Or, a single unit with could explore the entire search space in 213 time frames, assuming it had a global source of information guiding it to prevent it from returning to a previously searched location. Both of those examples are extreme cases, but they show how the Minefield scenario can be solved over a period of time with a much smaller population size than 213 and without the use of global information as needed by the single agent.

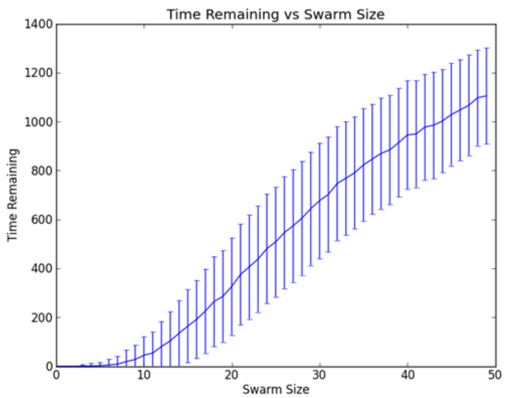

Figure 13. Time Remaining. The time remaining at the end of a successful search increases with swarm size.

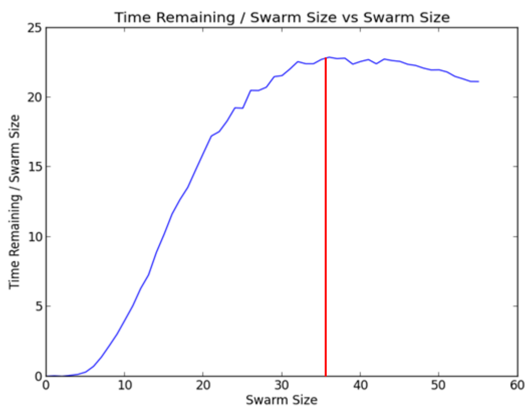

Figure 14. Time Remaining / Swarm Size. A shown here, the average time remaining divided by the swarm size peaks at a swarm size of approximately 36. This means that increasing the size of the swarm up to approximately 36 agents increases the speed of the swarm. After 36 agents, however, the addition of agents does not speed up the swarm enough to justify the cost of additional units.

V. Conclusion

We have designed a simple model of a minefield and evolved a swarm that can successfully map out all of the mines' locations within a set time limit. In order to determine a "successful" swarm simulation, we set thresholds on three separate objectives. When those criteria were met, the swarm was optimized for speed. We also test for the optimum swarm size needed in this simulation and found that a population size of 15 is required while approximately 36 agents would be ideal. By simply adjusting some parameters, a user could set criteria for success, and then test to see if the required swarm size was feasible for their specific application.

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