UNIVERSITETET I AGDER

IKT407 Web mining

Pathfinding for ORTS

Background & design specification

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1 Background

1.1 Pathfinding

Pathfinding is a term used to describe processes involving a computer program finding a path from a point A to a point B. The concept has several areas of application in the world of computer software, and the computer gaming industry is arguably one of the largest.

In a computer game, a pathfinding system is used to calculate and plot a course for mobile units when they are issued a command that involves moving somewhere. The system should (ideally) ensure realistic and efficient routes from the unit's start to it's destination, avoiding any obstacles along the way.

Although pathfinding is crucial in a wide range of computer game genres, perhaps the most evident, and also the one we will be working with in this project, is Real-Time Strategy games (RTS). In RTS games, all units depend on a primitive form of artificial intelligence to move around, as there is no human interaction guiding them every step of the way. Typically you simply select a unit and then choose a destination.

1.2 ORTS

The Open Real-Time Strategy game, often referred to by its acronym ORTS, is a free software RTS game engine. ORTS is essentially a playground for studying real-time AI problems such as pathfinding, dealing with imperfect information, scheduling, and planning in the domain of RTS games. It's released under the GNU Public License, and is platform independent[2].

Rendered in the OpenGL client, the ORTS game environment appears three dimensional, with hills, plateaus with ramps, and so on. To the pathfinding system, however, the environment is purely 2D. This makes navigation considerably easier, as you only have a grid of tiles of some shape to work with. An example shown in figure 1, with start position marked red, end position marked green and obstacles in blue.

1.3 The A* algorithm

A star is a graph search algorithm that is heavily used in RTS games for unit path finding. The algorithm was first written by Peter Hart, Nils Nilsson, and

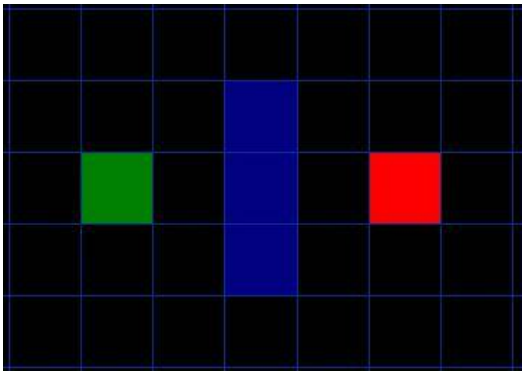

Figure 1: Simplified game environment as seen by the pathfinder

Bertram Raphael in 1968. The algorithm calculates a heuristic to find the best path to the destination. Unlike other path finding algorithms, which does not derive from A-star, this method takes into account the distance already traveled and it is therefore the best approach for finding an optimal path. A-star does however require a good deal of resources from the computer and can be too expensive to use in a larger scale[1].

2 Requirements

The original requirement specifications states:

> Develop a pathfinder for ORTS. The idea for this algorithm is to find the shortest path to an enemy unit and attack this unit. In this assignment obstacles, such as stationary units (mountains etc.) must be considered.

We find no reason to change this. The goals for the project are further outlined in the next section.

3 Design specification

During the course of this project we are going to look closer into the path finding algorithm dubbed A* (A-Star). We have set up three points that we are going to look deeper into concerning this algorithm:

Other moving units (collision detection) We will try to improve the algorithm in such a way that it will be capable of detecting units moving into its path of travel and handling this situation appropriately. Preferably finding a way around the obstructing unit.

Unexplored areas We will have to experiment to find a way to handle units going into unexplored areas.

Optimization We will try to find the most effective way of writing this algorithm in relation to computing time.

To run the experiments we are planning on implementing the algorithm into ORTS which is an open source RTS-game.

References

[1] A* at wikipedia. Available: http://en.wikipedia.org/wiki/A-star.

[2] Orts website. Available: http://www.cs.ualberta.ca/ mburo/orts/index.html.