BOULDERING WALL ROUTE REPLICATION

Abstract

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Background

44ft Climbing(client) is a start-up company for artificial bouldering walls. The company's mission is to increase the accessibility to the bouldering discipline of the rock-climbing sport. They plan to achieve this by introducing multiple bouldering walls and managing them well.

Project Problem

As part of the company's service, the client plans to frequently update their bouldering wall routes to engage and promote user' participation. Generally, to set routes, professionals called *route setters* are hired. However, to set the routes on the several bouldering walls they will manage would be redundant, expensive, and time-consuming as route setting is a creative trial and error process. Therefore, the client wishes to set the routes on one of their bouldering walls and replicate those routes onto other bouldering walls with the same design. Answering the following question would help determine a solution for the stated problem- *"How to accurately replicate the pre-set routes formulated on one bouldering wall onto another with the same geometry?"*

Approach

To solve this question, a clear background analysis must be conducted to determine the feasibility, requirements and features of any possible solutions. Based on the analysis result, create three concepts, and evaluate them using selection criteria. Finally, the chosen concept is iterated and validated using literature review and prototyping.

Results

The solution can be broken down into 3 main problems – capturing route data, adding route information to route data, and representing the route data to replicate routes. These 3 problems can be categorised into 2 categories - route recording and route replication. Route recording is the capturing of the initially set routes along with the addition of relevant hold or volume information to help the route replicator to identify and fasten them. The data is captured as a 3D model using the new generation iPhones or iPad that are equipped with Li-DAR sensors using the Polycam application. Once the 3D model is captured, a self-authored program uses the 3D model and 3D CAD model to present the holds/volumes information linked to the location perimeter of the given hold/volume. The location perimeter of the given hold/volume is manually

placed at the relevant locations. This entire data is now converted to an augmented reality interface input to present the data in the order of route replication - identification, placement and fastening. The route replicator first uses the image targets to align the AR to the replication site bouldering wall. Then using triggers and visual keys, places the holds and volumes at the correct locations with the help of the AR glasses. Though this system is backed with literature reviews, it is mostly validated theoretically. Therefore, the major limitation of this project is the lack of practical validation of the proposed theories.

Conclusion

With the help of design, brainstorming and research a framework was designed to solve the main problem introduced in this thesis. The report presents adequate information to provide theoretical proof of concept. The proposed solution has many literature papers to support its claims, however, the concept lacks practical validation. Hence, the first step for the client is to test a prototype and derive elaborate requirements for the self-authored software. The client would then have to improve the usability of the entire system based on user feedback and investigate further expansions to include additional features.