

MAS - Miners report

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1 Exploring the map

Map exploration with the goal of finding depots, gold and obstacles was done by creating a Map class for each agent which held a grid graph structure representing the map, with originally all map positions being connected to their manhattan-distance 1 neighbors and having the type of empty space. Along with it's type each position also held a timestamp when it was last seen, which is an integer value representing the value of each agent's particular scalar clock of when the position was last seen. Each agent has its own unique clock which it increases by one on each iteration of it's main cycle.

Agent send each other messages about what they see. When an agent receives such a message, it updates it's internal map with the type of field the other agent has seen and updates the position's timestamp to the agent's current scalar clock. When an agent receives a map update message with the type agent, it doesn't update the map structure itself with the type agent, rather just changes the position of the other agent in it's memory and updates timestamps in the 8-neighborhood of the other agent's position, as well as the timestamp of the other agent's position itself.

As the map doesn't change, each message is trusted. The only way the map actually changes is when an agent picks up gold. This case is handled by a special message type. An agent only sends messages about what it sees if seeing it made a change to its internal map. If an agent's internal map hasn't been updated by seeing a thing, it assumes that other agents have already been informed about the given position.

When exploring the map, an agent selects a spot to visit as the position in the map with the lowest timestamp. If there are several positions with the same lowest timestamp, then the nearest one gets selected.

While exploring, agents can already claim (claiming explained in the next section) and pick up gold, but unless the map is fully explored, agents only try to claim gold which is at most manhattan-distance 2 away from them, so they don't try to walk across the whole map to claim some gold an other agent has seen right away.

2 Claiming gold

When an agent is aware of an eligible (if the map is not fully explored, only gold which is at most 2 steps away from it, otherwise all remaining gold) gold present in its map, it tries to claim the nearest one to it, if there is not already a claim on it. It does so by sending a claiming message to all other agents. All agents track claims. When a claiming message is received by an agent it responds to the sender with the agentId of the agent that has the claim at the position. The agentId that has claimed the position is checked in the following way. If the position was not claimed by anyone when the claim message was received, it gets assigned to the claim sender. If it already has been claimed, the new claimer gets the position if and only if its ID has lower numeric value than the previous claimer. This way conflicts are resolved. The claim sender waits until it has collected three claim responses with the agents own ID for the position it's trying to claim. If it receives a claim response with a different agents ID, it switches back to exploration.

If claiming is successful, the agent then proceeds to the gold. When it arrives at the gold it sends a message to all other agents asking for help. The other agents must respond to this message by either informing the sender that they either will or wont help. The agents that are willing to help then change to a state waiting for a response if they've been selected as helper.

The original sender waits until it has received all responses, and sends message that help was accepted to the nearest willing agent, while sending a message informing that help was refused to all other willing agents. If however all other agents refused to help, the sender changes his state to exploration, but notices it has an active claim and tries again, until either he is succesful in finding a helper, or it itself gets asked for help, in which case the agent will only be willing to help an agent with a lower ID. This is done to prevent all agents perpetually waiting for help while standing on top of claimed golds.

After a helper-picker duo has been estabilished, both the agents will refuse to help anyone else until the picker picks up the gold. The picker sits at the gold until the helper sends a message that it is in position. After the picker picks up the gold, it sends a message to all the other players removing its gold claim. The helper is checking until the picker's claim gets removed and then returns to exploring. The picker continues on to deliver the gold to the depot (searching for it if it hasn't been found yet). While carrying gold, the agent is willing to help other agents pick up gold, if and only if the depot is more distant than the agent asking for help.

3 Conclusion

This simple architecture of each agent being an automaton proved to be a viable option for most maps, except the last one which requires more agent cooperation.