Implementing Subspace Anomalies in *Hunt the Wumpus*

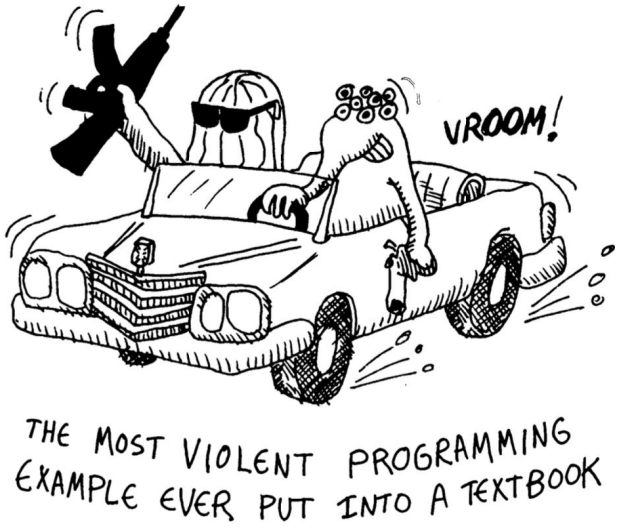
> “What in the heck are you talking about?”
> — Adele Dunn

My wife likes to randomly ask me “What are you thinking about?” I gave her the title of this lightening talk and this was her response.

Yuma - Certified Rubber Duck Facilitator

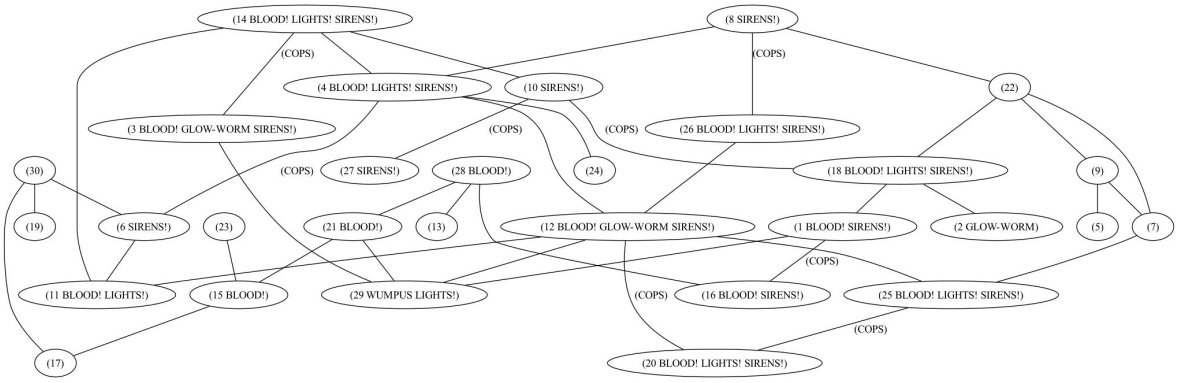
This is my dog Yuma. He doesn't understand computer science or pop culture references but he is great at rubber ducking. Being an energetic three year old means he gets lots of walks. On one of our walks I was telling him about a book I was reading that was using the game *Hunt the Wumpus* to illustrate programming techniques.

Grand Theft Wumpus



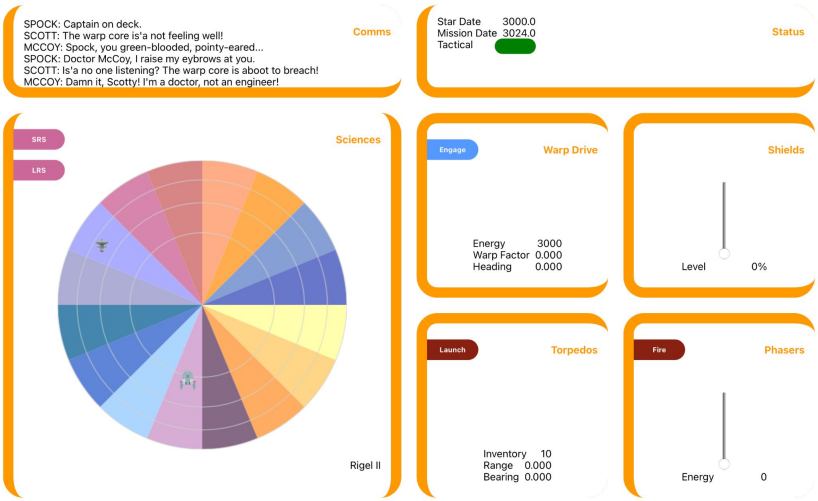
In *GTW*, the player is hunting for his double-crossing partner, The Wumpus. The city is controlled by the Glowworm Gang and if you meet a gang member, you will be abducted and dropped at a random spot in the city. The roads of the city are patrolled by law enforcement personnel whose goal is to take you into custody.

Congestion City



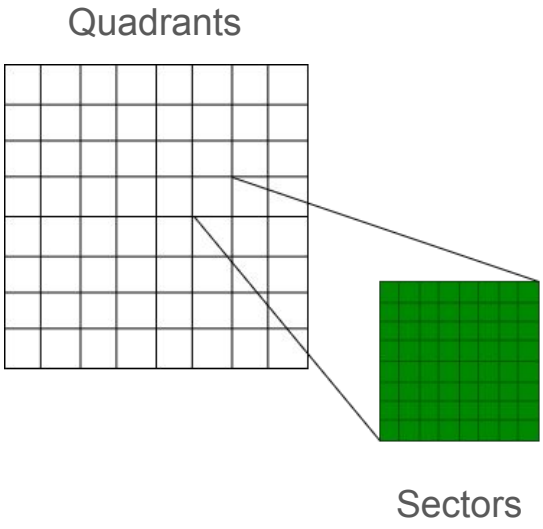
The action of the game takes place in Congestion City. The map of Congestion City is stored in a **graph**. Both edges and nodes of the graph contain data driving the game play. Here we can see that some edges, aka streets, are patrolled by cops. We can also see which nodes, aka neighborhoods, contain Glowworm gang members.

New Trek



One of the toys that I break out when I'm bored is my reimagining of Mike Mayfields 1971 classic, *Star Trek*. My high school had a teletype machine that was connected to the mainframe at the Board of Education and you could sign up for time on the machine. The mainframe had *Hunt the Wumpus*, *Star Trek*, and other distractions.The teletype was in the boiler room. I spent too much time in the boiler room.

OG *Star Trek* Galactic Map

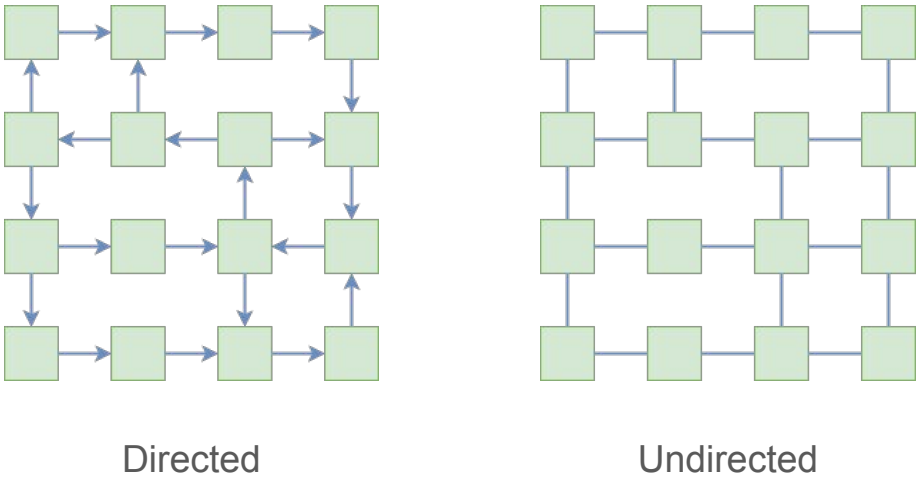


The *Star Trek* board divides the galaxy into sixty-four **quadrants** of sixty-four **sectors** each. A quadrant **grid** stores data about the stars, Klingons, and starbases in the quadrant. The sector grid positioned those stars, Klingons, starbases, and the player in the sector. The game state was tracked with one 8x8x3 array for the galaxy and one 8x8 array for the current sector, along with a handful of global variables.

I told Yuma all of this and he asked “Is a matrix the same as a graph?” I started to explain about adjacency matrices but he didn’t pay attention because “Squirrel!”.

So what happens when we use a graph instead of a matrix?

Edge Directionality



We get new and exciting ways of connecting quadrants together.

The way we traverse edges can be either:

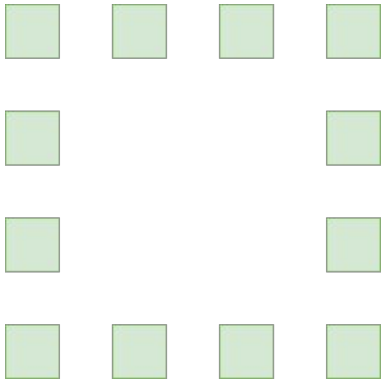
Directed

Edges only go from one node to another.

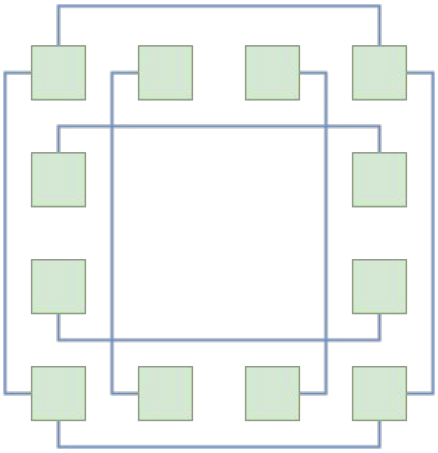
Undirected

Edges can go in either direction.

Boundary Connectivity



Flat



Torus

The edge of the map can wrap or not.

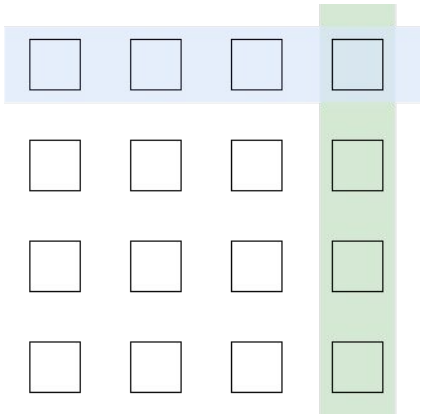
Flat

No special handling of the edges of the graph.

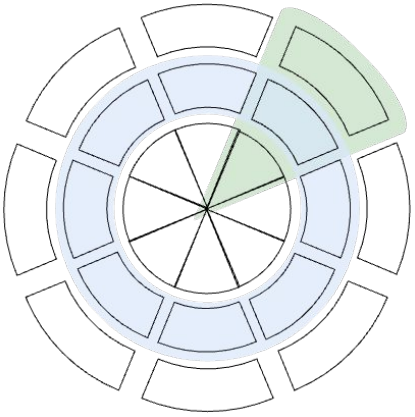
Torus

The nodes on the left edge are connected to the nodes on the right edge and top is connected to bottom.

Map Shape



Cartesian



Polar

The shape of the map can be arranged as rows/columns or rings/sectors.

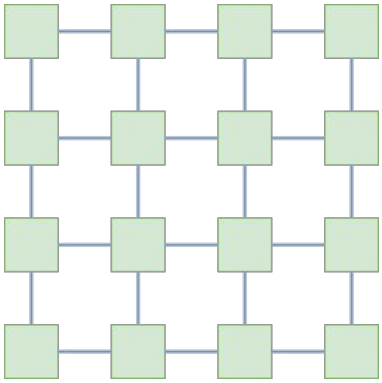
Cartesian

Nodes are connected as rows and columns. This is a 4x4 Cartesian grid.

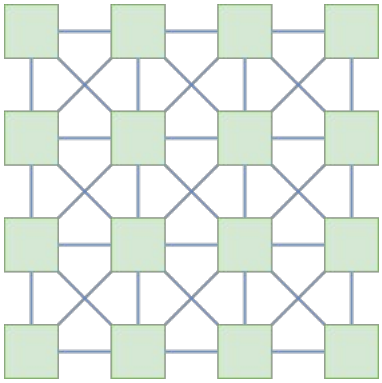
Polar

Nodes are connected as rings and sectors. In this example we have a 3x8 polar grid.

Neighborhood Connectivity



Von Neumann



Moore

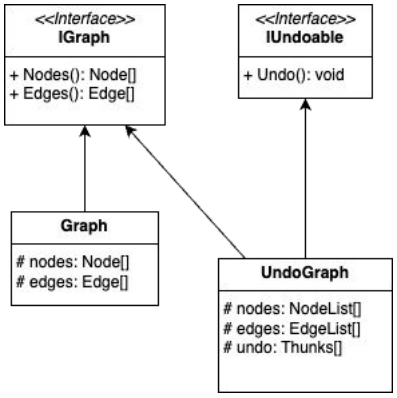
Finally we have the type of neighborhood.

Von Neumann
Orthogonal nodes are connected.

Moore
Orthogonal nodes as well as diagonal nodes are connected.

Graph

- Getters return the related field.
- Setters set the related field.

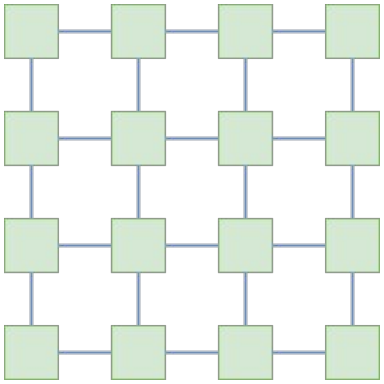


UndoGraph

- Getters return the top of the related stack.
- Setters push to the related stack.
- Setters push an undo function onto the undo stack.
- Undo() pops from the undo stack and calls the function.

A graph with an undo stack provides an easy way to alter the game map during play.. The undo-graph differs from a regular graph in that the nodes and edges fields are stacks of lists instead of just lists. A setter will push the new set of edges onto the edges stack. Returning to the previous configuration juse means calling the Undo() method to pop the edge stack.

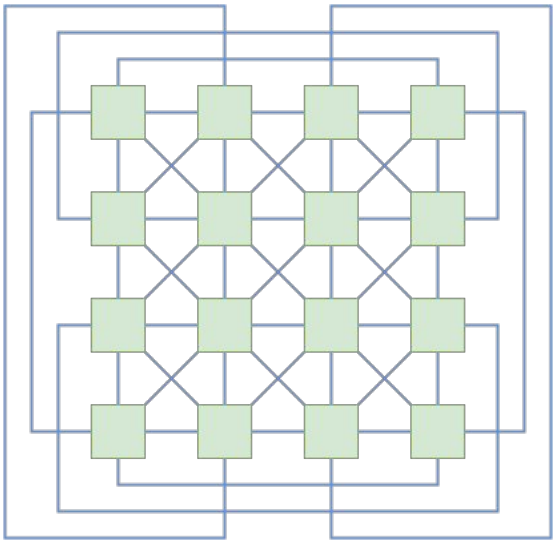
Normal Space



Here's the map for normal space. It going to take a long time to get from one side of the galaxy to the other.

Push the warp button, however, and ….

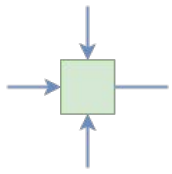
Subspace



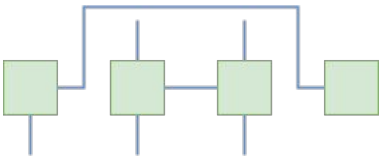
… we change the edges of the graph to become a torus with a Moore neighborhood. Travelling the galaxy just got easier.

Once we’re done with warp drive we pop the stack and we’re back in normal space.

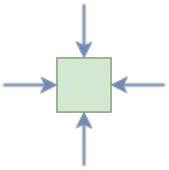
Subspace Anomalies



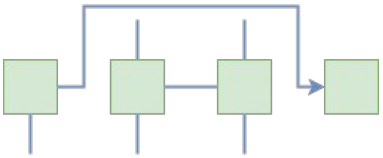
Chamber



Conduit



Well



Gate

The undo-graph allows all kinds of game map shenanigans.

- Subspace chamber where there is only one way out.
- Subspace well where there is no way out.
- Subspace conduit where widely separated nodes are neighbors.
- Subspace gateway which is like a one-way conduit.

I looked at the Memory Alpha website to find different types of subspace anomalies but that was way beyond my fanboi rating. I leave that an exercise for StarFleet cadets.

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Land of Lisp, Conrad Barski, 2011

New Trek, dennisdunn.github.io/trek

Thanks for your time and I'll see you around. My name is Dennis, callsign alpha-echo-zero-zulu-whiskey, email ansofive@gmail.com, and on the web at dennisdunn.github.io.