Nexus Rescue Team Description

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Abstract. This paper presents an overview of Nexus Rescue Simulation Team. Our main concentration was on developing a better way of co-operating in a multi-agent system. In this paper we try to describe some of our algorithms and strategies such as Cooperation, auction, reinforcement learning briefly.

1 Introduction

Recently, multi-agent systems have gained a lot of attention. Thus rescue simulation which includes heterogeneous intelligent agents with different types of abilities, is an excellent framework for multi-agent planning, communication skills and coalition formations. So we tried to improve algorithms with a hope that these algorithms can be used with similar situation in the real world.[1]

2 Communication Skills

Theoretically we can implement an intelligent multi-agent system without any communications between agents. But when it comes to practice, we see some problems in co-operations between agents. One way and the best way to reduce this problem is solving it by communication between agents. Doing that, we can create a better coalition formation. And since there's a limit on the message length, we need to choose the most important messages to be sent. We used priority deciding policy in order to solve this problem. So what we do is choosing the most important messages by giving them priorities and save the other messages for the coming cycles. We used a centralized priority setting mechanism in center agents to manage message passing in team agents. [1]

3 Decision Making

We used different kinds of algorithms for decision making depending on agent type that will be described briefly and categorized by agent types.

Fire Brigade:

We tried different kinds of algorithms to choose the best fired building and extinguish it. And finally we decided to use auction algorithm. Using this algorithm, gives us a con to find a fired building which is in the best situation for the agent. Some important parameters are *fieriness*, *fired area* and *neighbors' situation*. And if the agent wasn't able to find any fired buildings, it will try to help other agents, like looking for blocked roads to help police agents.

Police Force:

Unblocking roads, plays an important role in the quality of other agents work. So police force agents need to find the most important roads and try to make them open. Our solution to this problem is Coloring algorithm. In this algorithm, each road belongs to a color which shows its importance. For example, a road that leads us to an area with fired buildings or damaged civilians will get a high priority and belongs to a color like red. This algorithm, combined with some others like *Region priority, Timing priority,* helps us in finding the most important road to be unblocked.

Ambulance Team:

Ambulance Team agents' duty, is to find civilians, estimate their time of death and move them to a safe place. In our algorithm, we divided the map into several areas and each area will be given a priority. Using these priorities, we choose the number of agents to be sent to each area. These priorities also show us which areas include civilians that are still getting damage (e.g. a civilian in a fired building). Thus, using this algorithm gives us this advantage to choose where to go first and how many agents to be sent there.

Path Finding:

Using graph of the map, gives us the advantage to find the roads with graph search algorithms. We used BFS algorithm to find a way to destinations and Dijkstra algorithm to find the shortest way to destination by considering length of each road as each edge's weigh in the map's graph.

4 Conclusion and Future Works

As we have worked on rescue simulation we noticed that real rescue operation is very complicated and these kinds of activities and researches could be helpful for rescue teams. As a future plan we decided to work on fuzzy decision making for our agents in order to have better results. Furthermore learning algorithms helps us in rescue processes as we have the experience of using learning in other projects and it made a magnificent improvement in the results. [2][3]

References

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