335 — Algorithm Engineering — Bizarre Cave

Project #2 — Bizarre Cave Explore

Introduction

This project is to write an Html+Javascript program to find a path from the mouth of this bizarre cave to one of the innermost cave rooms. The category of Bizarre Caves each has room-to-room directed links (edges) that obey three bizarre principles. Fortunately, you carry a BCS app that can tell you the available links/ways to move from your current cave room into another room. You begin at the cave mouth which has coordinates (16,0,0). You are attempting to find a route to the cave room (8,1,7), the deepest room in this cave system.

Cave Rooms, Links and Principles

When you follow a link from one room to the next, only two of the room coordinates change, and they do so in a bizarre way, obeying three principles.

Say, you are in room (A,B,C). Then when you take a link to another room, one of the coordinates (called the "source") will go lower, another (called the "target") will go up, and the third will remain constant. Assume C remains constant. If A is the source, let it go down to $X < A$. Then the target is B, and let it go up to $Y > B$. (Examples below.) Then, here are the three Bizarre Cave System principles:

1. **Conservation**: $X + Y = A + B$. The sum of the coordinates never changes.

2. **'Speed of Light'**: Each coordinate has a maximum limit, and can go no higher. (All coordinates are non-negative, by the way.)

3. **Go for Broke**: Either the Source goes to 0, or the Target goes to its maximum value.Examples

Examples

This Bizarre Cave system that you've been dropped into has these coordinate limits: (16, 9, 7). So, for example, the 3rd coordinate cannot be larger than 7.

For example, from the cave mouth (16,0,0), you can follow a link to either (9,0,7) or (7,9,0).

Or, from cave room (6,3,7), you can step to (0,9,7) or (9,0,7) or (6,9,1) or (13,3,0).

Or, from cave room (6,10,0), you can immediately move to (0,10,6) or (16,0,0) or (6,3,7). But notice that room (6,10,0) violates the coordinate limits, so you can't move there.

Display

Your web page needs to display the path as your program explores the bizarre cave system. One fairly easy way to do this is to show progress like a folder hierarchy is displayed: each mom node/room on a line and its kids/rooms are indented on the lines below.

An alternative would be to show a graph of nodes/rooms with a directed arrow linking a mom to each kid node/room.

In either alternative, you should initially display the root node/mouth-room, and as kids are discovered, you should show them and the links/edges from their mom.

Complexity Order

You should prepare a 1-page (at most) paper describing your analysis of the Big-O running time of whatever algorithm you use. Address the usual issues such as main operations, input size, etc.

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Team

The team size is the same as before, but you can change team members from the previous project if you wish.

Project Reports

As before, but simplified a bit. Please check out the updated sample Report pdf.

Readme File

As before.

Academic Rules

Correctly and properly attribute all third party material and references, if any, lest points be taken off.

Submission

As before.

Grading

As before.