Simulated Framework for Swarm Robotic Exploration of Post Disaster Environments

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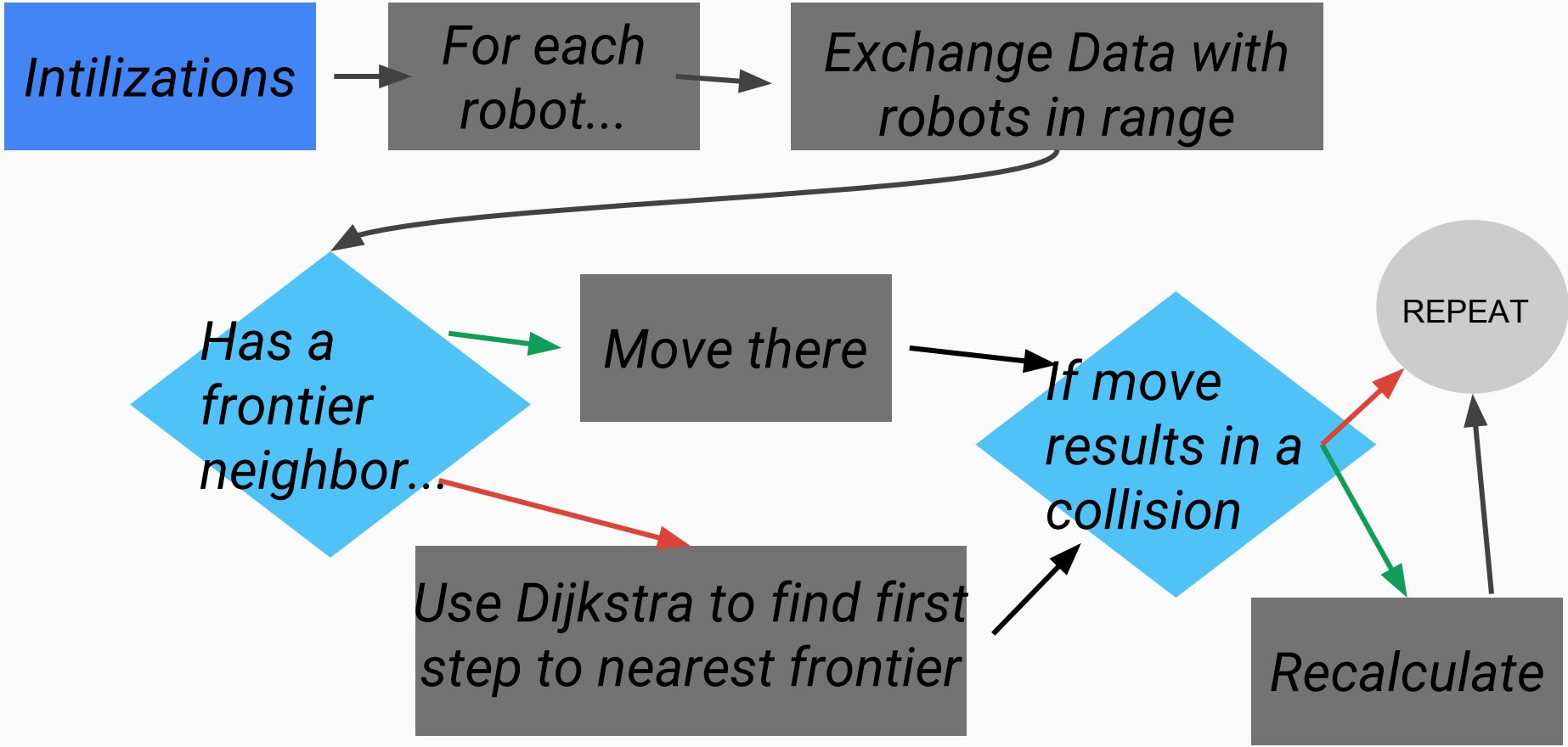
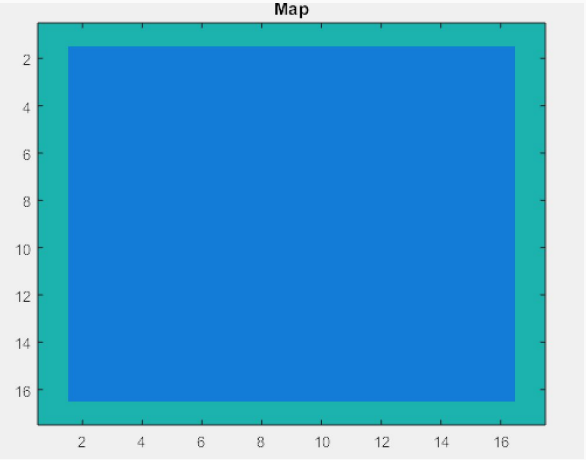
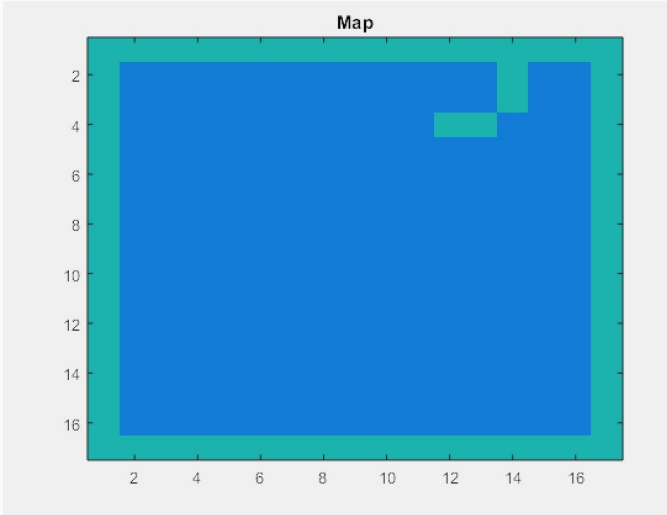
GOAL

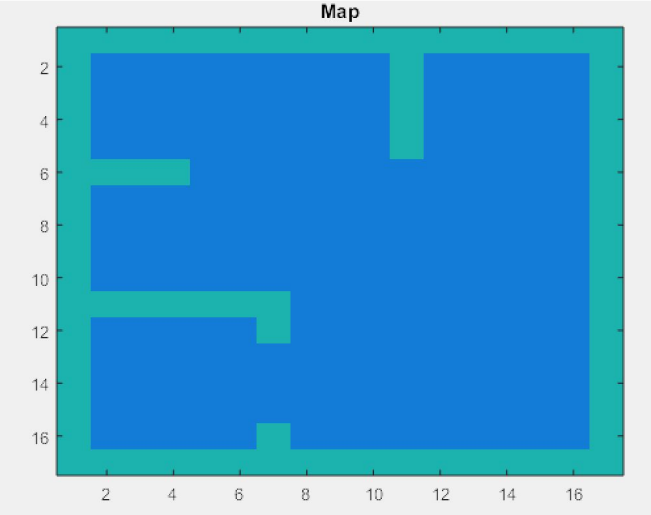
*Develop a simulation for **distributed robotic mapping** of disaster environments - with a focus on the occurrence of **communication dead zones**.*



Implementation Overview - based on *Frontier-based multi-robot exploration using particle swarm optimization*





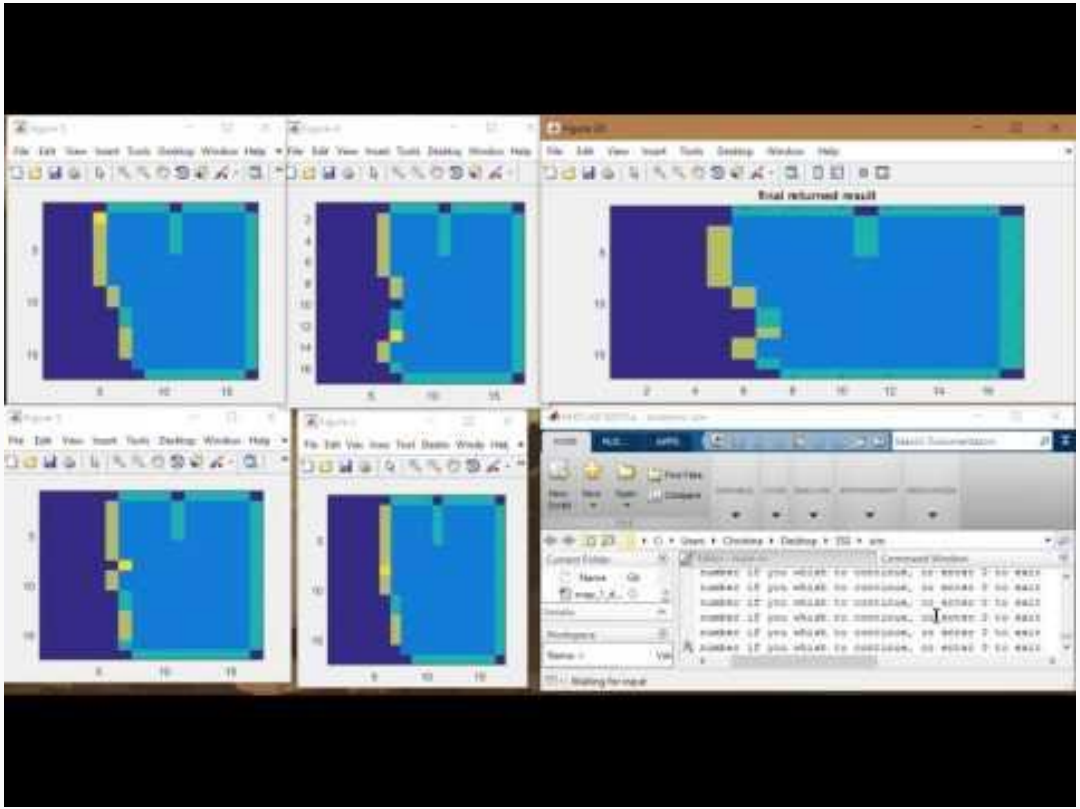


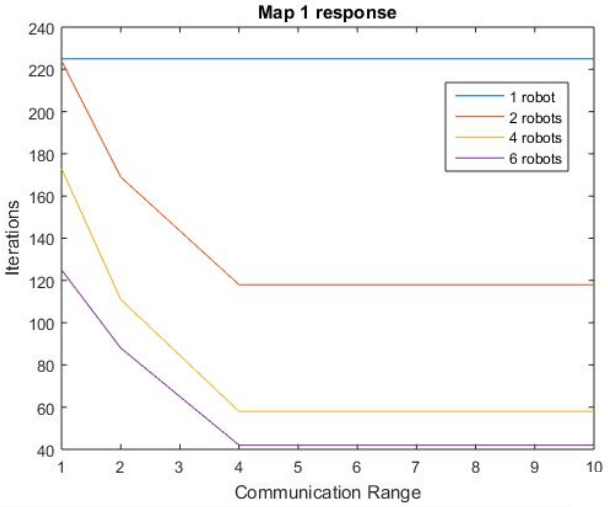
Teal = WALL

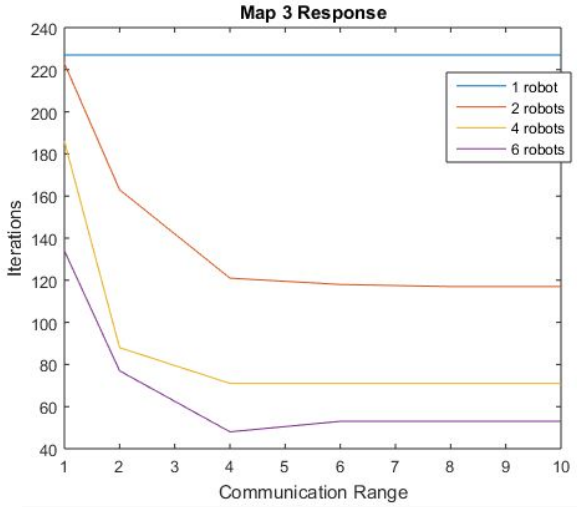
Blue = FREE

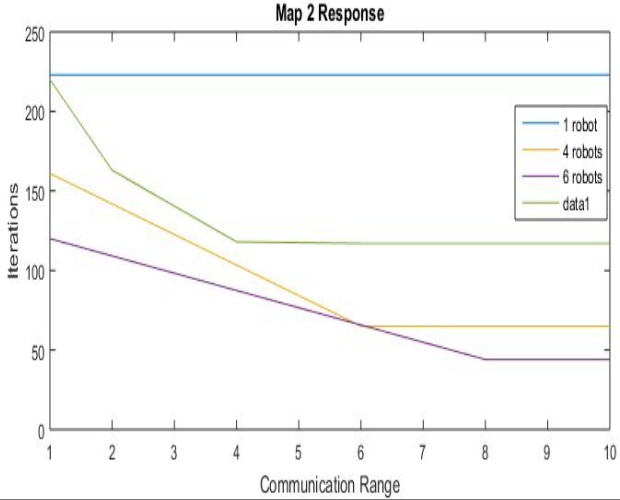
Test Maps

4 robots, 6 communication range w/ Dead zones

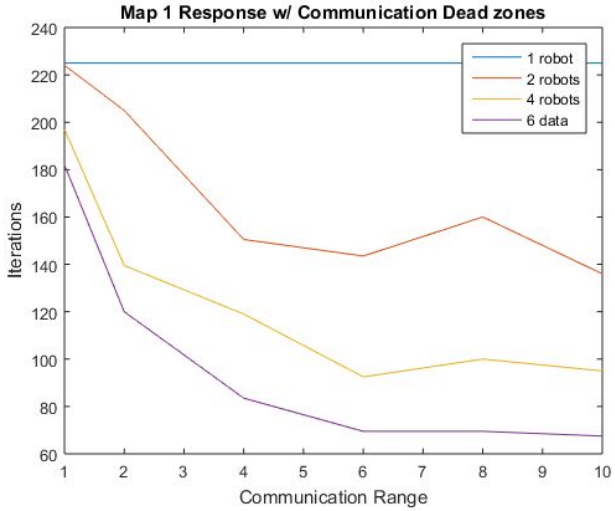


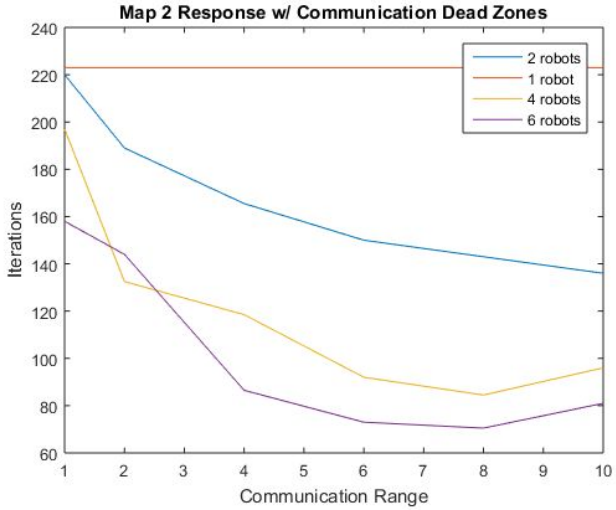


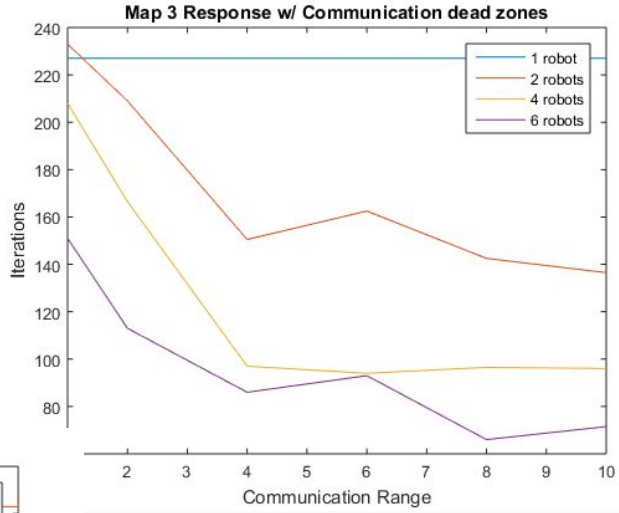




No communication dead zones response







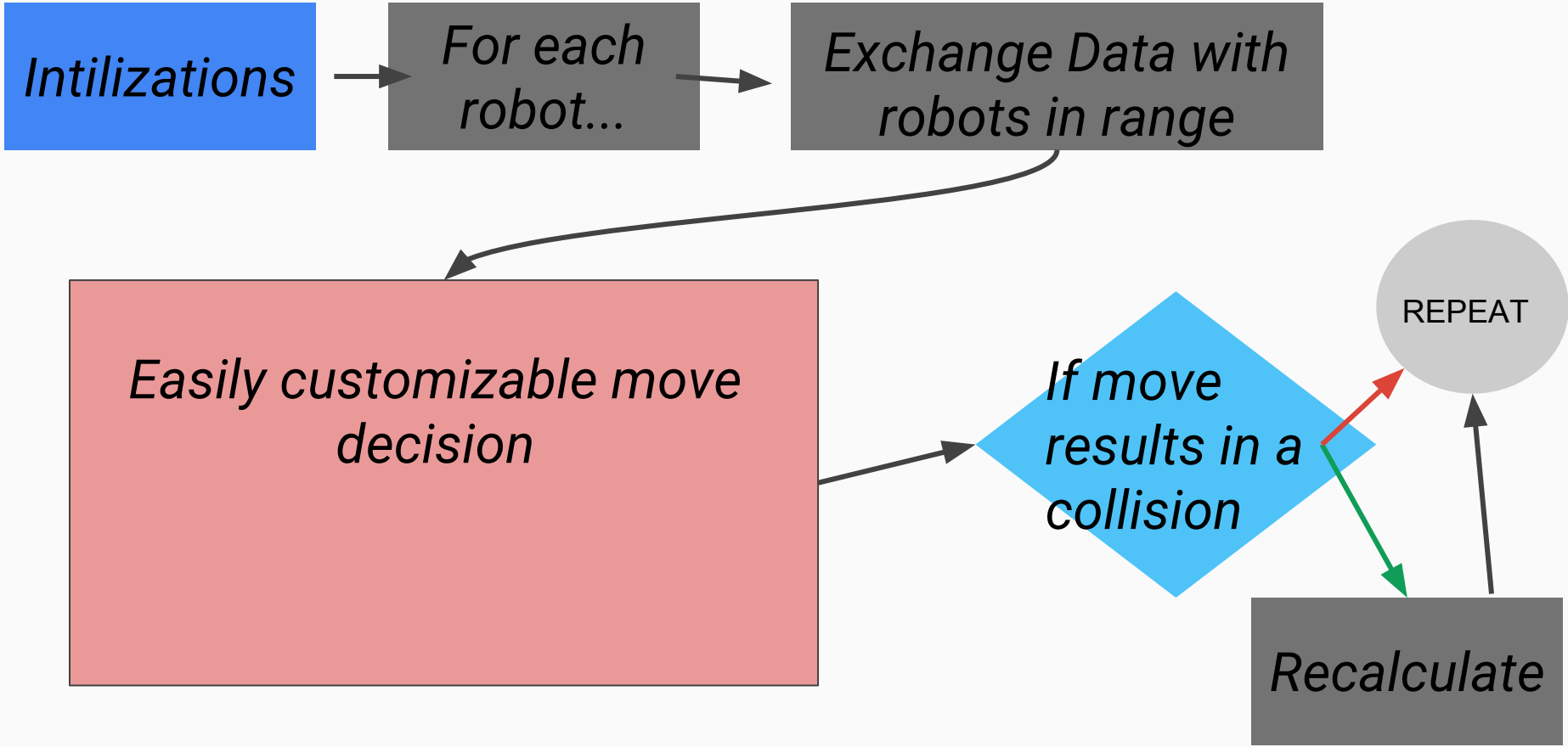
Randomized dead zone responses

38.25

Using this method randomized dead zones cause an average of 38.25 extra iterations

Modularity

- In current configuration; number of robots, communication range, maps and dead zones are easily changeable
- It is also fairly easy to implement a different model for finding the frontier to move towards (Dijkstra, straight line)
- Changing overall framework is not difficult but requires more of a time commitment.


Intilizations
For each robot...
Exchange Data with robots in range
Easily customizable move decision
If move results in a collision
REPEAT
Recalculate

Future work

- Apply Simulation to a broader range of cases including real world examples
- Implement robot repulsion
- Implement other variables we care about for this application; energy consumption ect.
- Develop a more user friendly GUI

Questions