ROBOTS AND HUMANS: A COLLABORATIVE WORKSPACE

Implementation of the solution

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SOAS Course

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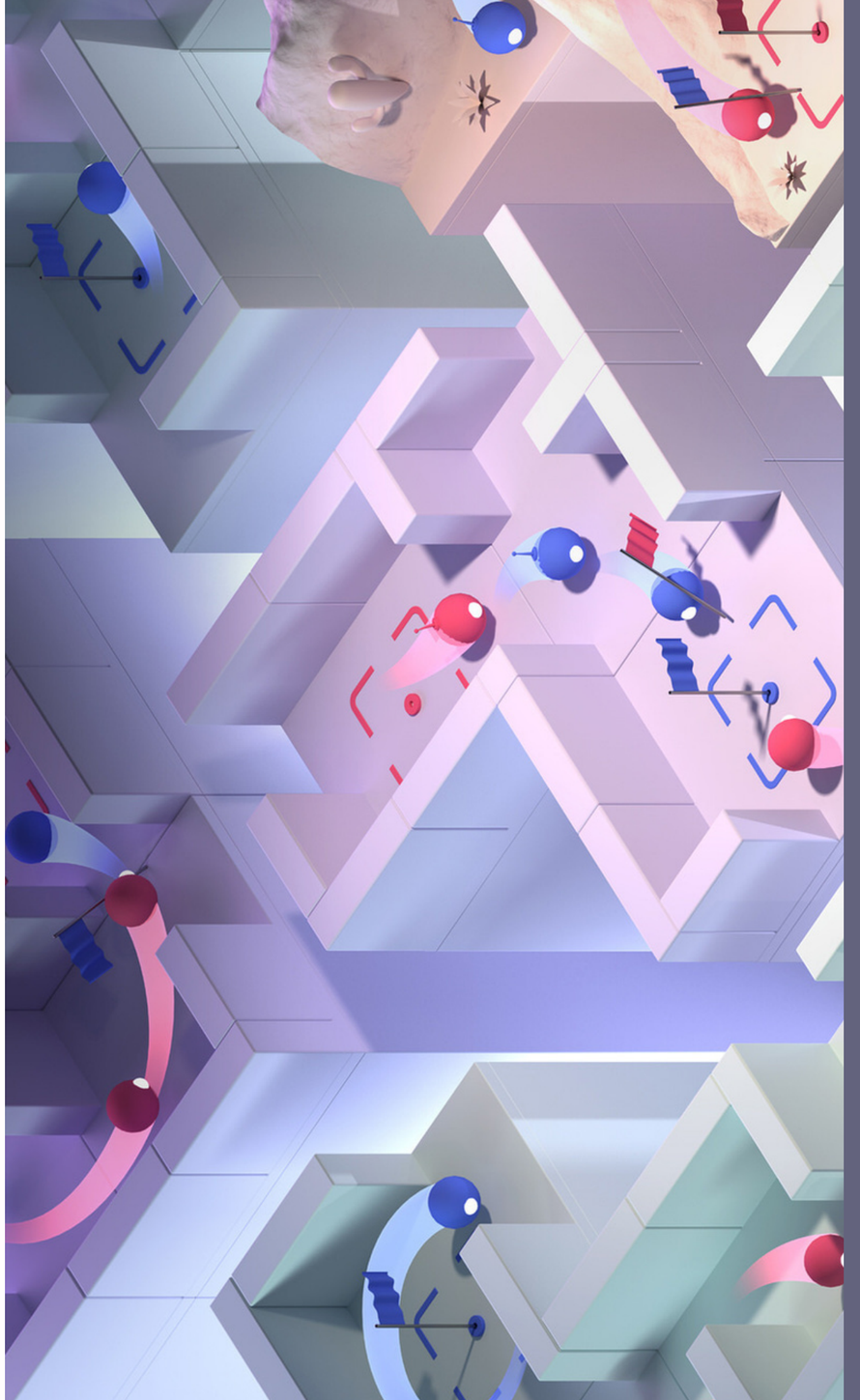

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Case study of my project : A workspace with robots

Workspace Represetation

*To not make the environment more complex, we won't be representing every "resource" on it own. We will consider all the resources are represented by the green patches.

Resources represented in green patches could be :

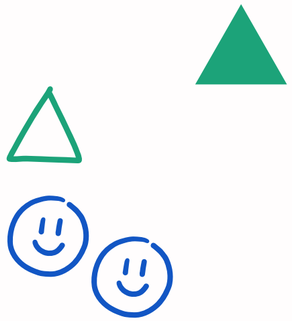
- Papers
- Printers
- Coffee Maker
- Coffee
- Milk

Every green patch represented in the simulation has a max-resources (capacity) that is randomly associated. We define the value and it's distributed randomly through the different patches.

```
ask n-of 40 patches [
  set pcolor green
  set resources random max-resources
]
```

Explaining the logic and calculations

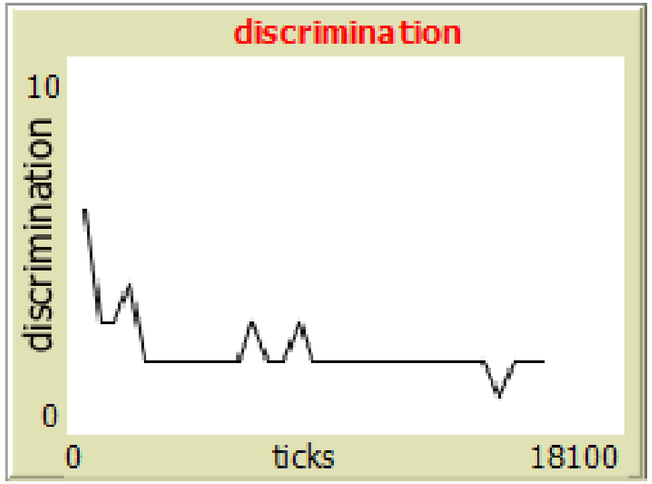
Discrimination



Discrimination (unfairness and inequality) is true if :

- distance between the resource and blue agent < discrimination_threshold
- if the distance between blue agent A and blue agent B next to the resource is < 2 --> A is discriminating against B and not letting him use the resource.

Number of discriminations



If we reduce the numb of patches, discrimination increase

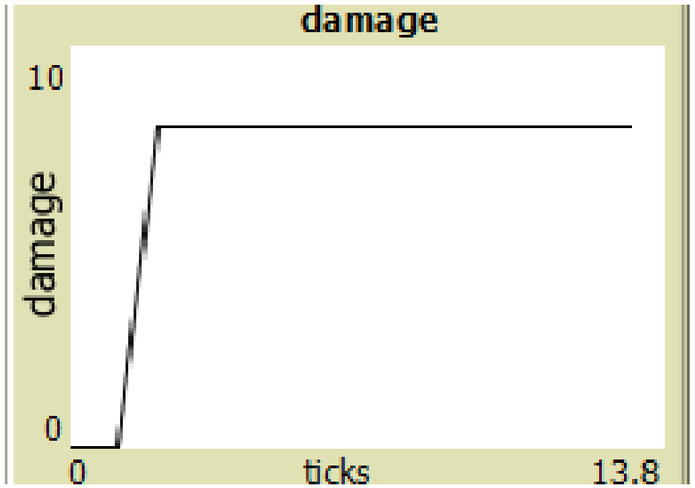
Damage

Damaging the resources take into account these elements :

- distance between the resource and blue agent < damage_threshold
- resource_depletion_rate > 50 %
- cumulative_degradation > 10
- cumulative_pollution > 0.2
- ecological_disruption

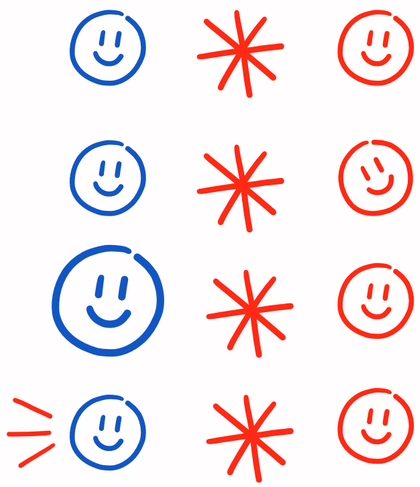
Damage is checked for each turtle individually

Count of Damage per tick



Explaining the logic and calculations

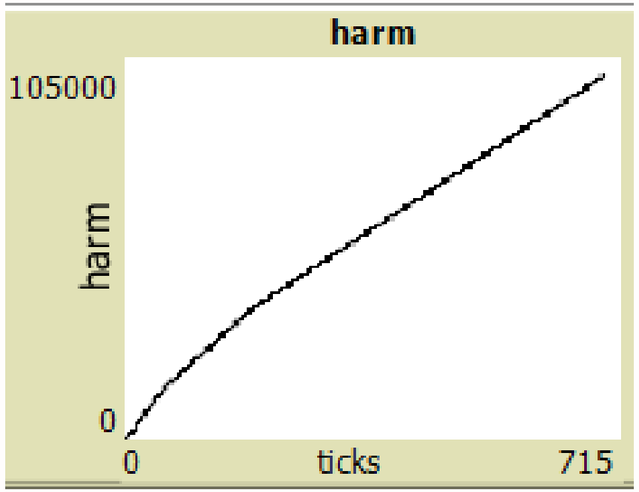
Harm



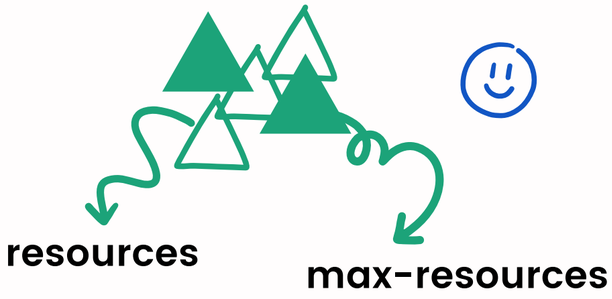
Harm is true if :

- distance between them < harm_threshold
- angle-diff > 170 or angle-diff < -170
- (size - [size] of myself) > 1
- (speed - [speed] of myself) > 3

Potential Harm per Tick



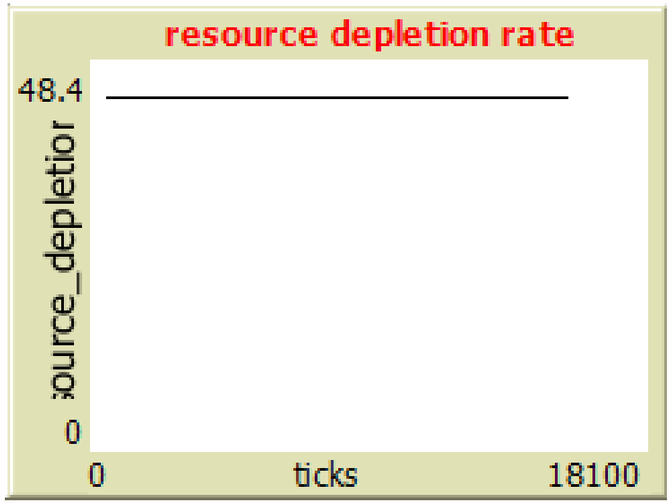
Resource Depletion



Resource Depletion is calculated taken into account :

- (max-resources - resources) / max-resources

48,4% of the resources have been consumed



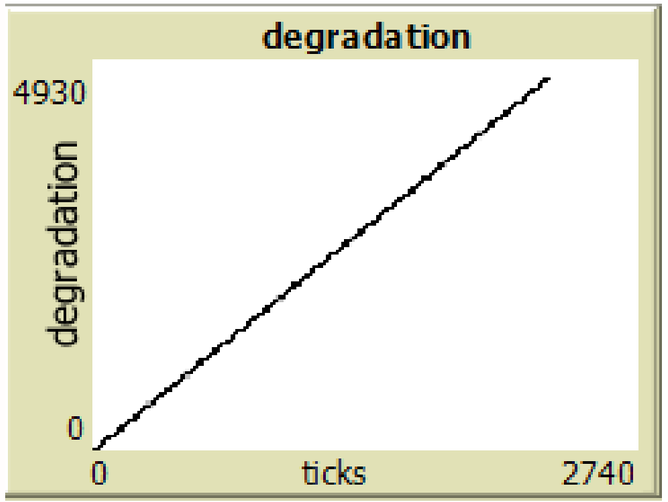
Explaining the logic and calculations

Degradation

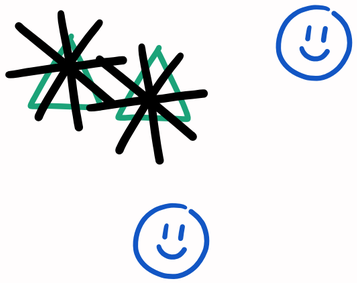
Detecting degradation of the environment (Environmental stewardship) can be calculated using :

- **degradation degradation + resource-depletion * degradation_rate**

Degradation cumulative per tick



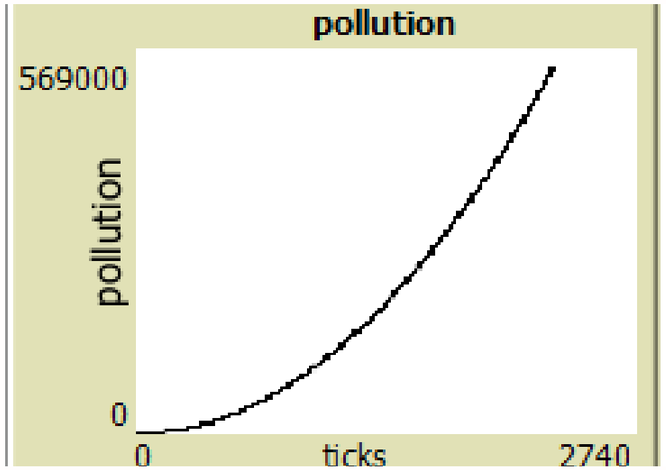
Pollution



Pollution can be calculated using degradation level calculated :

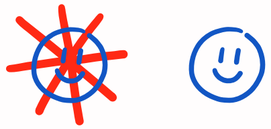
- **pollution pollution + degradation * pollution_rate**

Pollution cumulative per tick



Explaining the logic and calculations

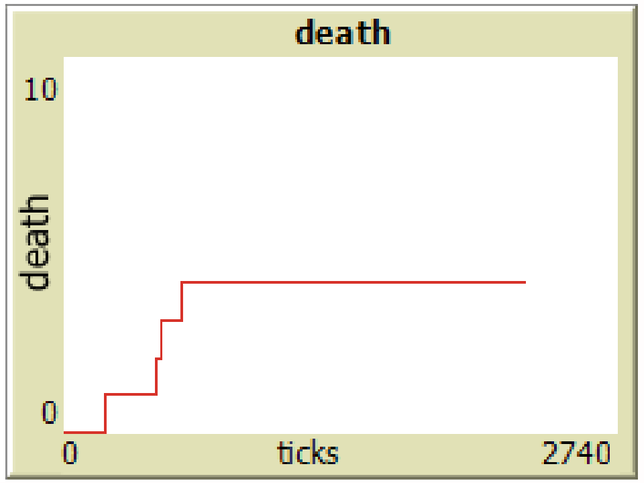
Death



Death in our case can be represented as an accident done between two blue agents (two robots) that will make one of them break.

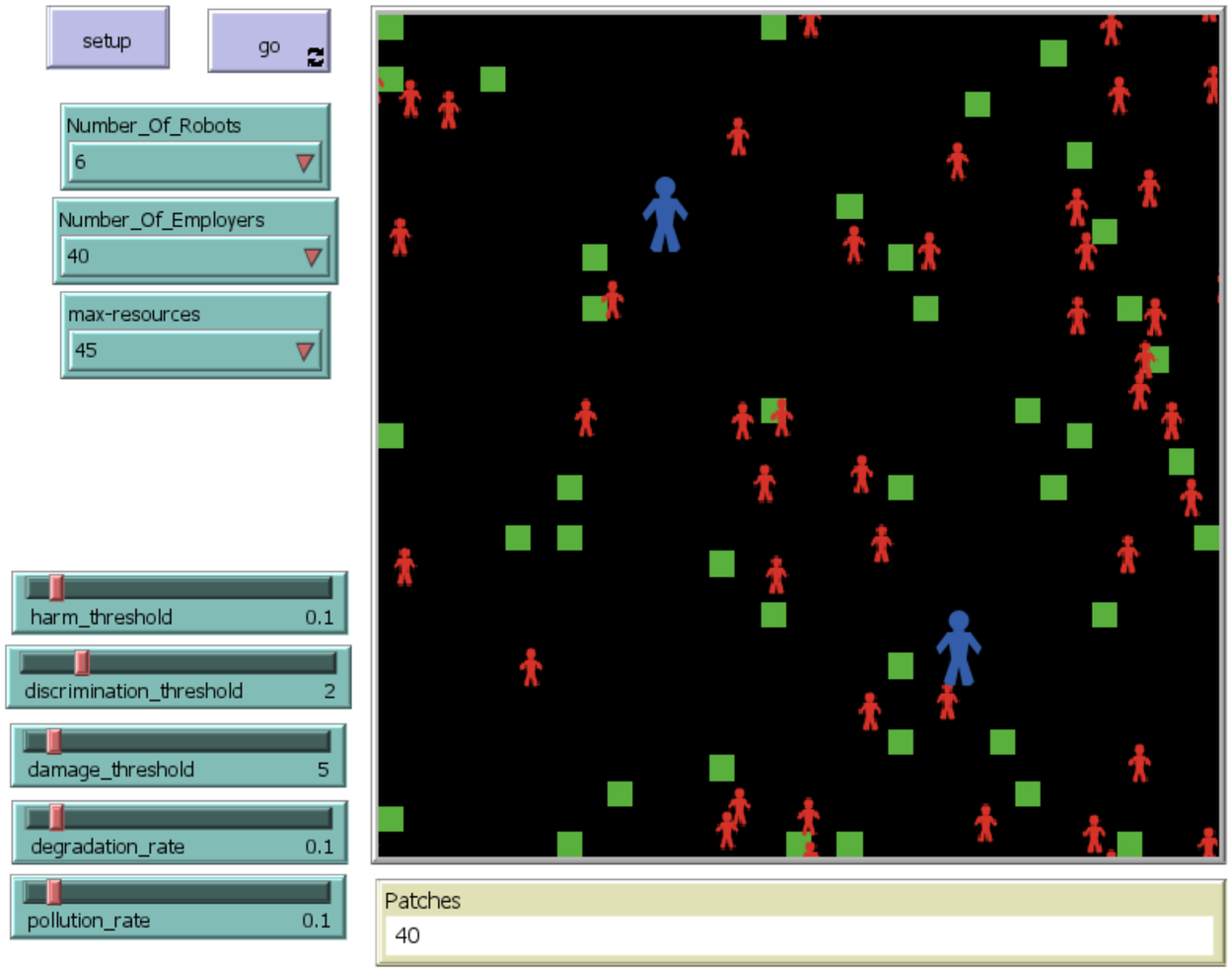
- Distance between blue agents
- Speed of the blue agent
- Size of the blue agent

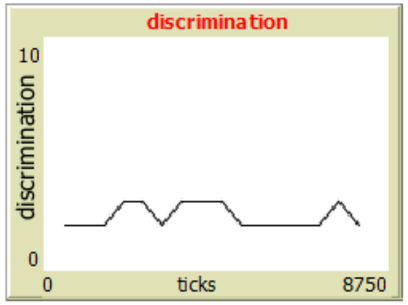
Death Count

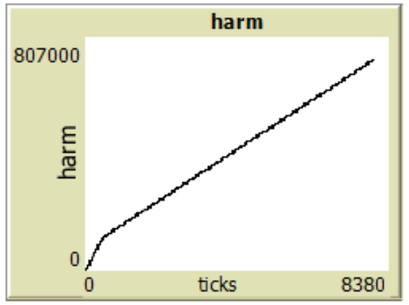


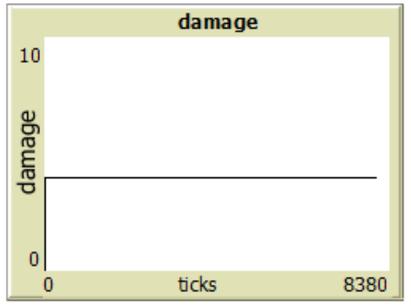
- In fact, all the logic behind the calculations and behind the definition of ethical values were done taking into account my case study.
- Resources online and already done implementations don't exist as well, so my implementation is fully based on my understanding of ethical values and their logic.
- I had to analyze the ethical considerations, interpret the requirements of the case study, and devise my own logic to incorporate those values into the model

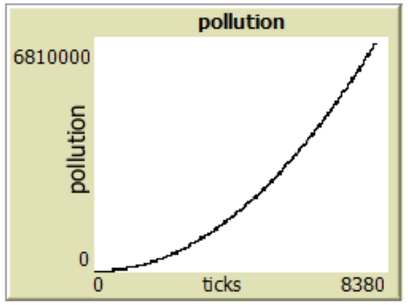
Implementation representing ethical values and intelligent agents inside a workspace

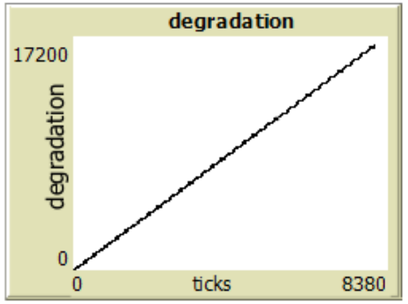


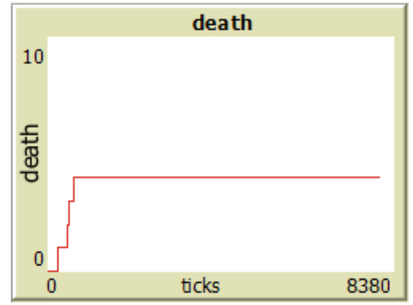


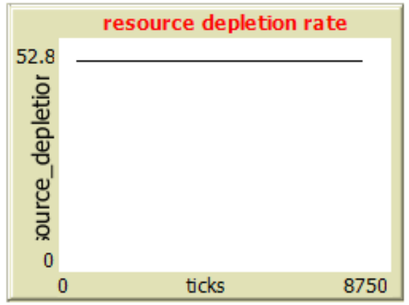








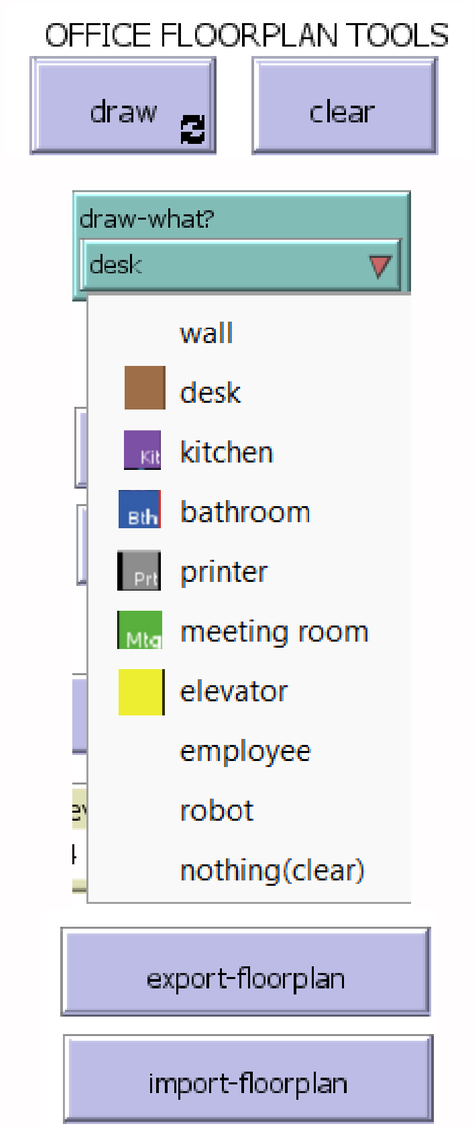




But what if we want to have a general implementation of the workspace and the interactions humans-robots ?

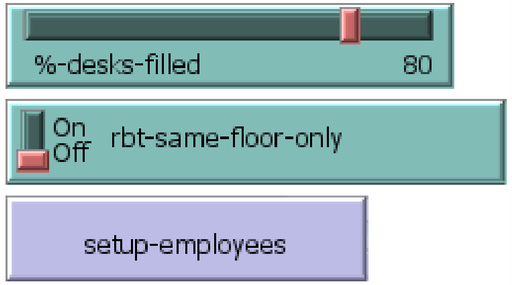
Explaining the logic behind the general implementation

Designing the workspace

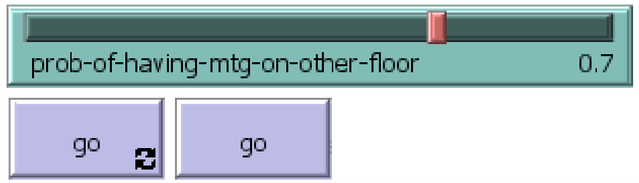


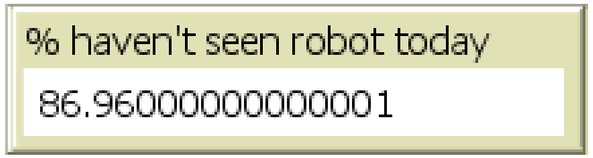
Setting up the office

Setting up the employees

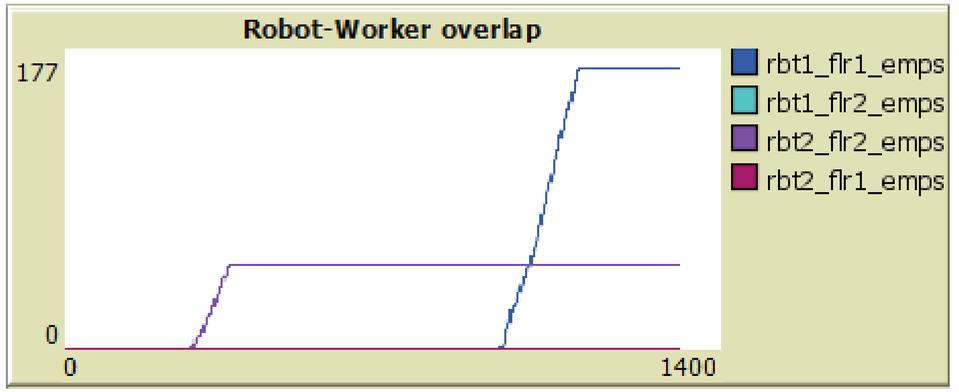


Setting up the probability

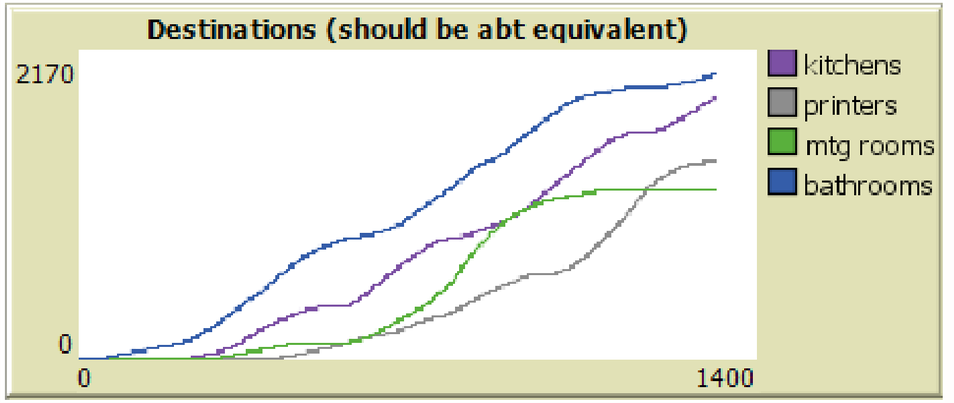




Overlap due to the robots going to different floors

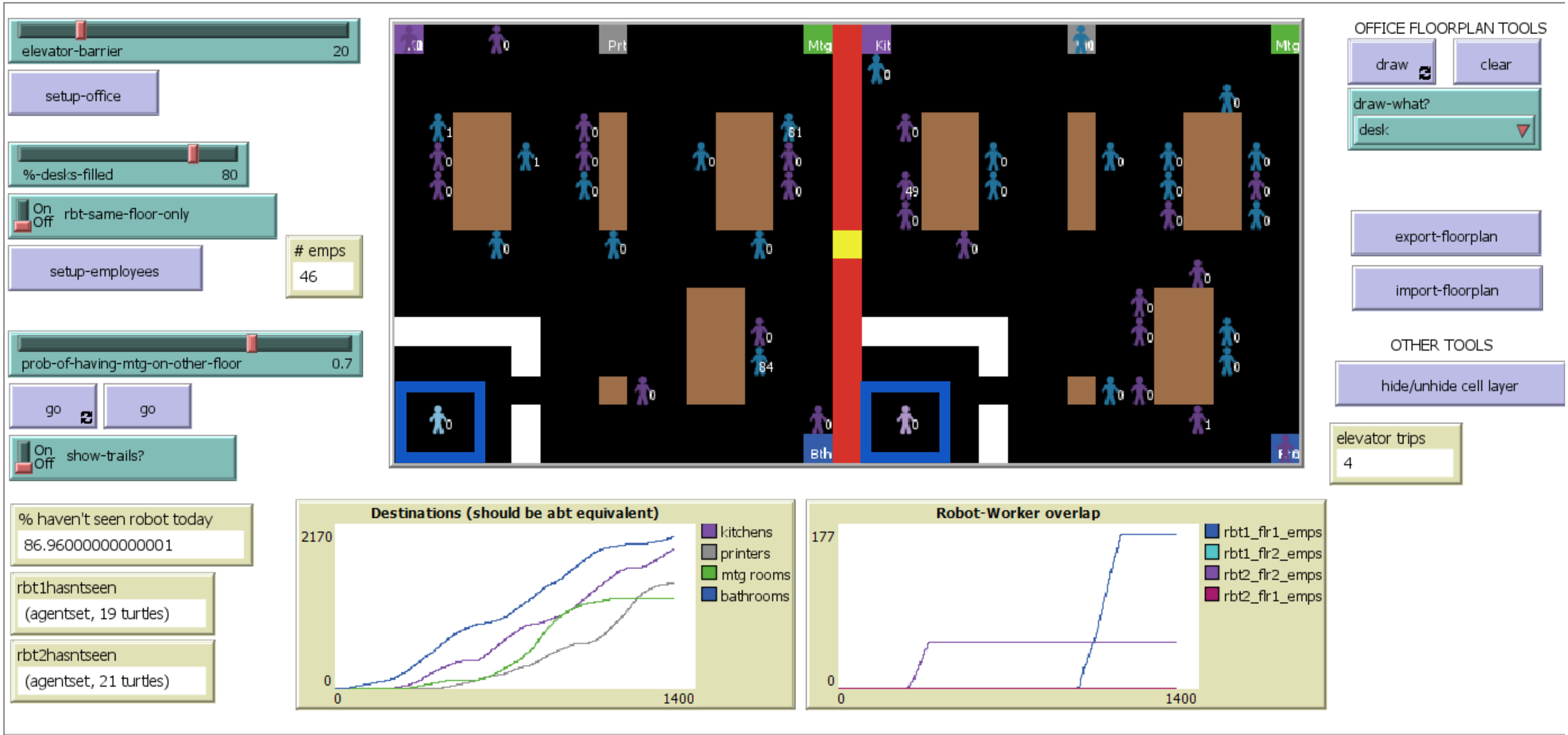


Overall use of different resources



Probability of employees who didnt get to use the robot

Implementation representing interactions workers-robots inside a workspace



Challenges and future plans

Not enough documentation and resources when it comes to the topic of "Implentation of intelligent agent ethical agents"

The calculations and the overall logic behind the implementation may vary depending on our **individual perceptions and interpretations of ethical values**. Therefore, there is a subjective element involved, which introduces a certain level of bias.

Due to **time constraints**, my project faced some limitations as a significant amount of time was dedicated to understanding ethical values and **determining how to quantify them**.

It would be beneficial to **continue working on the project**, particularly the second implementation, in order to further develop and observe **the nature of interactions and incorporate the ethical values into the model.**

Implementing a **reinforcement learning method** such as Q-learning would be valuable to observe the behavior of the robots and assess potential improvements in **their actions and decision-making processes**.

Conclusion