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GladOS:

- *I see you've made it almost to the end.*
- *Interesting ideas you have there, but that code you've written…*
- *Reminds me of my ugly uncle, I think his name was Skype.*
- *He would crash all night and day, segmentation faults he would say. Whoever designed him had a knack for* ***"well written code".*** *Just like you. Hue hue hue.*
- *…*
- *…*
- *Do yourself a favor, when you finish, give yourself a pat on the back.*
- *I would do so too but … I don't have hands, remember?*

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During the day, the sun will move through different positions. Given that the sun is very far away from earth, even though it is a spherical source of light, the rays that reach earth **are practically parallel**.

A solar panel can be placed on a cell only if all **8 adjacent cells** are at the **same altitude**, belong to the **same country**, and are **not on the border** between countries. That space is required by the infrastructure of solar panel arrays. Two panels can share that infrastructure and can be **placed one next to another** if the aforementioned **conditions hold for all panels**.

Your task is to find **all spots** that can be used to **place solar panel** and determine how **effective they are at capturing sunlight**.

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Given the light direction vector for each hour, calculate how many hours of sunlight is captured by each spot where panels can be placed.

A cell is shaded at an hour if light does not reach **the center of the top face of the cell.**

Light rays **stop** whenever they **touch terrain**. That includes **edge cases** when the ray is **tangent** to terrain blocks.

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2D to 3D transformation:

- X-axis -> X-axis
- **Y-axis -> Z-axis**
- **altitude -> Y-axis**

- If the height at row 5 col 4 is 9, that means that there are 3D cells placed at (4,9,5), (4,8,5), (4,7,5), …, (4,0,5)
- A 3D cell is a unit sized block with integer coordinates at the center of the block. Cell (0,0,0) spans from (-0.5,-0.5,-0.5) to (0.5,0.5,0.5)

Output should be a list of all spots where panels can be placed ordered ascending by country id, descending by hours of sunlight, ascending by row, and finally ascending by column.

Light rays are guaranteed to be heading towards the world (Y component is always negative).

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Input

H
l_{0x} l_{0y} l_{0z}
...
l_{H-1x} l_{H-1y} l_{H-1z}
rows cols
a_{00} c_{00} a_{10} c_{10} a_{20} c_{20} ...
a_{01} c_{01} a_{11} c_{11} ...
...
$a_{0rows-1}$ $c_{0rows-1}$ $a_{1rows-1}$ $c_{1rows-1}$ ... $a_{cols-1rows-1}$ $c_{cols-1rows-1}$

H - number of hours in a day
l_{ix} l_{iy} l_{iz} - Light ray vector for the i-th hour (integers)

rows, cols, a_{xy}, c_{xy} - same as before

Output

col_0 row_0 $sunH_0$
col_1 row_1 $sunH_1$
col_2 row_3 $sunH_3$
...

col_i - column of the ith spot where a solar panel can be placed
row_i - row of the ith spot where a solar panel can be placed
$sunH_i$ - number of hours collected by the ith spot where a solar panel can be placed

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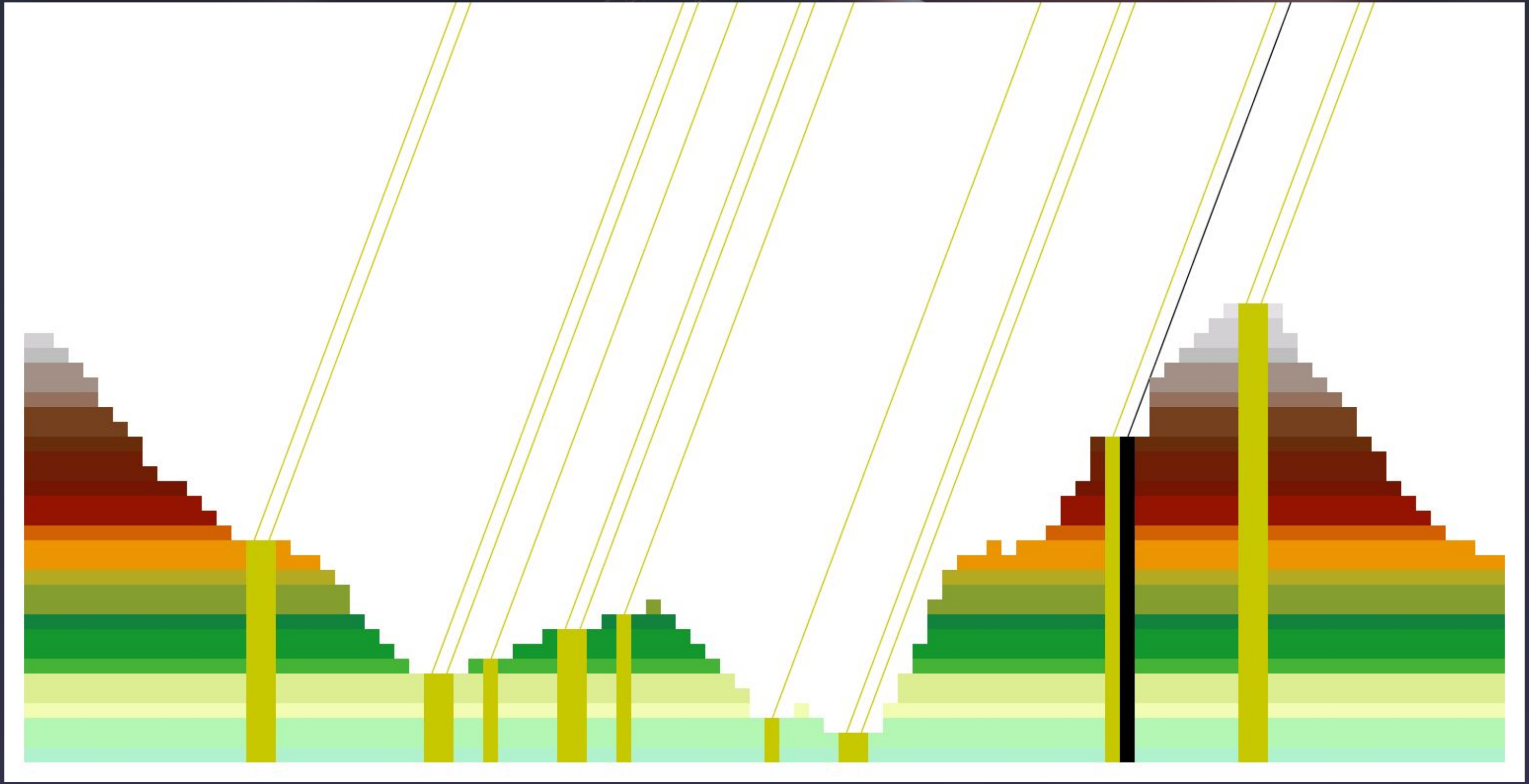

Example world. Light direction is (-3, -8, 0). Black represents spots where light does not reach, while yellow represents spots that are reached by it.

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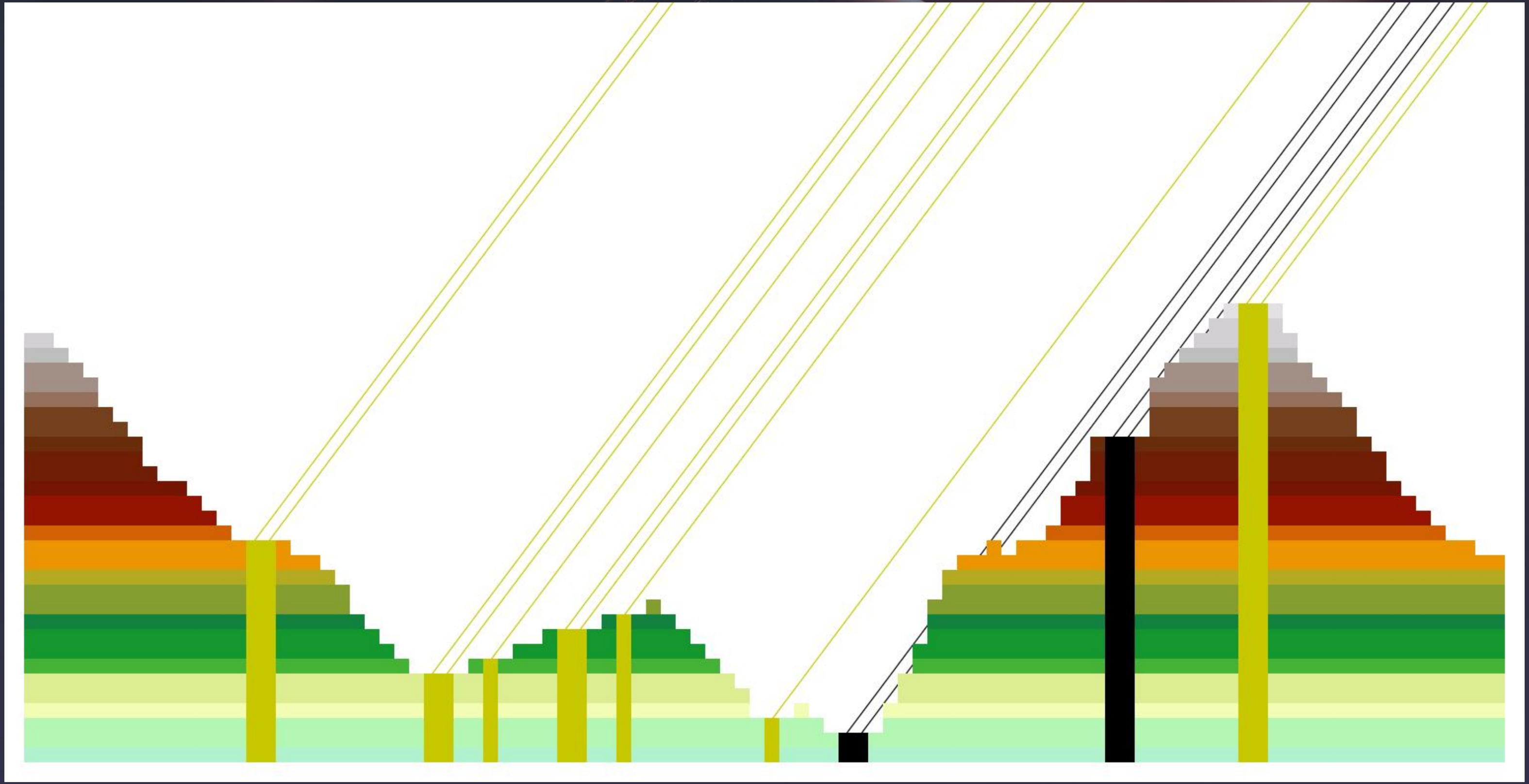

Example world. Light direction is (-3, -4, 0). Black represents spots where light does not reach, while yellow represents spots that are reached by it.

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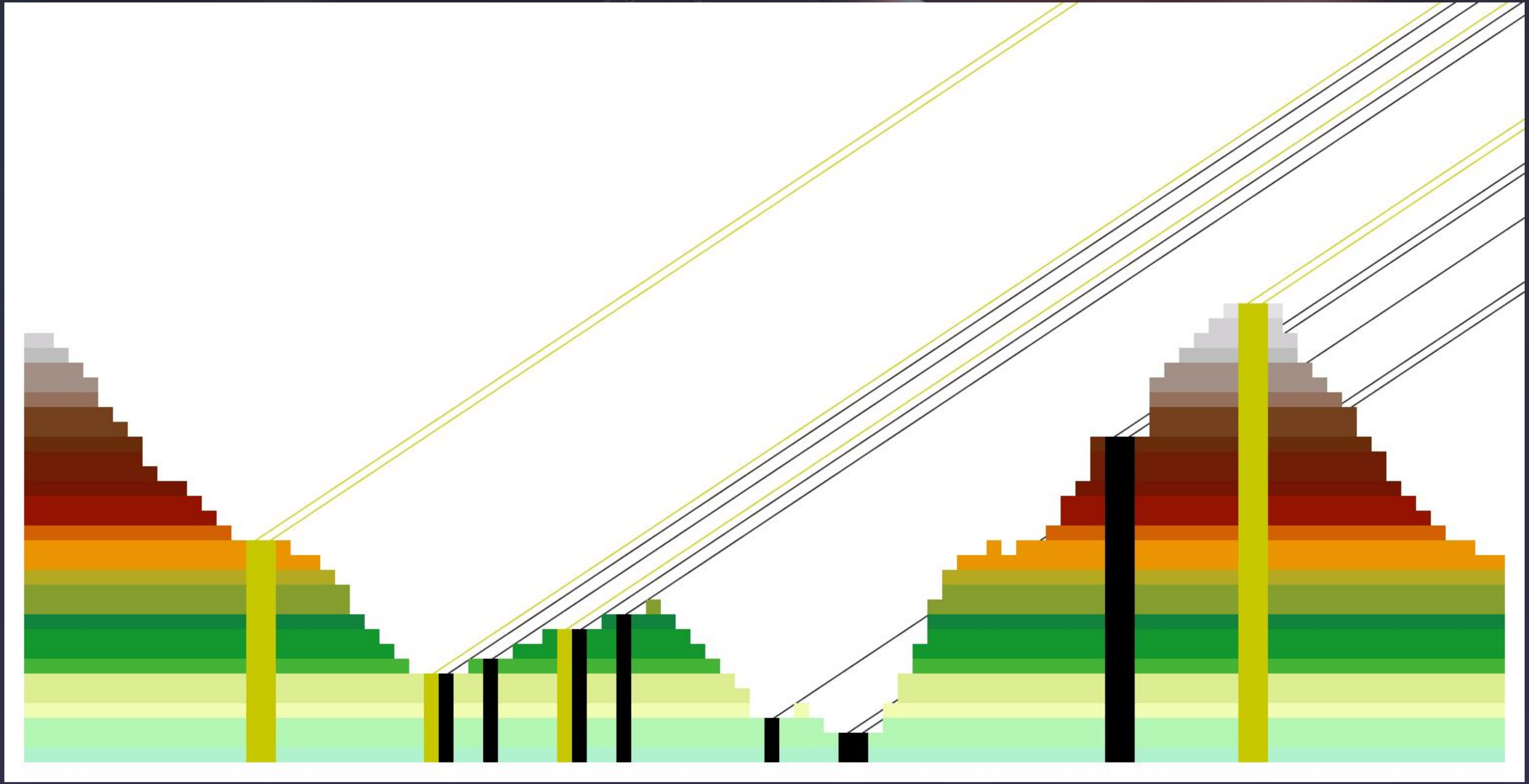

Example world. Light direction is (-3, -2, 0). Black represents spots where light does not reach, while yellow represents spots that are reached by it.