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Procedurally Generating Indoor Rock Climbing Routes

Summary:

To keep indoor rock climbing routes challenging and interesting, walls are often stripped of their routes, and new ones are placed. Unfortunately, it can be very hard to constantly think of new types of routes. Also, it is very hard to accurately judge the difficulty of a route, even after it is created. Therefore, procedurally generating new routes can be a really good solution to this problem.

The user will input basic information about their wall, like height, width, angle, and hole spacing. After that, a basic 3D wall will be shown that fits their input information. Next, the user will add a route by selecting the rating that they want that route to be. A procedurally generated route fitting all of the inputs given will be generated and displayed to the user on the 3D wall. The user can continue to add routes to the wall until they feel like they have enough. The user can also see a basic demonstration of someone climbing that route to see what it would look like. The climber will most likely be a simple stick figure or similar.

Main components of the project to be developed:

First, I will need to figure out the math. I plan to use my current knowledge plus the rock climbing gym near my apartment to study the rules of each rating. I know the basics of the procedure, but I want to try to be as precise as possible.

Second, I need to implement the rules to create a procedurally generated route. I will keep a basic climber, just a line symbolizing their body (between head and legs). I will have the climber follow the rules based on body angle and range of arms and legs. I believe I will use a sort of weighted graph system to encourage routes to use the same holds.

Third, I need to display my results to the user. I need to display a basic 3D wall and add little 3D labelled holds to the wall when needed. I will most likely not be particular about the types of holds, but rather leave that to the user to decide. I will then display a basic stick figure climber climbing the route so that the user can see what it looks like.

Fourth, if I have extra time, I would like to make my project a little more user friendly, like adding buttons to let the user select, delete, and see any route at any particular time.

What the demo will consist of:

I will demo the basic process, by giving inputs about the wall, adding routes, and seeing the basic climber climb them. I will also run it several times beforehand, and add pictures of their outputs to the slide so that it is clear that it works for different kinds of walls and is also different for the same wall for different runs.

I think it will be unlikely, but I want to see if the rock climbing place could try using my project to design a wall and actually build it. If they do that, I'd want to have a side by side comparison of some of the routes between people climbing the real one, and my simple climber climbing my displayed one.