

Comparison of Pathfinding Algorithms for Videogames COMP09041

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Laboratory Objectives

First Objective

With reference to the pathfinding tutorial and Javascript applications at <http://www.redblobgames.com/pathfinding/a-star/introduction.html>, explore the difference between breadth-first search; Dijkstra's algorithm; and A*.

Second Objective

Change directory to `redblob_code`; a version of the *Red Blob Games* C++ code. Use CMake to create the Visual Studio solution `redblob.sln` from the `CMakeLists.txt`. There is no need to edit the `CMakeLists.txt` file for this project.

Within Visual Studio; You should see 5 projects: `breadth_first`, `breadth_first_came_from`, `breadth_first_early_exit`, `dijkstra` and `a_star`. Follow the instructions below as you explore each in turn.

- a. Try the debugger: toggle a break-point in your code using F9, and run the debugger to this point using F5. Use F10 and F11 to step over and step into functions and methods. SHIFT+F11 steps out of a function. Press SHIFT+F5 to end the debug session.
- b. Compare the difference in iterations required when an early exit strategy is employed within breadth-first search; Dijkstra's algorithm; and A*;

- c. The `heuristic` function in `implementation.hpp` is used by A*. Look at the code of this short function and answer for yourself: which heuristic function mentioned in the lecture does this model? Experiment with different heuristic functions for A*;

Third Objective

We will now look at the Boost Graph library's support for the A* pathfinding algorithm. Change directory to `astar-cities`, and as in previous weeks, edit the `CMakeLists.txt` file within the `astar-cities` directory to find your Vcpkg installation. Configure, generate, and open the new project in Visual Studio.

- a. What is the latitude and longitude of Ithaca?
- b. What is the edge weight between Ithaca and Binghamton?
- c. Modify the code to allow the start and end city to be explicitly specified.
- d. Remove one city from the set of nodes and edges of the program.
- e. Modify the A* heuristic employed.