Gesture-based Navigation

An Innovative Way to Navigate Virtual Reality Buildings

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1. Motivation

The architecture, engineering and construction (AEC) industry is being disrupted by virtual reality (VR). VR brings buildings to life, and hand-gesture-based navigation is the next step in making the experience more immersive. Hand gestures are an alternative to physical controllers and offer a more natural way to navigate through 3D buildings in VR.

2. Objective

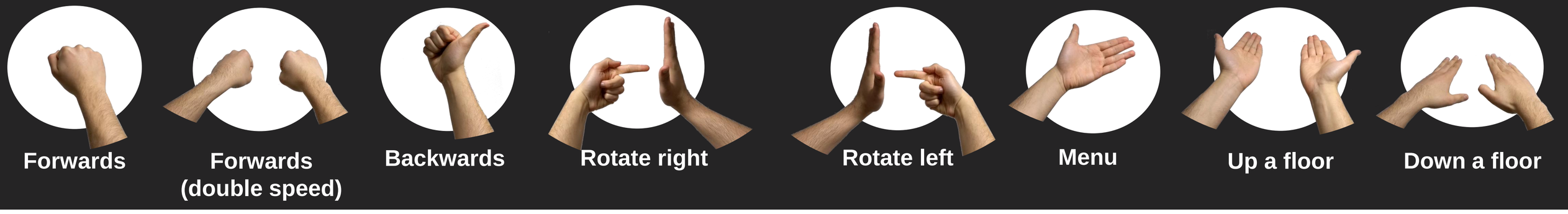
Our objective was to develop a cohesive and intuitive gesture set for the navigation of 3D buildings in VR.

3. Setup

LEAP MOTION · git · oculus · unity

To recognise hand gestures we used the Leap Motion. The Leap uses computer vision to recognise the position of the hands.

In Unity we defined the gestures and mapped them to movement functions. The Oculus Rift headset, on which the Leap is mounted, was used to provide the VR experience.



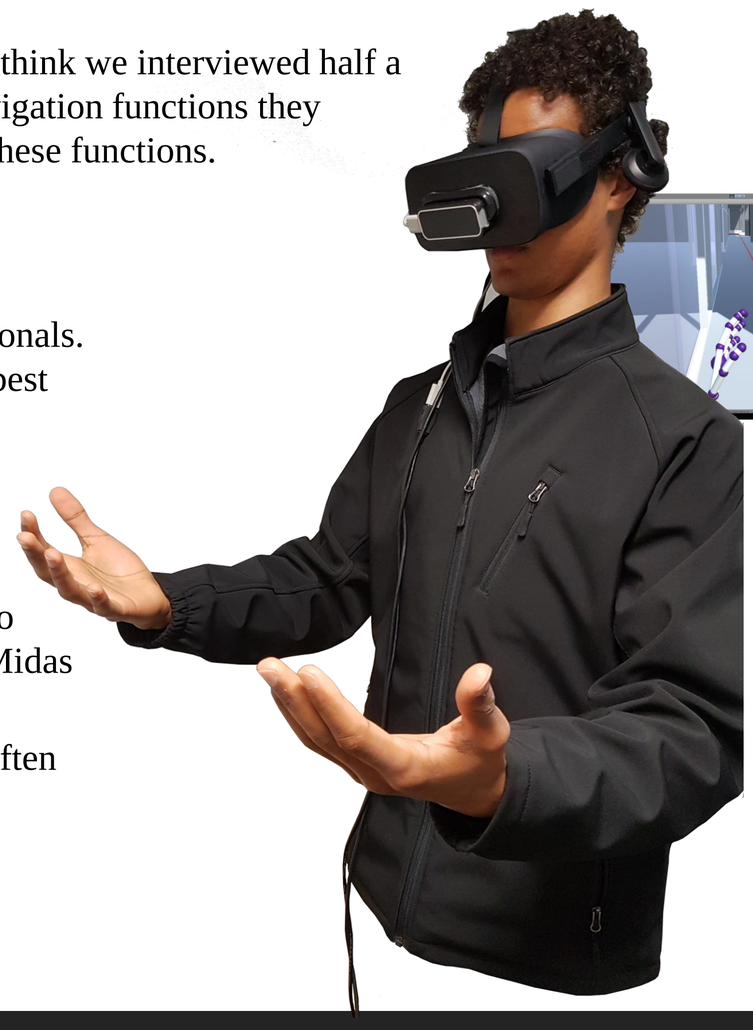
4. Requirement Elicitation

To understand how professionals in AEC industry think we interviewed half a dozen of them. We wanted to understand what navigation functions they wanted and to elicit gestures which could map to these functions.

5. Development

We collected 64 gestures in total from the professionals. We considered the following criteria to select the best gestures to form a cohesive set:

- **Physical demand:** The gesture should be comfortable and not prone to repetitive strain injury.
- **Gesture Recognition:** Avoid gestures prone to occlusion, misrecognition or false positives (Midas touch).
- **Suggestion Frequency:** Gestures suggested often are likely to be intuitive.

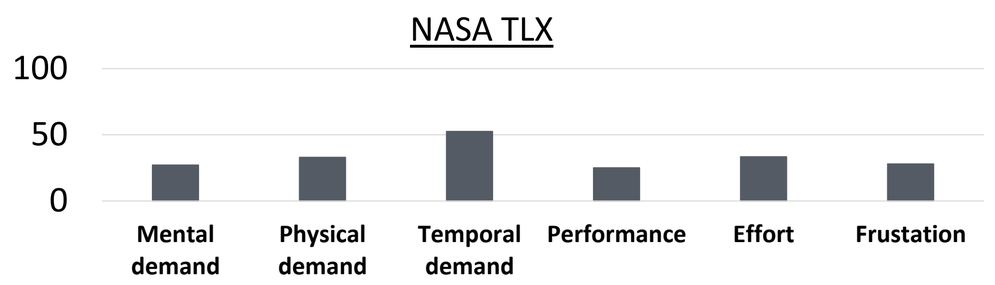


6. Evaluation

To evaluate our gesture set we ran a usability study with 12 participants who, after a brief familiarisation, had to follow a predetermined red path to reach a red ball under timed conditions.

Findings:

- All gestures were rated highly in terms of memorability, intuitiveness and comfort.
- Participants rated the perceived workload of navigating with the gesture set low on the NASA task load index.



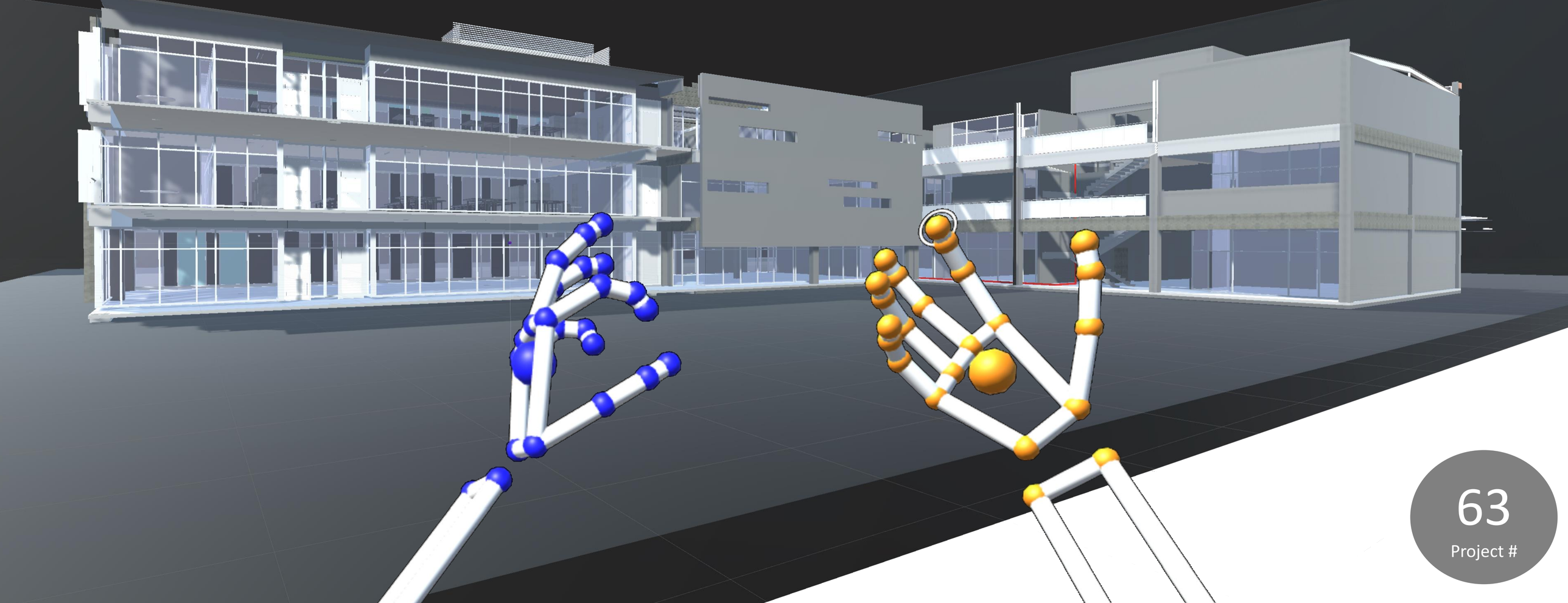
7. Conclusion

- Hand gestures prove to be a viable option for navigation in VR buildings.
- Overall the gesture set developed was rated highly in terms of usability.

8. Future work

In addition to navigation we also collected other activities that architects would like to do in VR environments:

- Object selection and inspection
- Social interaction



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Project #