ANIMATE

Explanatory 1:

Your First Experiment

Contents

Introduction

What is a Multi-Agent System and what is an Agent?

Animate is an experimental sandbox that provides a virtual environment for Artificial Agents. Think of the Agents as electronic ants within a small box that provides a simplified environment for them to exist within. This is essentially what a Multi-Agent System is.

The Agents in Animate are known as "simple reflex agents with internal state". This means that they react to their environment using a simple set of rules based upon their knowledge of that environment that has been gathered by whatever perceptive capabilities they have. Furthermore, they do not make plans, hence the word "reflex", they merely react to a combination of circumstances.

What is Emergence?

Animate may be used to study how simple interactions between Agents may combine together into more complex patterns that yield phenomena that are essentially a "sum of parts". The emergent phenomena that arise out of these interactions may be functional, structural, or both. Ants follow a very simple "script" to carry out their actions, but their combined impact upon their environment is considerable and the functional benefits that they bring to their colony are highly advantageous. However, they are not planning in the manner that we are familiar with, but reacting to pheromones or chemical trails that are released under certain conditions.

We inhabit what is known as an "object-oriented" reality which means that "things are made out of other things". An object contains other objects that in combination with each other, provide functions that even larger objects use. For instance, skin contains lots of layers of cells that all provide different functions depending upon their location and type. Combined, they provide a highly effective protective barrier for internal organs and not only have the ability to self-repair, but also provide sensory input and many other functions for the human organism. Emergence takes a keen interest in how very simple rules given to colonies of agents may scale up into sophisticated and beneficial functions, that may continue to scale to ever larger objects with increasingly complex and adaptive benefits for the objects involved.

Getting Started

Installing the Software

STEP 1: Unzip all of the files into a folder of your choice on your computer.

STEP 2: Double-click the file "Animate.exe" to run it. You may also create a shortcut to this file to make it easier to run in the future.

That's it!

There's no installation necessary, so to delete Animate, just delete the folder and all of its contents when you no longer want it on your computer.

Your First Experiment

We are going to simulate some agents mining minerals and carrying the ore back to their base. We already have an environment for the agents that came within the zip file, so let's load up that environment, known as a "map", and take a look.
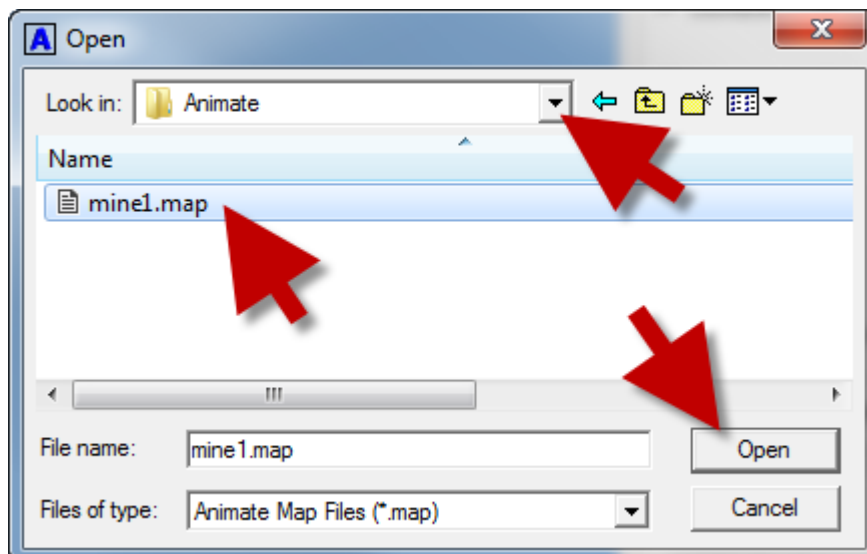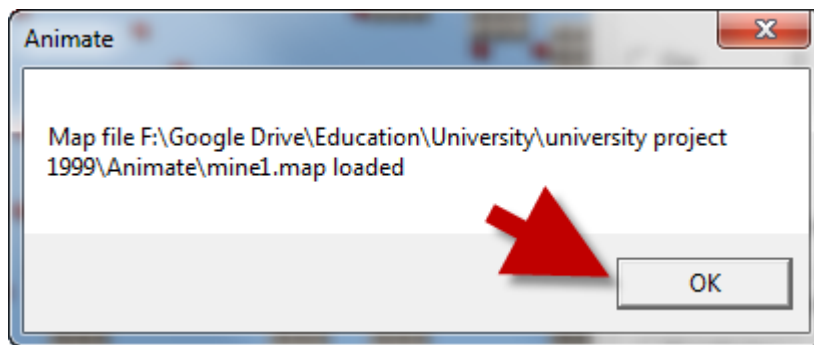
Click the "Map Editor" button illustrated below:
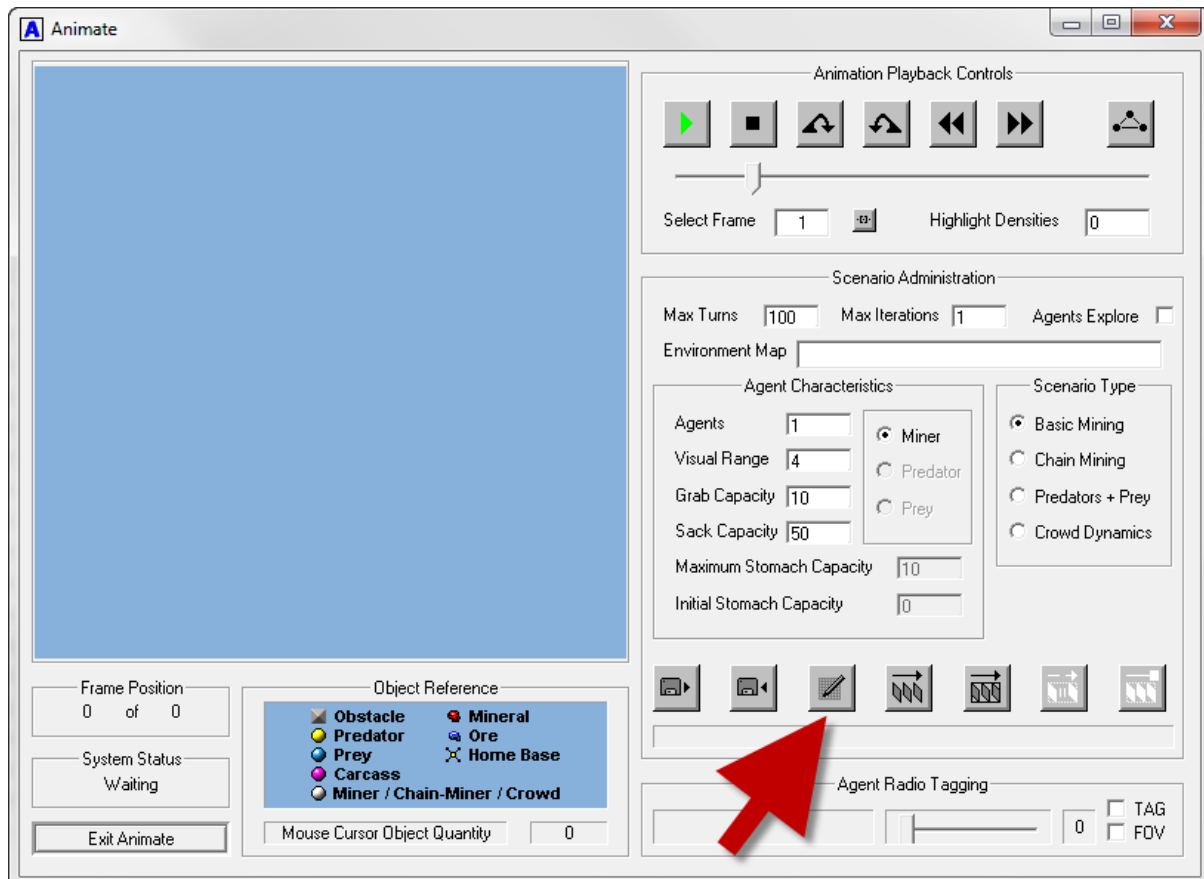
We need to load a Map, so now click the "Load" button illustrated below:
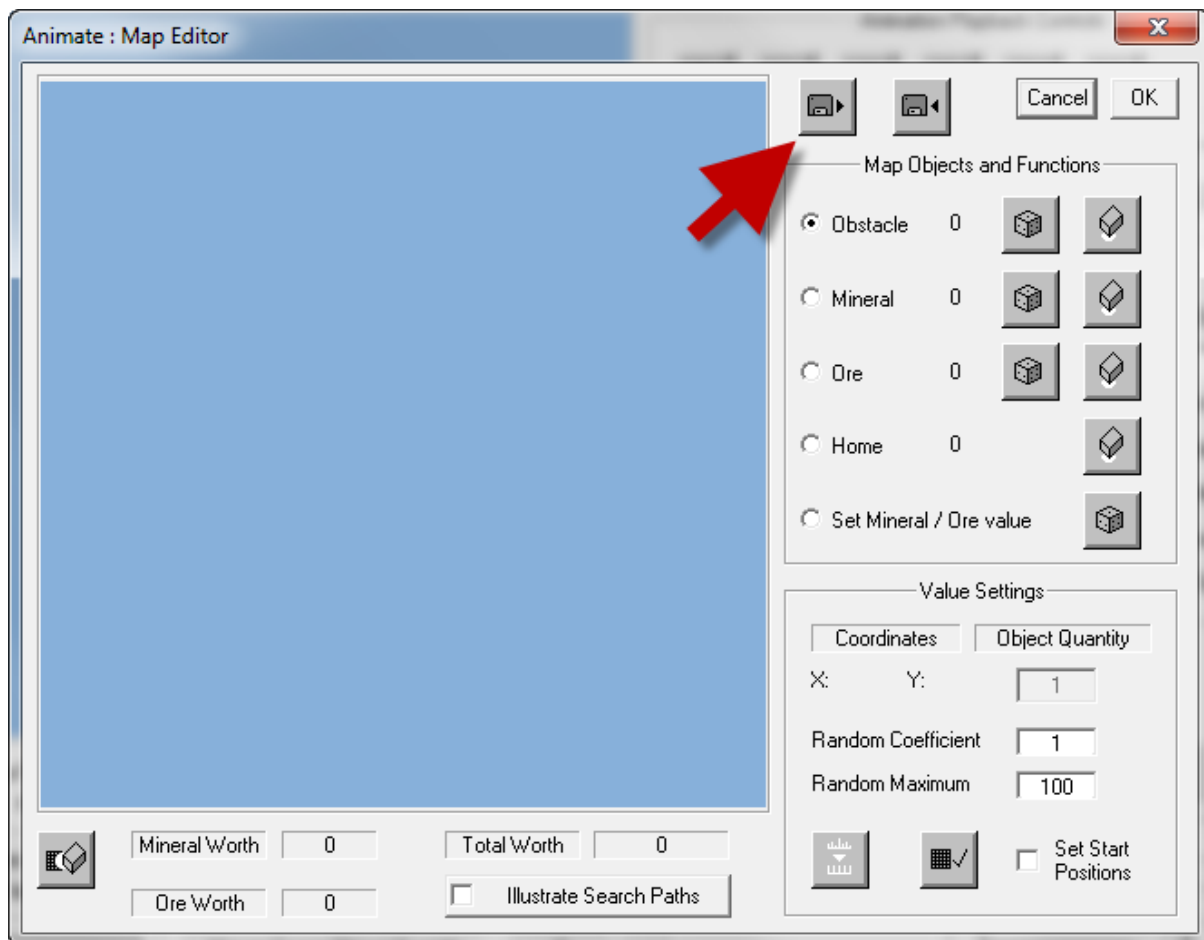
Navigate to the folder where you unzipped the files, select the file "mine1.map" and then click the "Open" button as illustrated below:


Click the "OK" button to close the window that confirms the map is loaded:

The map is now loaded into Animate. The red blobs are minerals, the pyramid blocks represent obstructions that cannot be crossed over, rather like large impassable boulders. The "X" is the base where the Agents need to deposit the ore that they find. The blue space is open ground over which the Agents may freely roam:
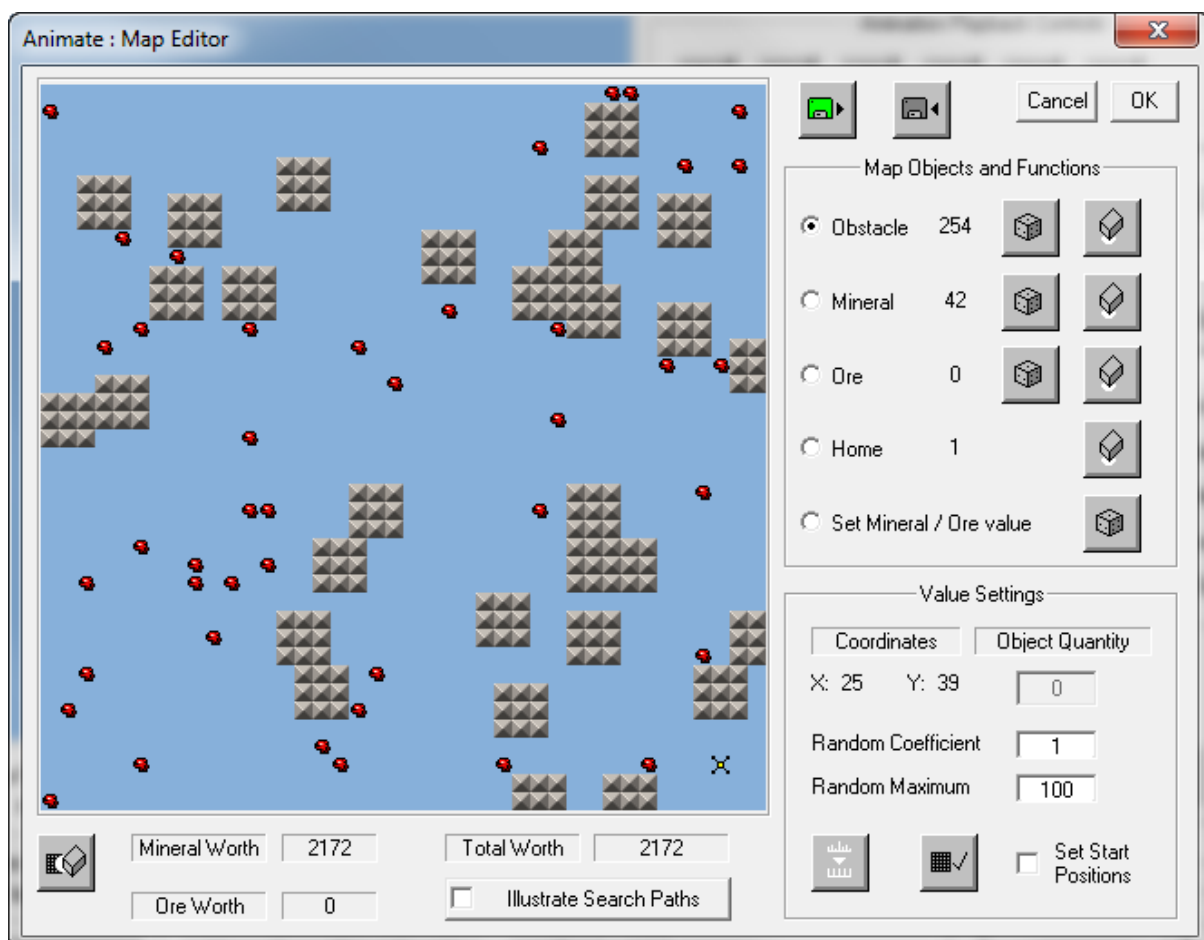

Let's not fuss over the other features at this time, as we are itching to experiment! Close the Map Editor by clicking the "OK" button as illustrated below:
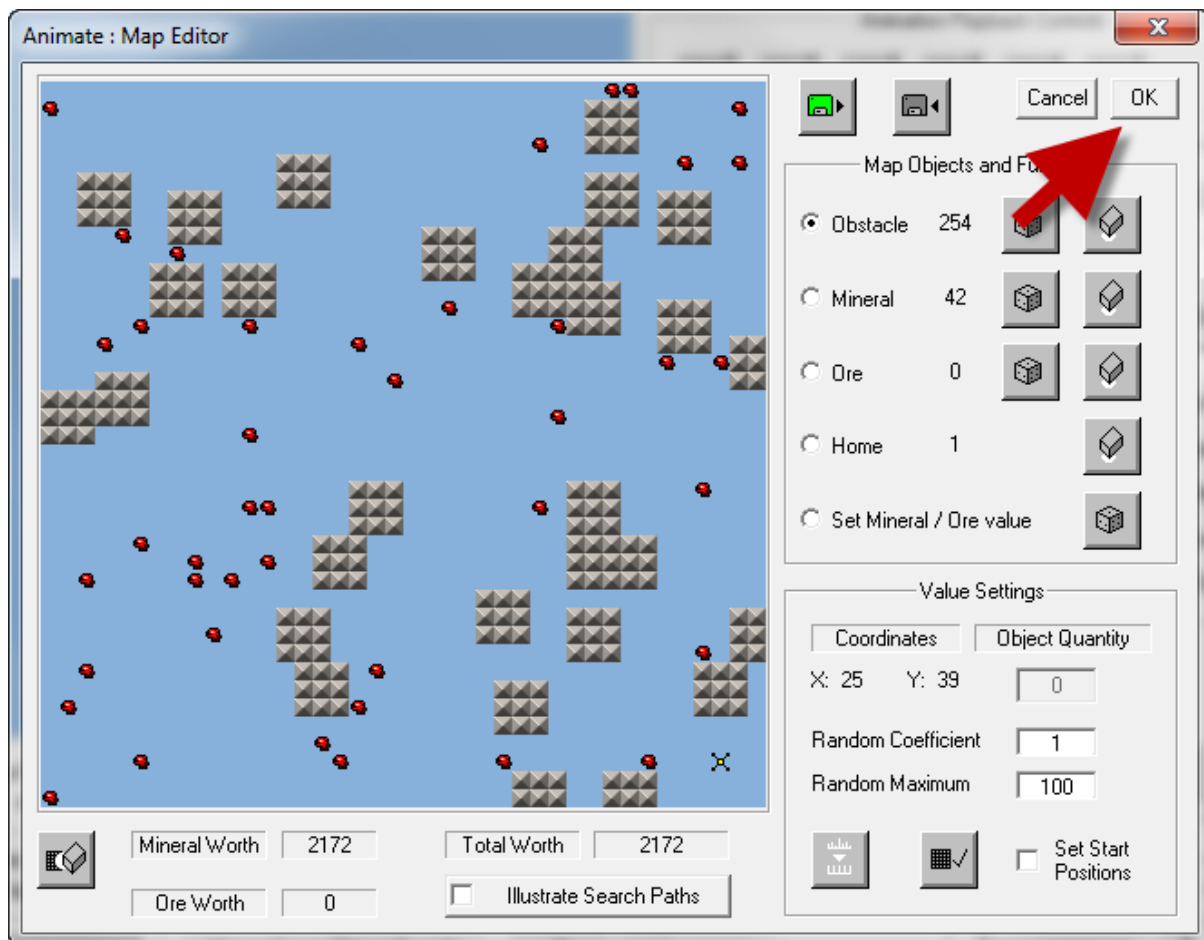
Now set the "Speed Slider" to roughly the position shown below. Also set "Max Turns" to "1000" by clicking in the textbox and adding a zero and also set the number of "Agents" to "8". This sets up the parameters for the experiment. Notice that the "Environment Map" shows the path to the map that you loaded. This is how you can tell if you have loaded a map:
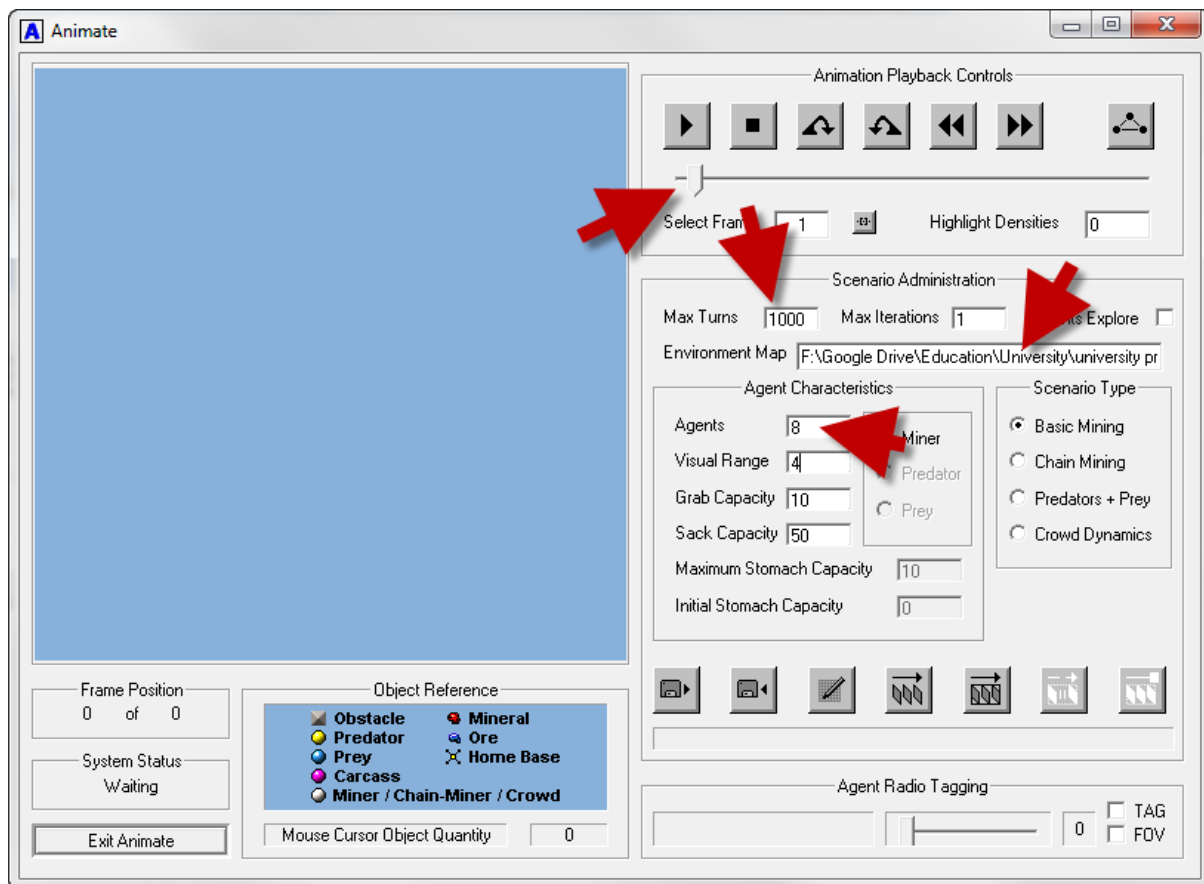
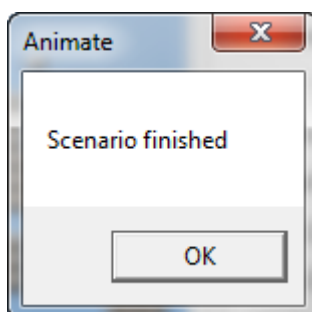Now click the button illustrated below to start the experiment:
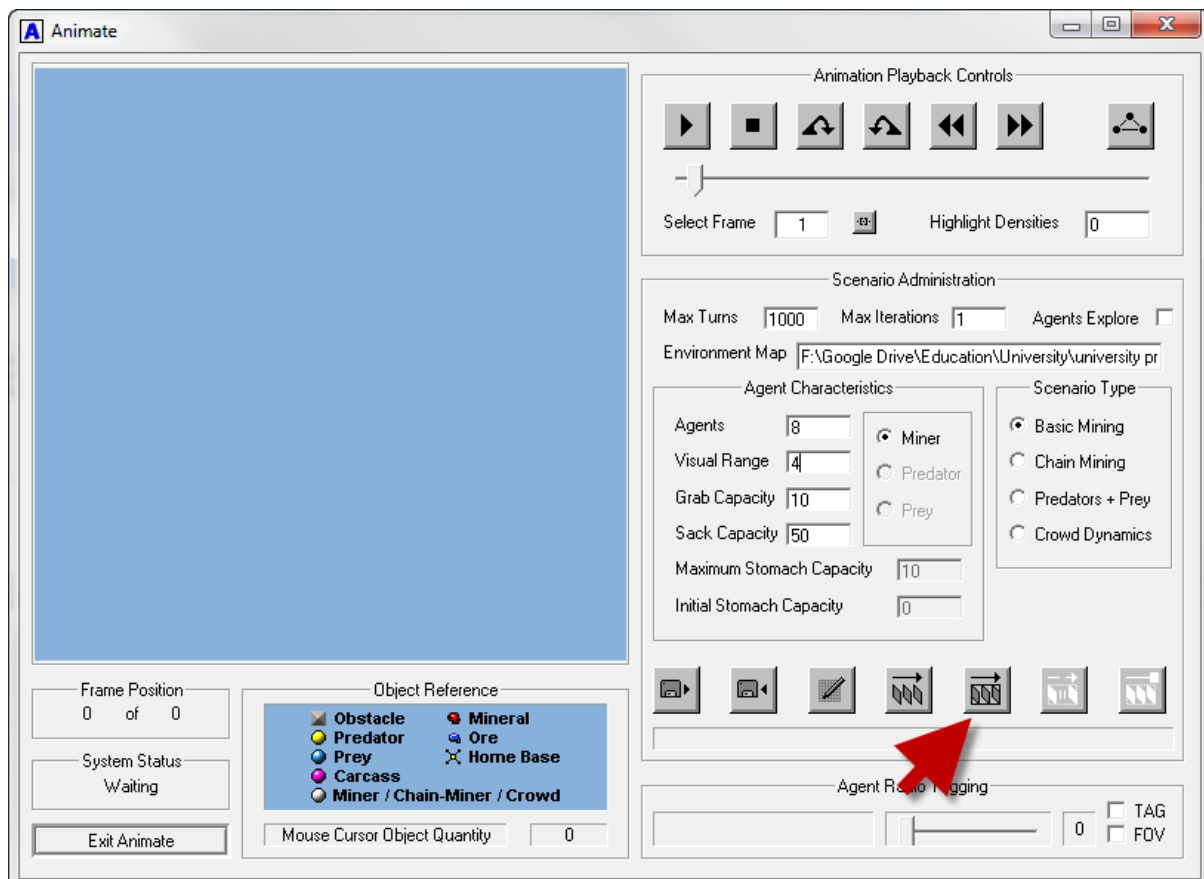
Click the "OK" button to confirm scenario execution:
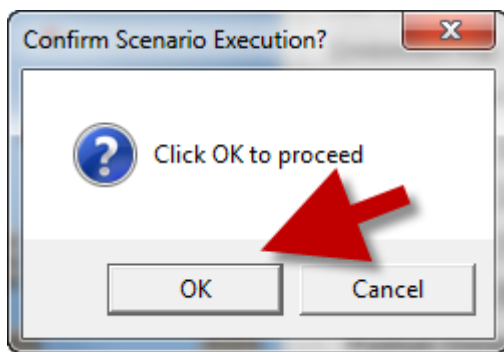
The experiment or scenario will now commence and the Agents will scurry about the map collecting ore and taking it back to their base. The scenario will complete after 1,000 turns, or you may stop the experiment at any time by clicking the button illustrated below:
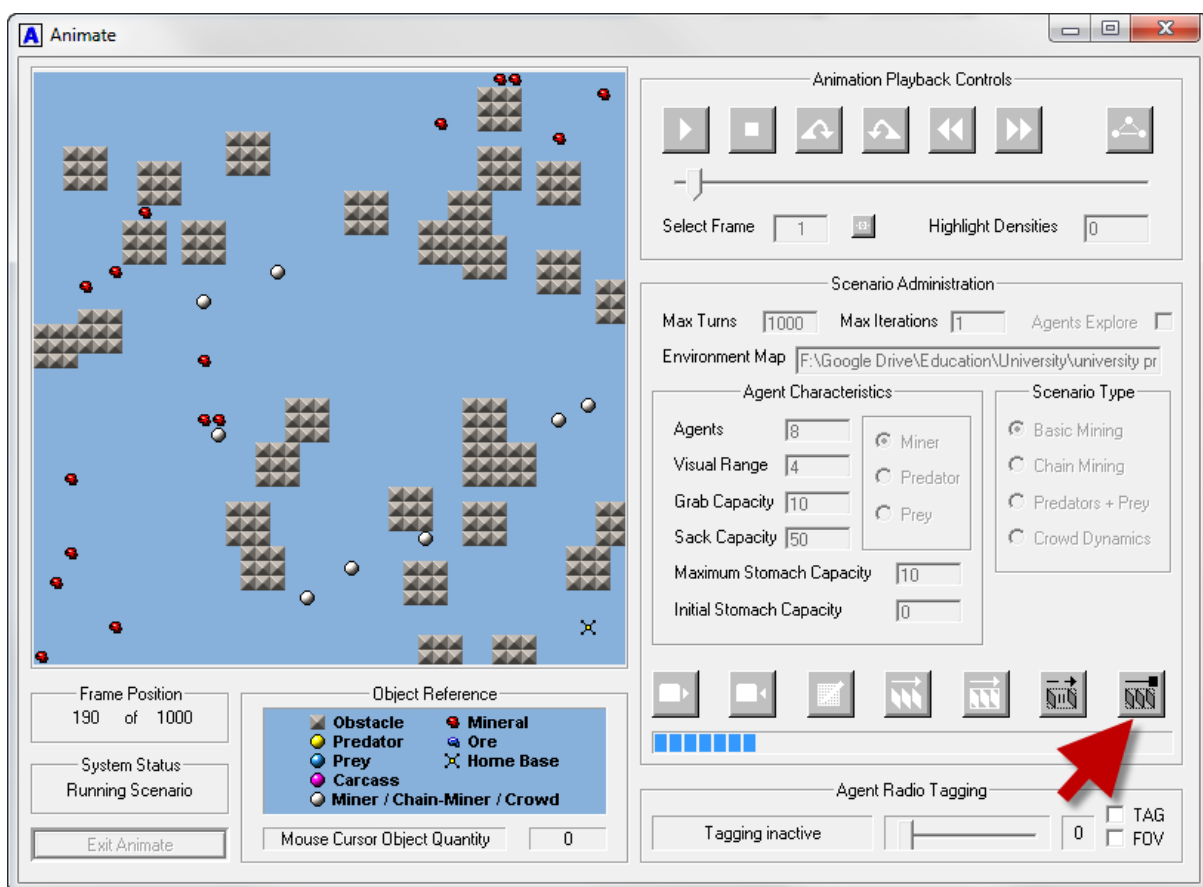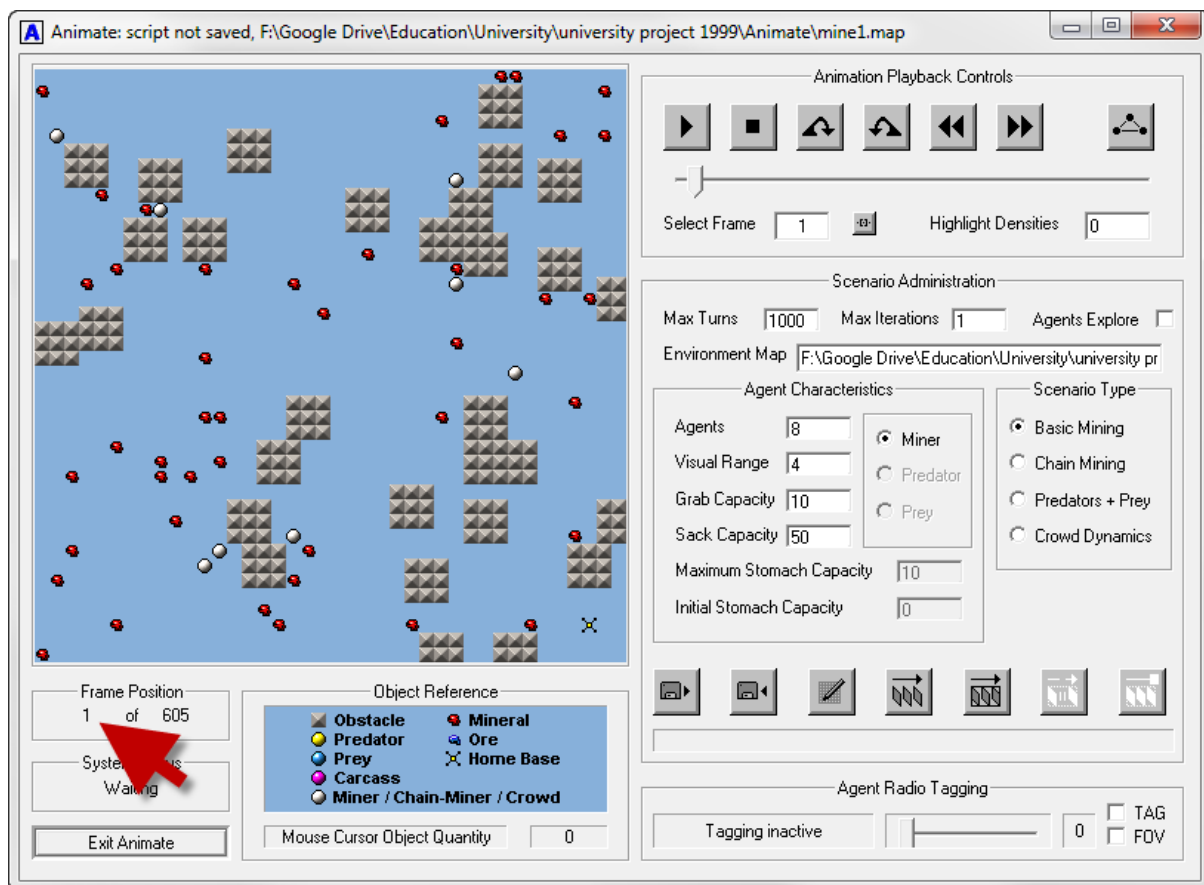

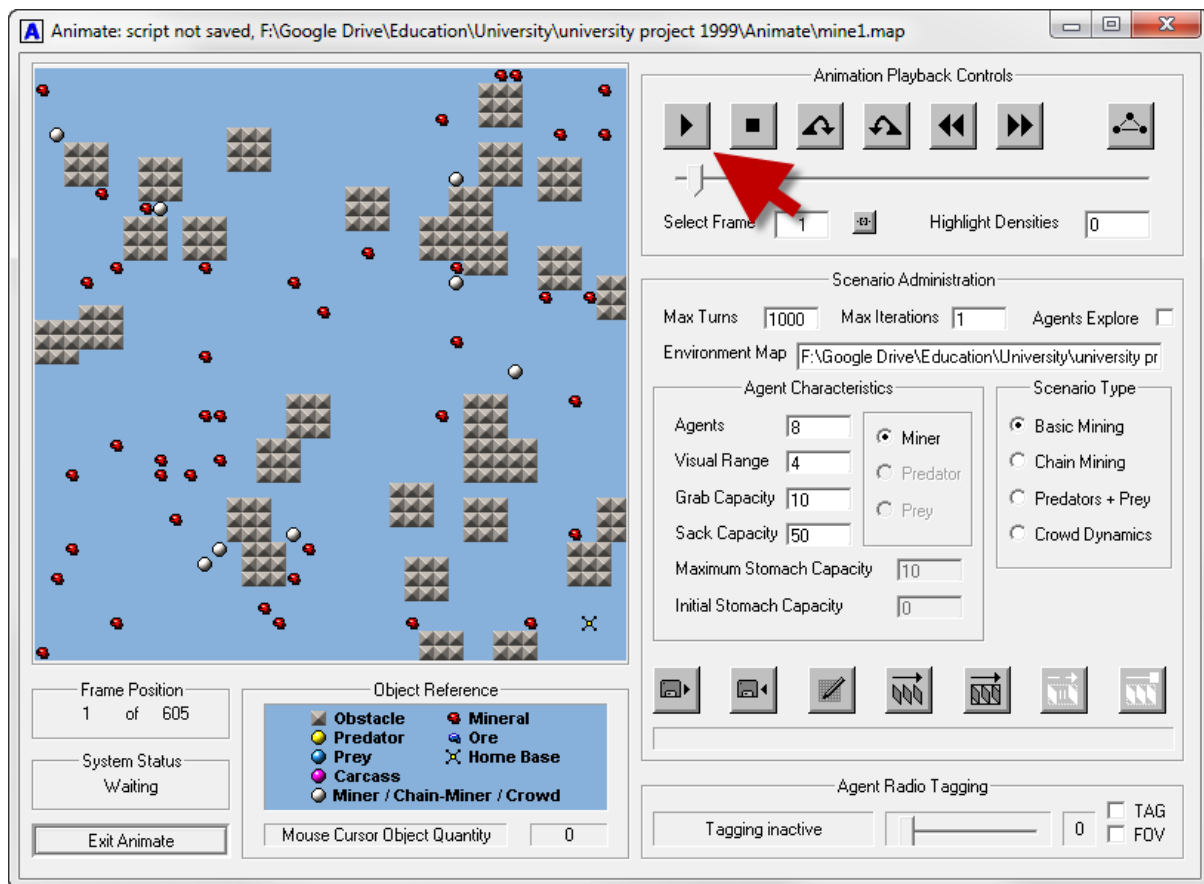Now click the "OK" button to acknowledge completion:

Animate will now reset itself back to the first frame of the recording that it took of the experiment:

You may now playback the experiment using the "Animation Playback Controls". Click the "Play" button illustrated below to replay the experiment that was recorded:
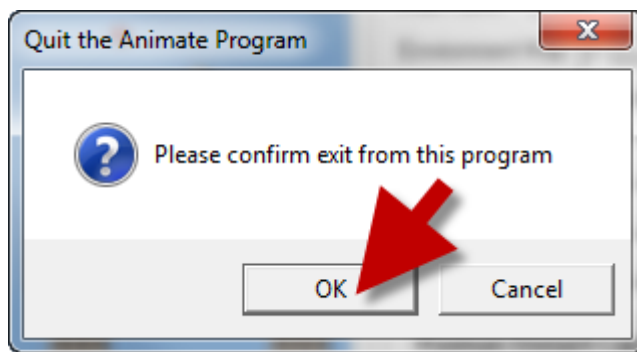
Animate will now replay the experiment that was recorded. You may stop playback by clicking the "Stop" button illustrated below:
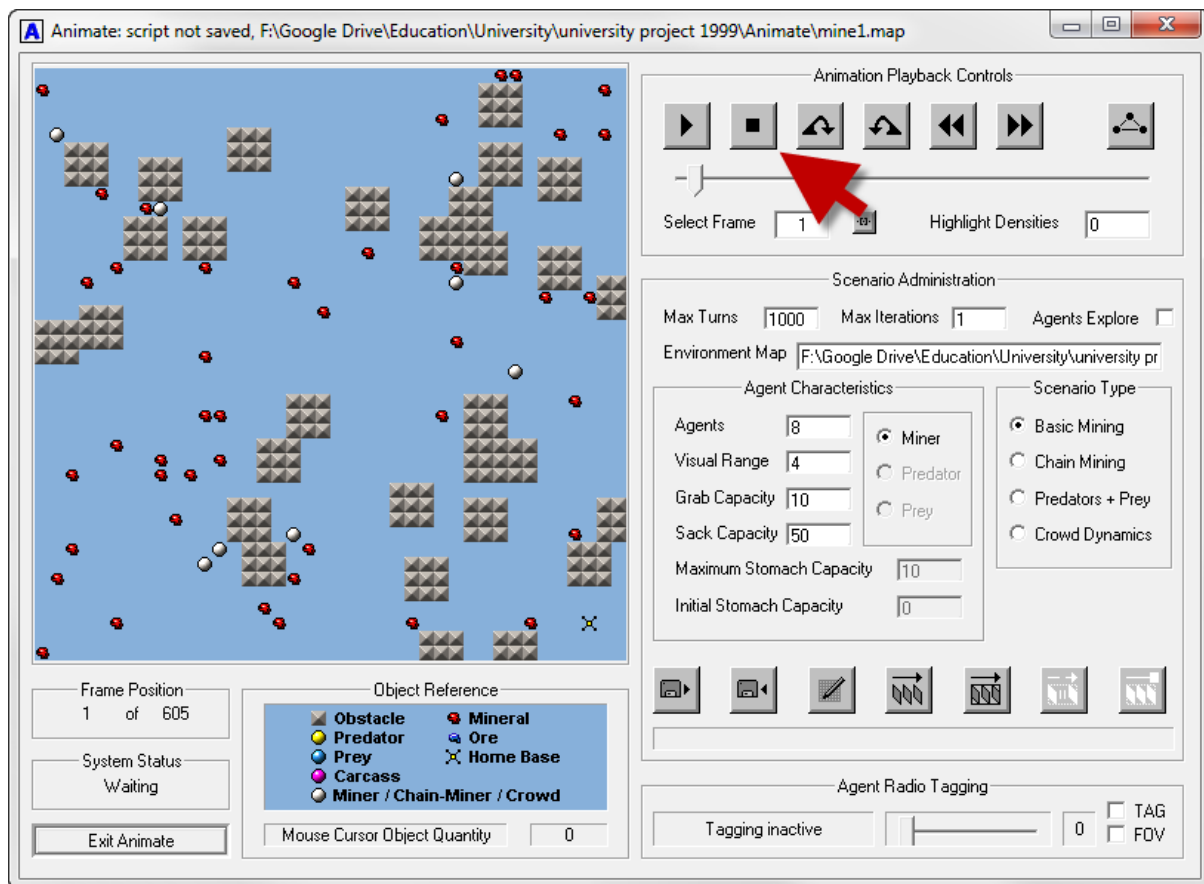
To exit Animate, click the "Exit Animate" button shown below:
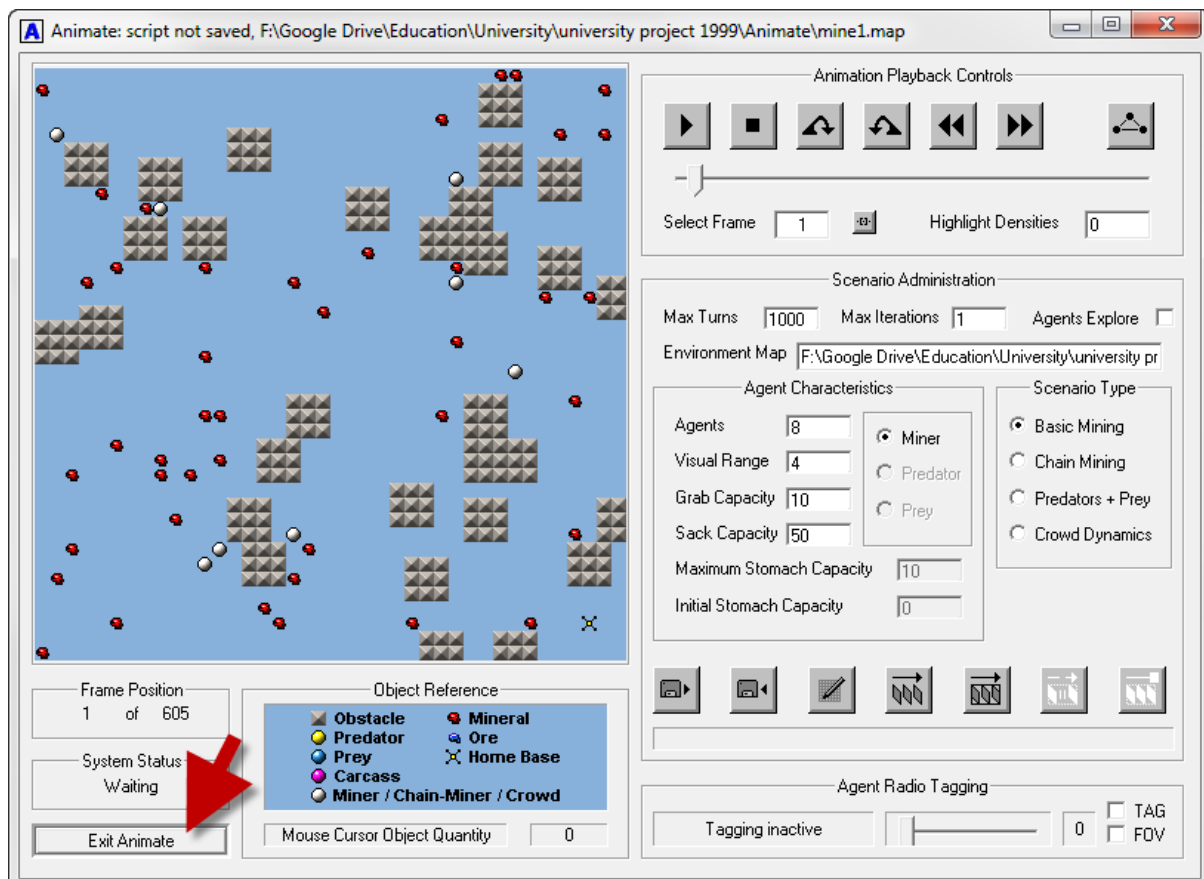
Click the "OK" button to complete the exit:

After chuckling merrily at the mad scientist summary, click "OK":

Experimental Results in the Context of Emergence

This was a very simple experiment illustrating the emergent function of a community of Agents with a common purpose. Collectively, they collect the ore and deposit it at the base faster than a single Agent. In effect, they have the emergent function of "community" in its simplest form. Other emergent features may arise in these types of experiment depending upon the amount of minerals, its location and the orientation of obstacles.

These types of experiment show how simple objects may collectively scale up into much more complex systems, in effect, helping us to understand the nuts and bolts that comprise complex systems that are hard to predict. We can tweak the rules that the Agents follow and also the environmental circumstances to establish which combinations yield interesting and beneficial emergent phenomena.

There's much more that you can do with Animate that will be covered in future explanatories.