2014-LT-01-EN Dam

0 hard	I: medium	II: easy	III: ----	IV: ----

☒ ALG	☐ INF	☐ STRUC	☐ PUZ	☐ SOC	☐ USE

Answer Type: Interactive Select Graphics are: self made and colorblind proof

Body

The beaver wanted to make a home, so he built a dam causing flooding of nearby fields.

Every hour the water floods all the grass fields (🌱) that are next to an already-flooded field (≈) (to the left, right, above or below, but not diagonally). There are fields with hills (⛰) that will not be flooded. Click on the field that will be flooded last.

Question

The question is formulated in the body (as this is an interactive task).

Answer

Explanation

The numbers in the answer map show the hour during which the corresponding field will be flooded. The algorithm is as follows – mark the flooded (blue) fields as zero. Then mark all the fields having a common border with an already-flooded field with the number of the smallest neighbouring flooded field number increased by 1. Repeat this step until the last field is assigned a number.

It's informatics

In Informatics we learn about different types of algorithms. This task demonstrates the wavefront algorithm. The wavefront algorithm is used to navigate an area, and is used to find a path from A to B. At each stage of the algorithm, each cell is assigned a value which corresponds to the number of moves required for the shortest path from the starting point A to the goal. The movement through the area is done using a breadth-first searching algorithm.

With a breadth-first approach(BFS) we consider each next possible step or option in parallel before looking further. So with breadth-first searching (BFS) of a graph or map we can visit every node in the graph/map in a systematic way. We call the place where we start searching the "root" (in this example it is the originally flooded fields). During the execution of breadth-first searching we keep a list of all the places we have reached, which we want to continue from later (the "fringe list"). We then visit all nodes that are adjacent to each node in the fringe list, making sure we do not visit any nodes we have already visited (not wishing to go round in circles).

Part of studying informatics is learning to apply known algorithms to particular problems.

Keywords

Wave front algorithm, BFS algorithm.

Websites

http://en.wikipedia.org/wiki/Breadth-first_search
http://www.cs.tufts.edu/comp/150IR/labs/wavefront.html

Internal Use

Wording

Dynamic programming;

Comments

This is an interactive task. It is possible to use a lot of different maps. Also maps can be generated automatically. If a non interactive task needed it is possible to mark several possible fields with letters and to ask for field name. For example:
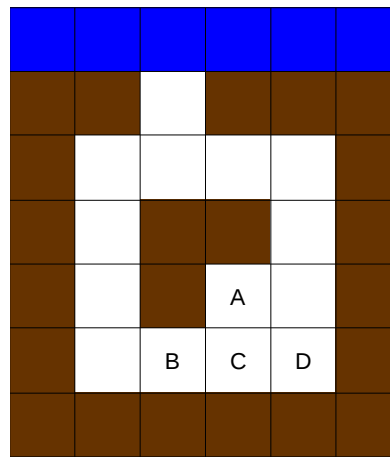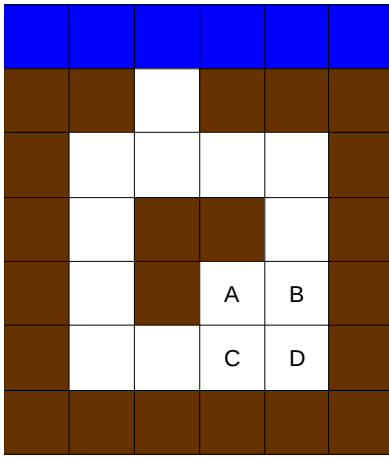
Sue Sentance (sue.sentance@computingatschool.org.uk) & Seiichi Tani (tani.seiichi@nihon-u.ac.jp), 3/6/14 Changed the wording of the body, the explanation, and the It's Informatics sections. LT-1,2 and 3 are similar tasks. We have edited LT-1 to have a much easier grid so that it is accessible by Group 0 (hard). We have changed LT-2 so that it is non-interactive and multiple-choice and thus can be a mandatory task. LT-3 is still as it was with a challenging grid and as an interactive task.

Files

2014-LT-01-EN (pdf)
2014-LT-01-EN.odt (this file)
2014-LT-01.ods (graphics)
2014-LT-01.png

Authorship

Bronius Skūpas, bronius@gmail.com, Lithuania. 2013-06-06, Initial version.

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