Report on Simulation

Our system’s simulation is built to deal with changes to the parameters that are fed into it; no matter how large or small. However some parameters will cause the simulation to run differently, for instance changing the width would evidently mean the robots are less likely to collide, and take longer to complete tasks. To test this hypothesis, we adjusted parameters and recorded their impact upon the rest of the simulation.

Width/Height:

Changing the width/height parameters meant that the robots would either have a higher chance of collision, or a lower chance of collision, as well as impact their battery life. If the grid is extremely large, it would mean the robots have to move through many more squares to reach their target locations, subsequently draining their battery life much more quickly, whilst them having a huge surface to move on would mean there are fewer robots on a big grid, so a lower chance of them bumping into one another. On the other hand, a tiny grid would keep battery life high, meaning the robots would have to charge much less frequently, although it’d also have the effect of making collisions more likely.

Capacity:

If the capacity parameter were to change, it would effect our simulation by the robot either needing to charge more often, or charge less often. This is because a higher battery capacity would let the robot, once fully charged, roam around and complete its duties without needing charge breaks, and so have the orders completed in a shorter amount of ticks, although if the capacity was lessened, the robots would have to charge often, and so the amount of ticks needed to finish the orders would go up.

Charge Speed:

The charge speed parameter is the rate at which the charging pods charge up the robots; the effect of this would be reminiscent of the capacity being changed, as it would overall either increase or decrease the number of ticks to complete the simulation. If the charge speed were a larger value, the robots would charge up quicker, and so be free to resume delivering their held item and then finish their tasks in fewer ticks, however if the speed was lower, the opposite would occur, and it would take more ticks per recharge of a robot, therefore increasing the amount of ticks it would take overall as a simulation to be completed.

Pod Robot:

The more robots in a simulation would possibly mean the simulation being completed in fewer ticks, due to the orders having more robots to complete them, however this would most likely have the effect of the simulation ending via robots crashing, as a greater volume of robots on the grid increases possibility of collisions. However, if there are too few robots, collisions would be rarer, but there would be fewer robots ready to take and carry out orders, and therefore it would take many ticks to complete the simulation.

Shelf/Packing Station:

The number of shelves in the grid would effect the simulation by meaning there are more/less locations for the robots to receive orders from, whilst the number of packing stations effects how long the robots must wait to complete their order. Less shelves on the grid gives the impact of the simulation being slowed down by the number of orders being carried out and transported by the robots, whilst additional shelves would mean robots do not need to wait to collect an order, and decrease the number of ticks for the overall simulation to be completed. Fewer packing stations could too slow the process as the robots would have to wait to have a station to complete their commands, whilst the opposite of having several packing stations would increase the speed at which the simulation is completed as there would be no delay for the robots to resume and carry out their objectives.

Orders:

The order parameter controls how many orders, and how many ticks it takes for orders to be completed. Due to this, if there are extra orders, this would evidently mean that the robots have more orders to transport and complete before the simulation is allowed to end, this could have various implications such as robots having a greater chance to collide and subsequently fail and crash the simulation, because of a higher number of them passing each other, and if the number of ticks to process the order is greater, it would too mean that the simulation is slowed down. On the other side of the scale however, fewer orders and ticks to process would speed up the simulation and reduce opportunities for robots to collide as there are less time that they would pass, ultimately speeding up the simulation, and increasing the possibility it is properly completed.