Bouldering Pathfinding

Project Advisor:

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Team Members:

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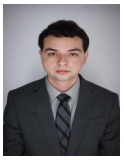
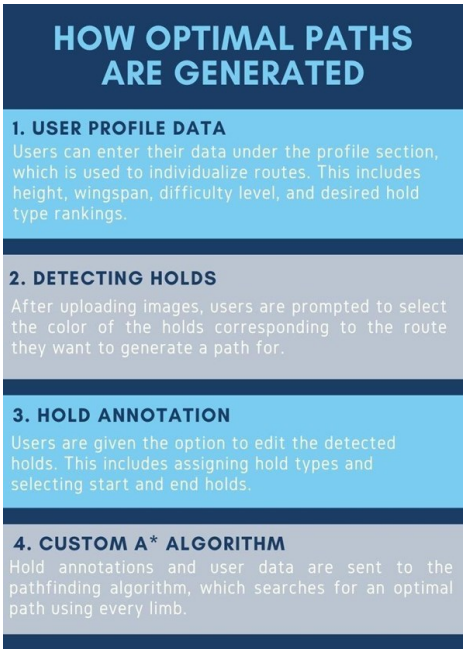


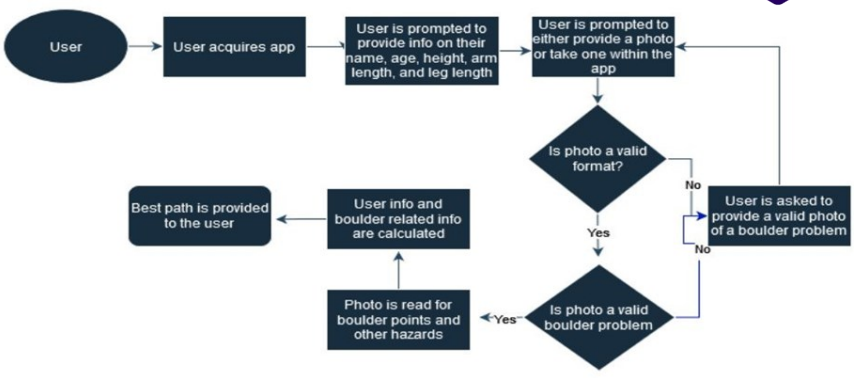
Our Mission

The primary goal of our application is to provide personalized climbing paths to users, helping beginner boulderers improve their climbing technique by following optimized move sequences. With an intuitive and user-friendly interface, our project enhances the indoor climbing experience, making it more accessible and enjoyable for all.

Intellectual Merits



Design Diagram



Challenges

Blob Detection

- **Problem: One of our primary challenges was identifying climbing holds by both color and type. Many open-source tools either did not support .NET android development or lacked necessary functionality.**
- **Solution: We integrated Emgu CV, a .NET wrapper for OpenCV that allowed us to detect holds by color. We decided automatic detection of holds may be too unreliable, so we added an option for users to manually change hold types from the annotation screen.**

Pathfinding

- **Problem: We initially considered using evolutionary computing to generate multiple paths, allowing users to choose the one that best suits them. However, with mobile processing limitations and time constraints we decided this approach was impractical.**
- **Solution: We instead opted to use A* pathfinding as an efficient and reliable alternative.**

User Interface

- **Problem: Designing a clear and intuitive UI was challenging. Displaying an entire climbing route, including hand and foot placements, often resulted in a cluttered and difficult-to-read interface.**
- **Solution: Instead of showing the full path at once, we implemented a step-by-step visualization. This approach highlights individual moves sequentially, indicating which hand or foot to move next, making the path easier to follow.**

Developed Using:

Results

- **User Profiles added for personal information.**
- **The app processes an uploaded image using blob detection and selects routes by color.**
- **The annotation page allows users to change inputs such as start holds, finish holds, hold types, and route length.**
- **The pathfinding picks the most efficient move for each limb until the finish is reached.**