Comparative Analysis of AI Models for Team with Goal of Survival

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Problem Statement

AI models for team is an interesting subject. But that might be too general for our project. We would like to evaluate different methods for a group of agents, in an environment where the survival of the team is the goal. More specifically, we would like to compare centralized approaches (e.g. there is a leader in the group) to decentralized approaches (e.g. acting individually but cooperatively).

Question we are interested in are: Is centralized methods superior to decentralized methods? which one of these looks better?

Techniques Involved

Many AI techniques are involved in this project.

For decentralized methods, our thought is there are many levels of communication. Level-1 self-interested; level-2 sharing useful intel; level-3 sharing stats and maybe form tactics accordingly and so on with each level more information is shared.

For centralized methods, our thought is using decision tree, machine learning techniques, state machines, game tree. And of course, there is some necessary AI needed like path-finding, decision of fight or flight and so on.

Evaluation Method

Obvious metric for evaluation is time of survival: By using which methods can a team survive the environment is the most amount of time. Another thought is to have 2 AI teams using different methods go against each other, but that would add to the complexity. We could also use the survival rate (survival times/times of encountering enemies) and winning rate (times of beating enemies/times of fighting with enemies) of AI. Both reflects the success of decision making, and the second one specifically presents how smart the AI fighting skills are.

Another way to evaluate would be to ask people to play against AI, and survey about how do they feel, since intelligent of a game AI could be a subjective subject. Other evaluation metrics exist that are better-targeted at specific applications.

Importance

In most games difficulties are achieved by making enemy stats stronger. We are interested in making it difficult by making AI looked more intelligent and characteristic. In decentralized methods, from self-interested to sharing team stats, each agent chooses the action based on the information they owned, and in centralized methods, the leader gather all the information and give the order to each agent. Both methods can be used in many game environments where teamwork and strategy are needed. Besides, by evaluate the performance of different method, we can find out which method is better under some environments or situations, and what is the advantage and disadvantage of the method respectively. Furthermore, this multiagent team model may suit for some situation in real world, and could provide suggestions to some teamwork such as military operation group.