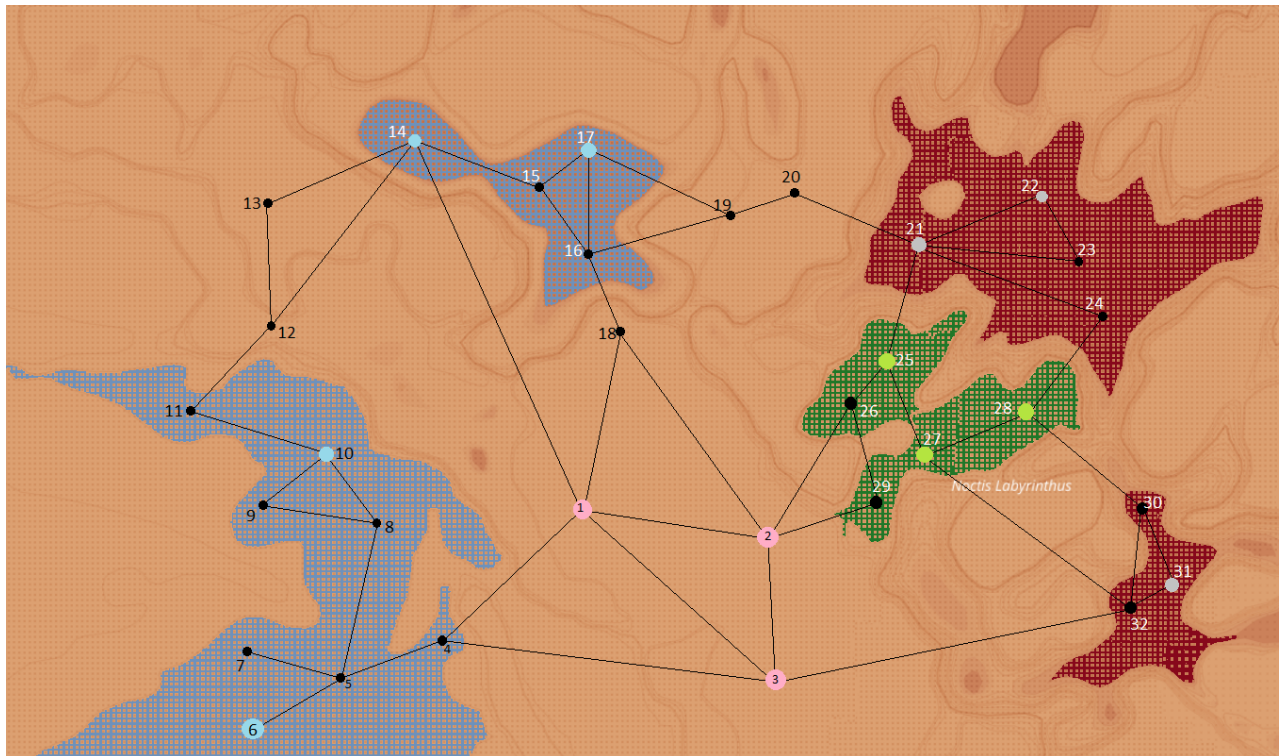


AlgOlympus Mons

Story

Humanity has finally reached mars, and a small city is in construction to make the mars base self-sustainable. But we face some problems and we need the use of graph algorithms to solve them for us!



We have established a colony called “AlgOlympus Mons” and our plan is to

Chapter 1: The Origins

After a decade of research and development of the spaceships and all the technologies, humanity is finally on mars. We have established a good enough base already, in a span of 3 years and more expansion is still going on. The “AlgOlympus Mons” mars colony is one of the greatest feats of humanity. Spread over an area of 6362 square kms, it has 6 major zones.

The Base

The Headquarters

The headquarters are at the heart of the colony, the 3 facilities house 3 mini-cities that house most of the residents of Mars.

Exploration Zones

The regions marked in blue are the major exploration zones that are of interest as they are yet unexplored and most of the expeditions are in these regions to explore and find new sources of resources like water, minerals, etc.

In-Situ Resource Utilization (ISRU)

This zone is most fully explored and contains water extraction facilities, mines and is the source of all raw materials for the colony.

Greenland

Contains greenhouses that are able to grow food in surplus to the current requirement. Also contains gardens and parks, so on. It's extremely water-intensive and is thus much closer to the ice mines.

Solar Farm

Produces the much-needed electricity for the entire colony.

Chapter 2: Critical Paths

The various zones and cities of AlgOlympus Mons are more connected to each other than ever before and new paths are under construction already. But we need to prioritize the construction of some paths before the others since the philosophy behind AlgOlympus Mons is to do every task as efficiently as possible.

But how do we prioritize which paths to construct first?

One way is to look at the redundancy of these paths. Sandstorms are very common on mars and they can create dunes that can sometimes even block some paths. We need to prioritize the construction of the paths in such a way that even if one of these paths is blocked, we have other routes to our destination.

For this, we find the bridges of this graph, that is, all those edges or paths, that if removed can make our colony disconnected.

How do we solve this problem?

A simple algorithm based on depth-first search can help us solve the problem.

Notice that if a given edge (a,b) is a bridge that means there doesn't exist no other path from b and its descendants to a . This implies that while running a DFS we will never come across a twice