**CraftBots AI Challenge Design Spec (WIP)**

**Overview**

The CraftBots AI Challenge is a challenge to create an AI to plan an execute randomly generated tasks in a randomly generated, multi-agent environment.

The problem presented by the challenge will consists of a world modelled as a graph. The randomly generated task will ask the AI to control several actors to collect resources and construct a/some building(s) in specified node(s).

Some of the nodes on the graph will contain different resource mines. These actors can gather resources from these mines and then use them to build the required buildings. Each resource will have different properties to challenge the AI.

There are also several different buildings can be built. Aside from fulfilling the tasks specifications, buildings also provide helpful effects to the environment to make your actors perform better. These buildings can be built even if the environment does not require your AI to do so.

**Actors**

When the simulation starts, the AI will have a certain number of actors given to them. These actors are controlled by the AI you are tasked with designing. They can be controlled to move to different nodes, perform different tasks, such as mining and building, and pick up and put down resources, of which they can carry only a limited amount.

**Resources**

There are 5\* different resources that can spawn and be used to construct buildings. These are: Red, Green, Blue, Black, and White. Red resources can only be gathered during the daytime of the simulation. Green resources require two agents to be mined. Blue resources take considerably longer to gather than the other resources. Black resources take up the entire inventory of the actor, as such, any actor can only carry one Black resource at a time. White resources decay overtime, and will eventually disappear, if not used.

Resources each take a certain amount of time to mine. Once mined, they are placed into the inventory of the actor, if it has the space for it, or drop onto the floor. Resources on the floor can be picked up to be moved somewhere else, and resources in an actor’s inventory can be drop to make space for different resources, or to store them there.

**Buildings**

There are 5\* different buildings available. The buildings are: Red, Green, Blue, Black, and White. Red buildings increase the speed at which actors can move between nodes. Green buildings increase how fast actors can construct buildings. Blue buildings increase the rate at which resources are mined by actors. Black buildings increase the inventory size of actors; however, this does not affect the Black resource’s property of taking the entire inventory space of an actor. White buildings, when fully built, allow actors to bring resources into the building to create more actors. This gives the benefit of giving more actors for your AI to use, with the downside of having to manage more actors.

Each building requires a different amount of some/all of the different resources. Buildings take time to build, and can only be built to a percentage equal to the percentage of resources currently given to the building site. Once a resource is placed in a building site it is consumed. Resources can also be placed in the same node as a building site and not be consumed. There can also be more than one building/ building site at one node. Buildings that provide an effect to the actors do so globally, affecting all actors in the simulation.

**Other Notes**

The CraftBots simulation will have a default set of parameters. However, parameters can be customised to provide different challenges from different aspects of the simulation. There will also be optional rules, such as partial observation, locked-step, and also options to adjust the random generation of the world, including an option to provide a set seed to generate the same map/task.

*\*These are subject to change. Resources/buildings may be added, removed, have properties changed, etc.*