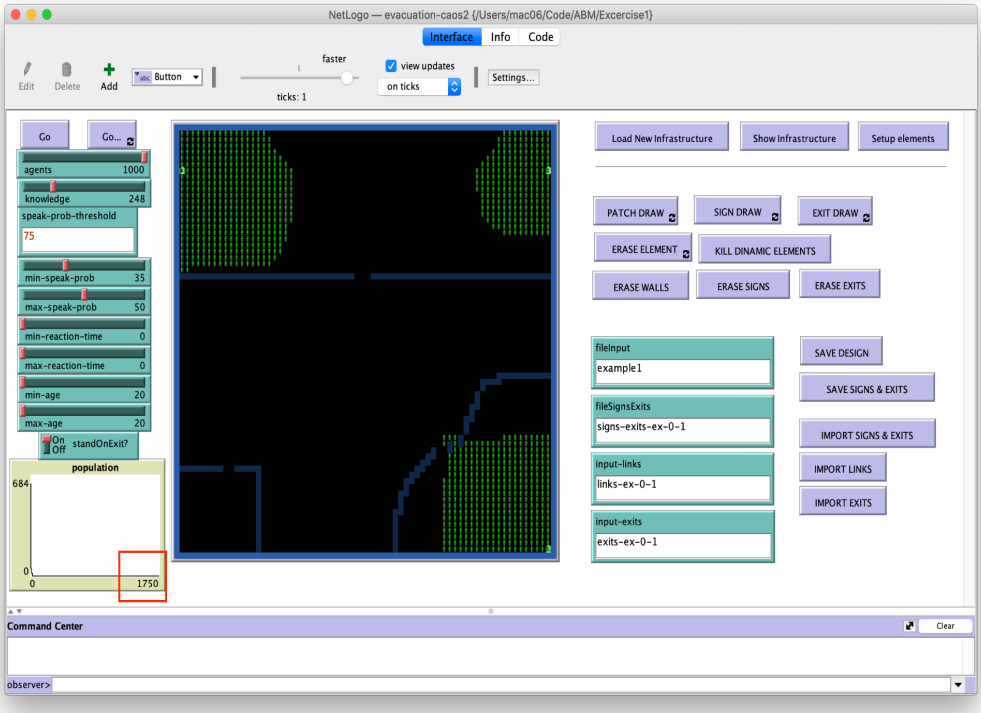

Figure 1: With the new location of exits without signs.

With Sign:
If we put some signs on the patches, then it will be faster.

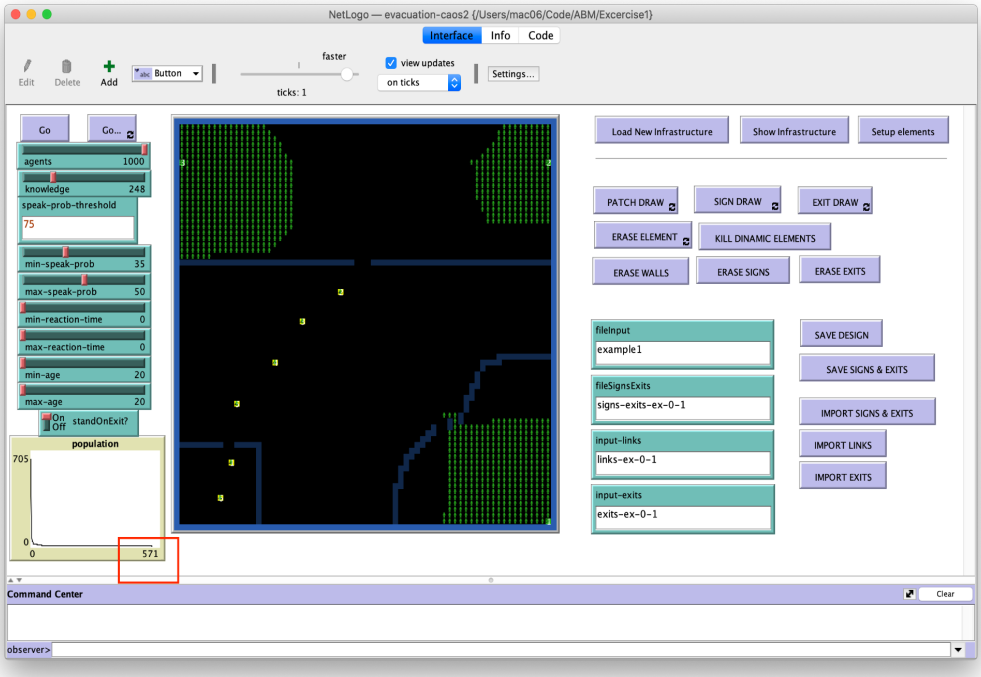

Figure 2: With new exits location and signs.

With "standOnExit? False":

This is also a way to prevent overcrowding. It means everyone who finds the exits will go out of there. And they will not be stuck around the exits.

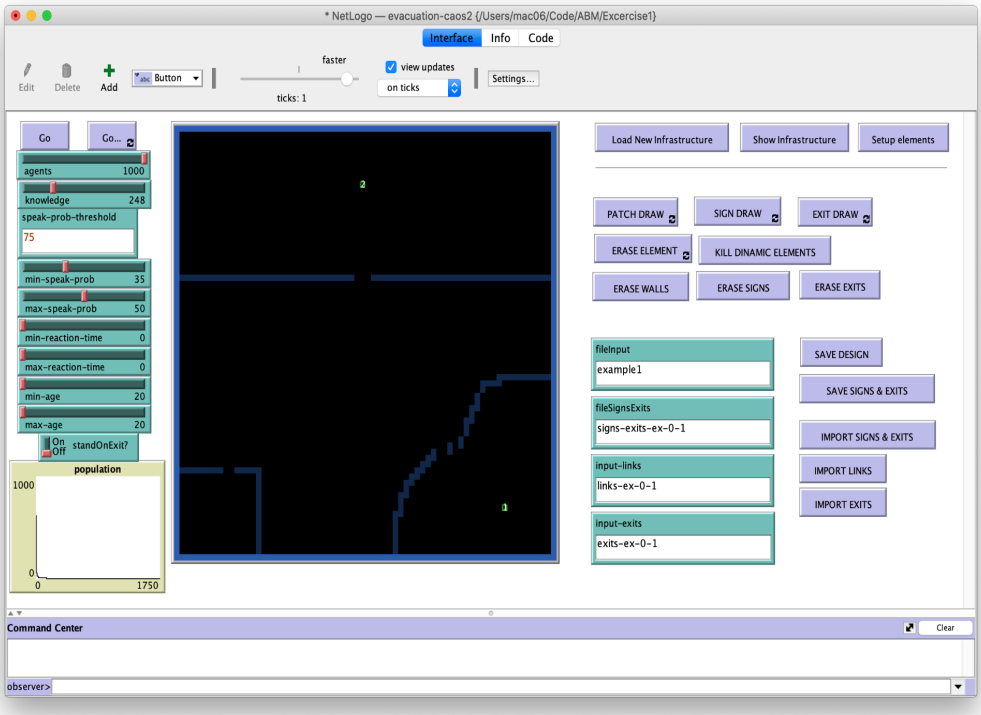

Figure 3: With the StandOnExit button equal to false.

Custom parameters:
Agents: 1000 (Default)
Knowledge: 338 One third of the people who know where the exits are from the whole population.
Speak-prob-threshold: 75 (Default)
Min-speak-prob: 40
Max-speak-prob: 75 Because normally the people in emergency cases tend to talk more.
Min-reaction-time: 0 (Default)
Max-reaction-time: 10 Assuming that there are some persons that have a better reaction than others.
Min-age: 20 (Default)
Max-age: 60 Assuming that a common population has a wide age range.
StandOnExit?: On (Default)

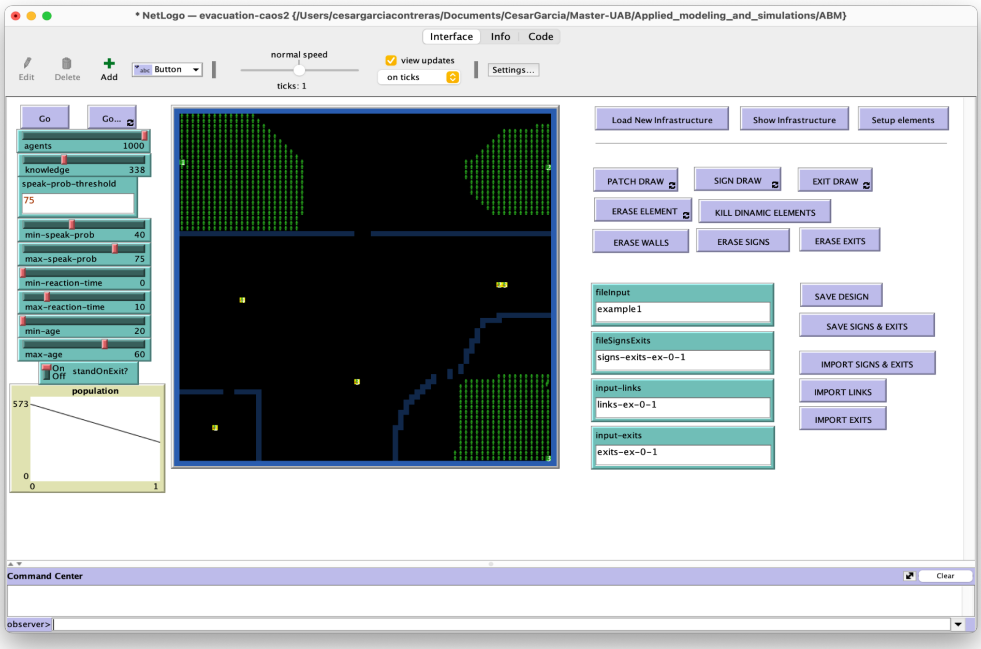

Figure 4: New parameters.

With a lot of signs:

We tried to put a lot of signs to see if the people will reach the exits faster, but we ran into a few problems the first one, that even when it looks like all the people is in the exits there are people stuck in the signs what lead us to the second, that was the simulation didn't stop because the people stuck.

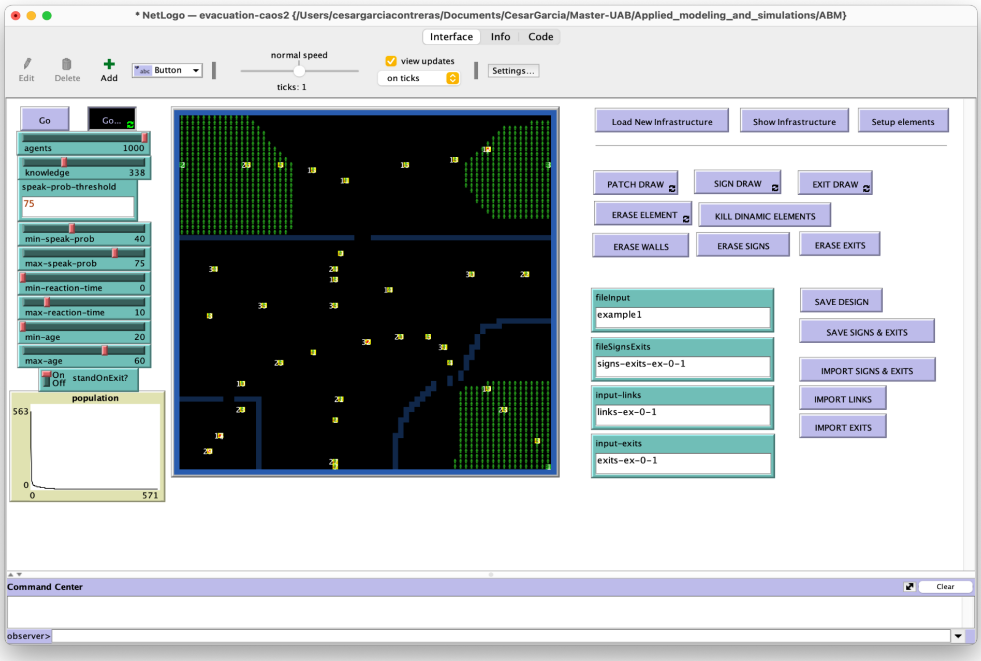

Figure 5: New parameters and with many signs

With a threshold bigger than the maximum speak probability:

For this one we moved the threshold to 150. That was a very big number and outside of the range to prove that people don't talk between them so they may reach the exit but never will know where it was until they found it.

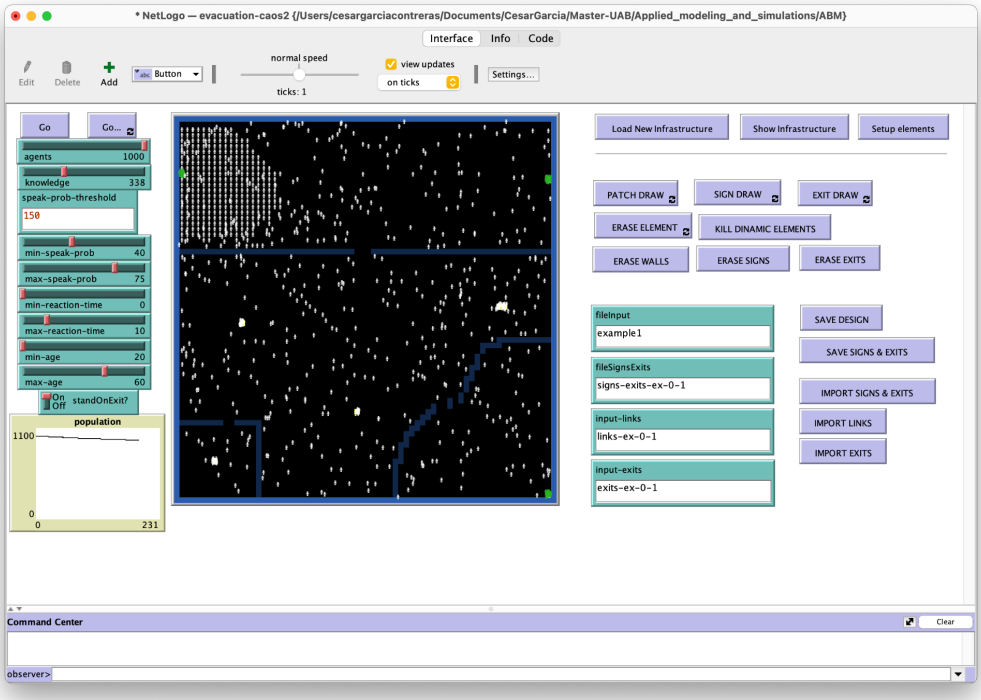

Figure 6: Simulation where people don't talk between each other.

With a small threshold but a little bit bigger than the minimum speak probability:

For this one we move the speak-prob-treshold to 25 and have to be modified the min-speak-prob to 20 to allow the threshold to be between the speak parameters and prove that if you move the threshold the white people will meet the green faster and eventually, they will reach the exits optimally.

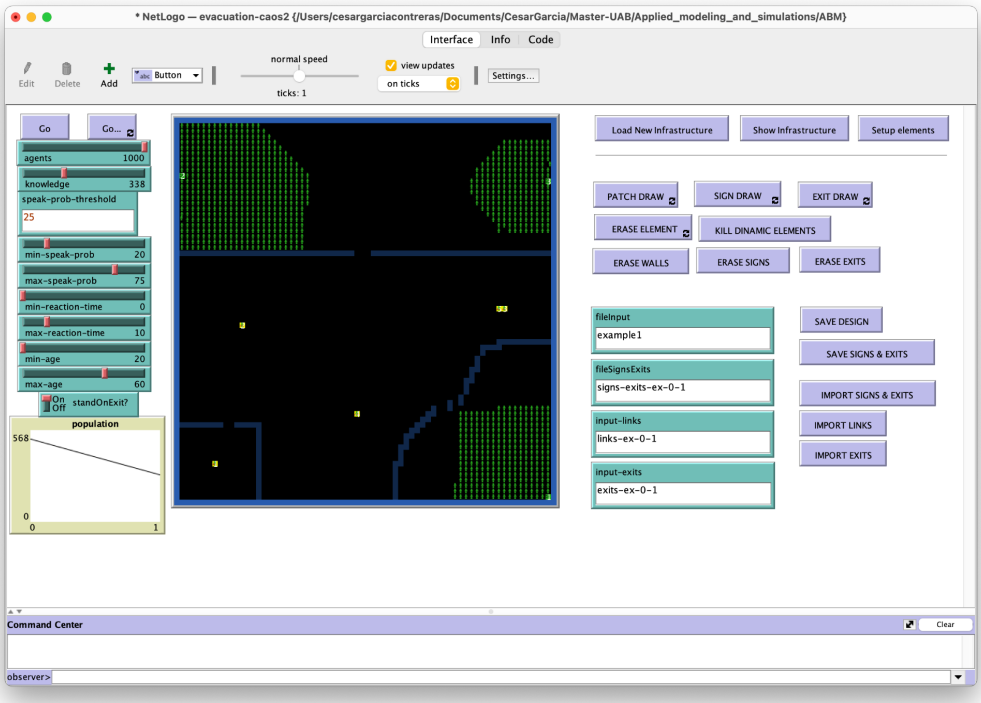

Figure 7: With a small threshold but in the range of the speak probability.

Conclusion

Concluding with the analysis we find an optimal map for the exits and signs that let the people reach it in an acceptable time, figure 1 has the exit locations but the problem is that it takes a lot of time to finish but we observe that these locations an allowed to avoid the overcrowding in the doors.

So, in order to reduce the time we modify the parameters to our custom ones and with figure 4 we can observe that there is no overcrowding, it doesn't take a lot of time to finish, the simulation ends once all the people are in the exits thanks to the correct number of signs. So, we conclude that the configuration in Figure 4 is the optimal one.