Bouldering-Path Finding

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Team Members:
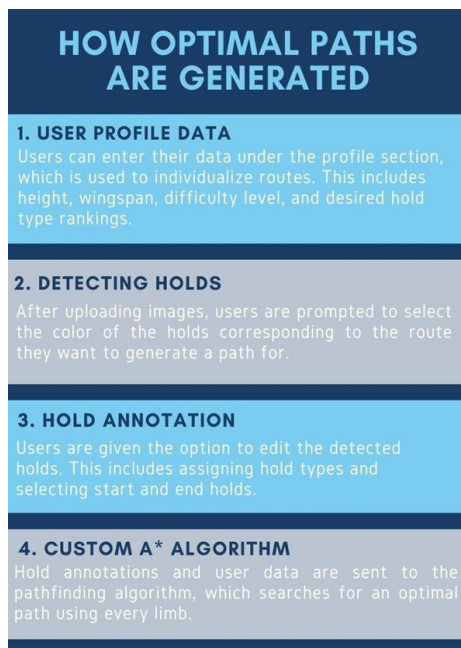
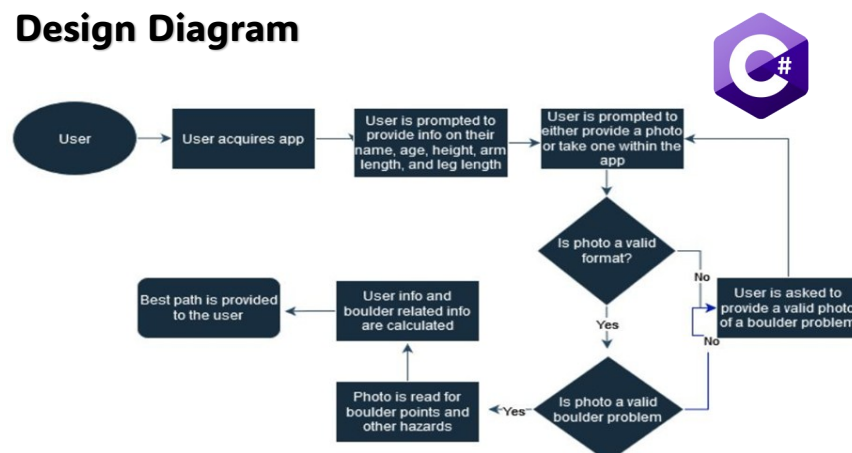Ethan Reed Tristan Pommering Bridget Hoernschemeyer Oankar S Ghorpade
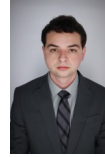
Goals

The primary goal of this application is to provide personalized climbing routes based on user-specific factors. This allows for beginner boulderers to improve their climbing technique by following optimized paths tailored to them. Additionally, the project seeks to enhance the climbing experience through an intuitive and user-friendly interface, making climbing more accessible and enjoyable for all.

Intellectual Merits:

HOW OPTIMAL PATHS ARE GENERATED

1. USER PROFILE DATA
Users can enter their data under the profile section, which is used to individualize routes. This includes height, wingspan, difficulty level, and desired hold type rankings.

2. DETECTING HOLDS
After uploading images, users are prompted to select the color of the holds corresponding to the route they want to generate a path for.

3. HOLD ANNOTATION
Users are given the option to edit the detected holds. This includes assigning hold types and selecting start and end holds.

4. CUSTOM A* ALGORITHM
Hold annotations and user data are sent to the pathfinding algorithm, which searches for an optimal path using every limb.

Design Diagram

Challenges

Blob Detection

- The first main challenge we faced was how to identify the rocks by color as well as what type of hold they are. We were running into issues where open source tools wouldn't work on Android or didn't do what we specifically needed.

- We solved this by finding a Lite version of OpenCV that has android runtime and allowed us to identify things by their color. We thought adding hold types would be too advanced and inaccurate so we decided to let the user optionally modify identified holds to be easy (jugs), medium (Crimps), Hard (Sloper or Pinch)

Path finding

- We wanted to use evolutionary computing to generate multiple paths and allow the user to select the one most suited for them but quickly determined that time and limited computing on mobile devices would create issue so we settled on the simplest pathfinding that would work for us which is A*

Display an UI

- We need to figure out a UI design to make the app feel more seamless and readable.

- We also have the issue of trying to display the route to the top showing where both your hands and feet go can look cluttered and difficult to read or memorize if needed to be used. The solution to this problem is to display everything in a step by step way indicating which hand/foot goes where 1 step at a time.

Development

Results:

- User Profile

- App Loads Picture and Uses Blob Detection and select different types of holds as well select one hand or 2 hand start same for legs

- Crops the picture before loading for better clarity

- Path-Finding: Gives the shortest path to reach the designated location