Spike Outcome Report

Number: 11
Spike Title: Tactical Analysis with PlanetWars
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Goals:

- Create at least two different "bot" agents for the PlanetWars simulation.
- One of your bots must utilise tactical analysis to inform its decisions.
    - Simple: include attacking "weakest", "strongest", "closest" or most productive planet.
    - Complex: include event detection ("fleet leaving planet vulnerable"), scouting or fog-of-war deception.
- Numerically compare each bots' performance and present the results of the both performances over multiple maps.

Technologies, Tools, and Resources used:

- Planet Wars Simulation (from Lab 4)
- Microsoft Excel

Tasks undertaken:

1. The first step in spike was setting up the testing environment. To do this, we used to the bots created in lab 4, specifically the "Random" bot and the "BestWorst" bot to demonstrate the advancement to be gained by using tactical analysis.
    a. Random bot (no tactical analysis): Simply picks a random friendly planet and send most of its bots to another random not-friendly planet.
    b. BestWorst (uses tactical analysis):

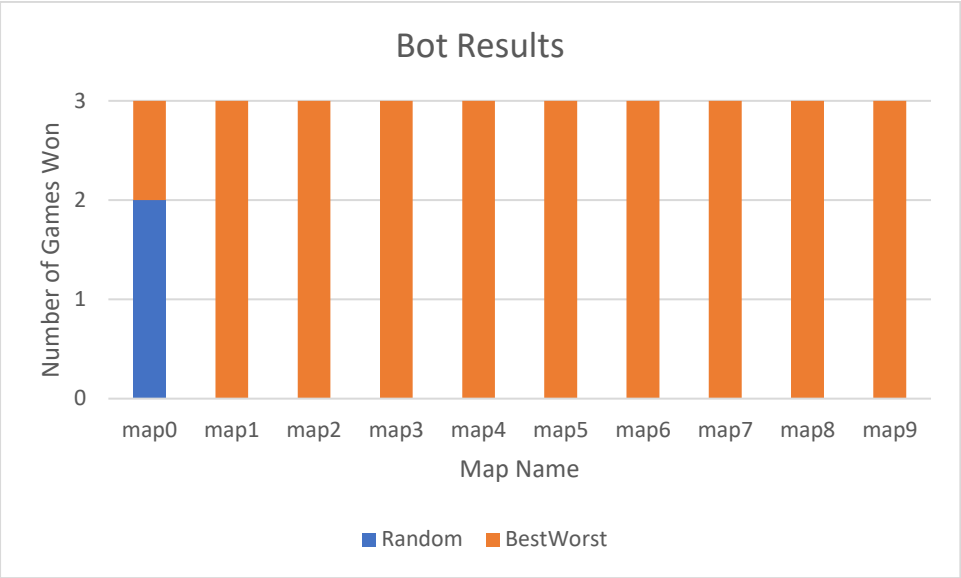
```
# check if we should attack
if gameinfo.my_planets and gameinfo.not_my_planets:
    # select the best destination
    dest = min(gameinfo.not_my_planets.values(), key=lambda p: p.num_ships)

    # select best source
    src = max(gameinfo.my_planets.values(), key=lambda p: p.num_ships)

    # launch new fleet if there's enough ships
    if src.num_ships > 10:
        gameinfo.planet_order(src, dest, int(src.num_ships * 0.75))
```

2. The next step was deciding on our testing methodology. We decided that we would simply pick the first 10 maps, and play best out of 3 games on each, whoever one the most maps would win overall and be crowned the superior bot.
3. We set up a spread sheet in excel that we would use to capture all of the data, with the names of maps down one side and the two bots along the top.
4. We then ran all 30 games across the 10 maps and recorded the results into our table.
5. The final step was analysing the data and determining what it meant.

What we found out:

We found out that even using a very simple model for performing a tactical analysis can have a major outcome on the behaviour and how successful that agent is. The model we chose to use was just simply use ships from the planet with the most ships and send them to the enemy planet with the least ships. To our surprise, this worked amazingly on all but the first map.

The following chart displays a graph of the outcomes for all the games.



As can be clearly seen, the overall winner was “BestWorst” bot, who won 90% of the maps with 93% of the individual game wins.

Some further research could be done with a second bot who also implements a tactical analysis method to further analyse the implications of adding tactical analysis into the bots repertoire of behviours.