

Due:  
5/5/23

# Assignment 2

SPACE COMBAT

THOMAS PETERS

## Outline

The primary outline of the assignment was to highlight the bee algorithm, in tandem with the flocking or boids simulation. In the included files, the flocking algorithm was redesigned to introduce a more reactive and real-time form of flocking which introduced the ability to generate and function in selective groups and with individual leaders.

For groups, they follow a cascade system, in which any drone within proximity to a drone designated to the same group will automatically share a leader reference should they need one. Unfortunately, due to the time dedication elsewhere, and the complexity of the system itself, groups aren't utilized despite functionality being included (in `mothership.cs`) to form them. However, each finite state has inclusion for the action as a leader and as a group member. For example, if in a group, during attacking the leader will hold position whilst flocking when at the designated location, but when moving will ignore flocking whilst all group members will attempt to flock whilst following the leader. This opens the opportunity for more functionality such as a firing squad, one of the attempted AI features that failed to function in the final hours. For this functionality the leader shares an attack order on which all followers begin following.

The bee algorithm is also quite simple, however, could use more refinement. For the designation of drones, a linear value was chosen, where the percentage of the drone's battery efficiency is subtracted from 1 and the remaining value is subtracted against mining efficiency. The result is a value ranging from -1 to +1 in which the highest value represents a drone of better scouting capacity due to being more efficient, whilst lower results in drones with the best mining efficiency at the cost of battery efficiency

-1 (Elite Mining)

+1 (Scouting)



The unfortunate downside of this heuristic is that due to the reduced value of mining efficiency on the end product, more often than not, a drone of near perfect mining and battery efficiency may become a standard drone rather than an elite.

Should you choose to test the grouping system, the functionality is as follows.

Any drone actively doing a job the requires freedom from the collective will be placed in group -1. This represents an individual, and all individuals will ignore one another. Any groups formed in  $\geq 1$  will automatically flock depending on cohesion range and will ignore groups of any other value apart from their own. Groups formed with a chosen leader will share their leader will all neighboring grouped drones. In the event the leader wishes to disband, an event will fire causing all members of the same group to return to group 0, known as the general group. In a combat scenario, the leader is programmed to hold position after ordering an attack, and should the leader need to flee, the remaining group members will follow. Additionally, if any member of a group needs to flee, they will automatically abandon the group for self-preservation.