

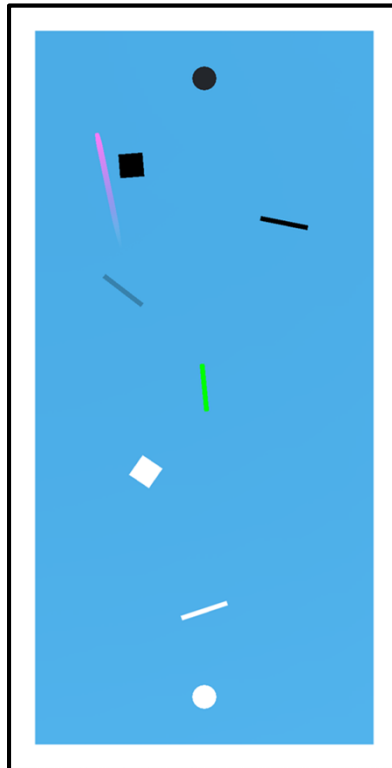
Superhuman sports in mixed reality: the multi-player game League of Lasers

Nico Arjen Miedema
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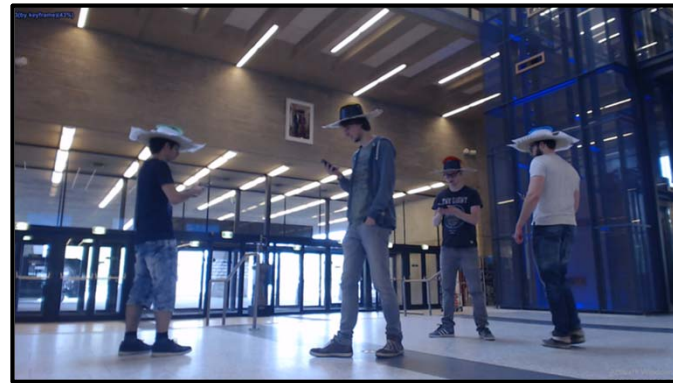


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- Problem Statement
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Introduction



Screenshot League of Lasers



Playing league of lasers

League of Lasers
A superhuman sport using Motion Tracking

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ABSTRACT
League of Lasers is a motion-based game where two teams compete in a mix between football and Pong [2]. Players use 'virtual mirrors' to try to guide a laser pulse towards the opponent team's target. The game aims at stimulating interaction between players by making cooperation a vital part of the gameplay, while having them physically move near each other. The game tracks the physical

For that, it is playable for short periods of time and its gameplay was designed as very easy to grasp. In addition, the game stimulates players to communicate and collaborate with each other, combining strategic thinking with fast-paced physical movement, in an Augmented Reality (AR) setting.
League of Lasers is a game that plays as a crossing of pong and football; the game innovates by using players' positions and ori-

SHS Paper League of Lasers

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Problem Statement

“How can mixed-reality be used to create a competitive multi-player superhuman sport?”

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Problem Statement

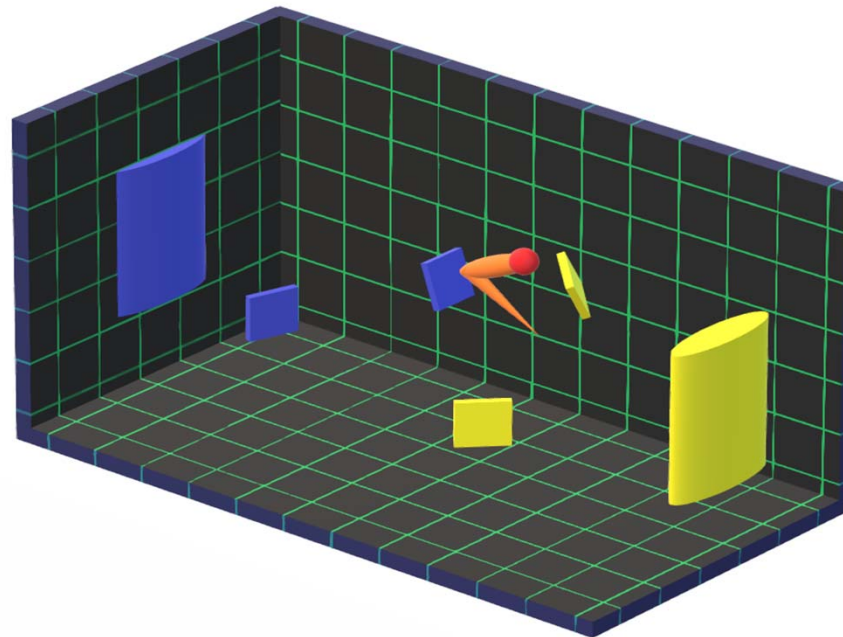
Superhuman Sports Design Challenge

- Human Augmentation
- Fitness and Skills
- Fun and Engagement
- Audience
- Inclusiveness

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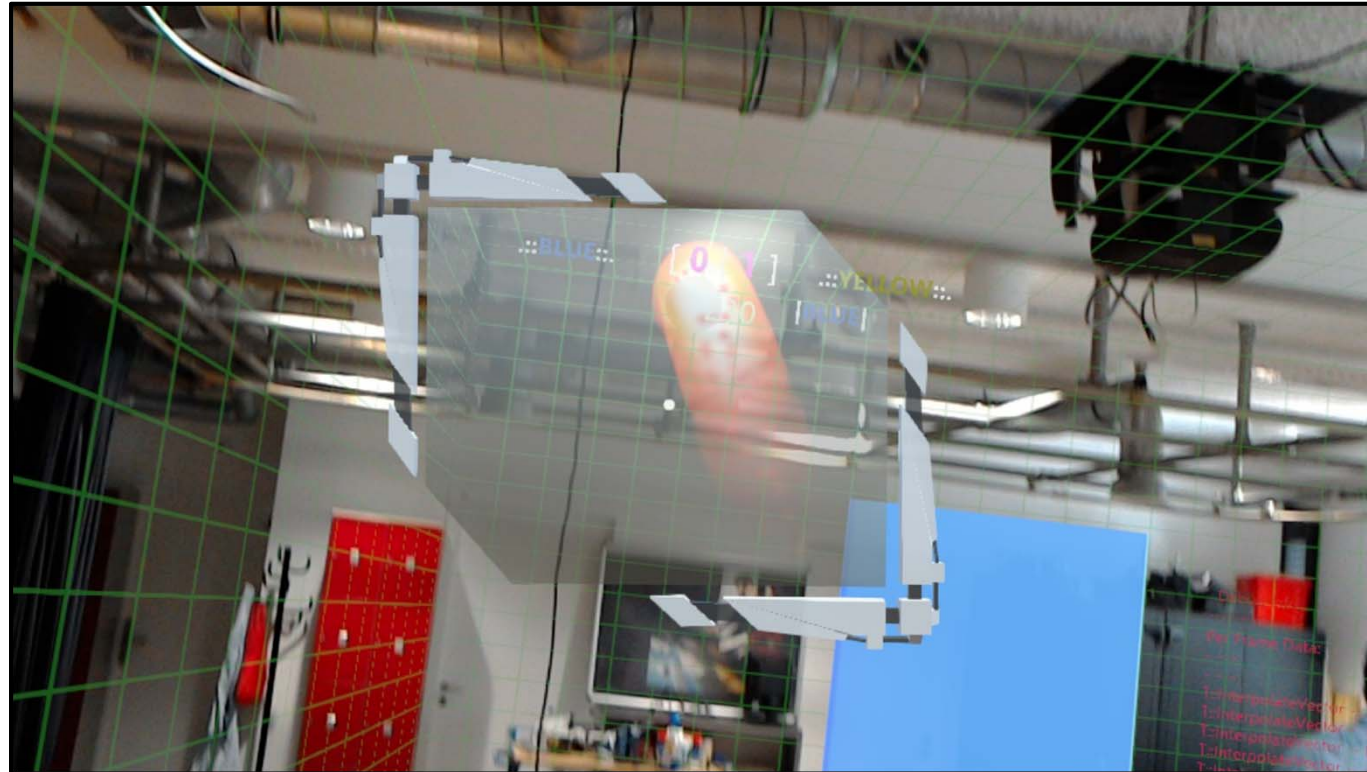
Game Overview

Game design



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Game Overview



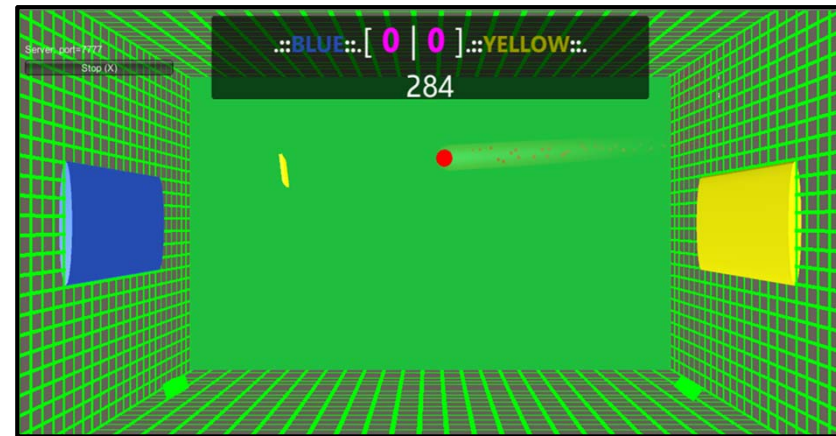
League of Lasers first-person view on the HoloLens

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Game Overview

Audience View

- Top down
- Server-rendered
- Projected on a wall



Top-down overview of the game for the audience

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game trailer

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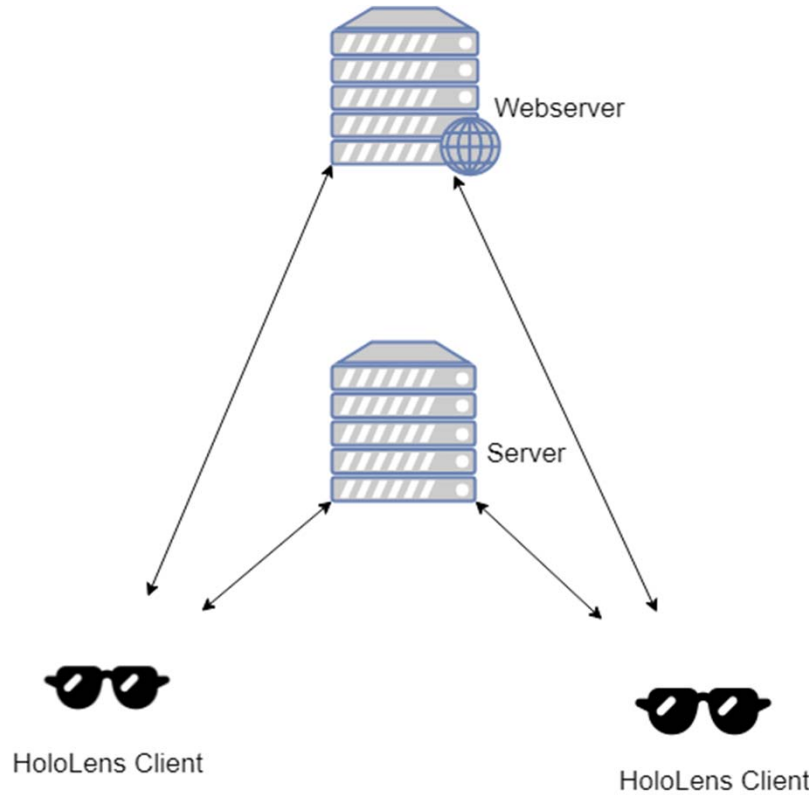


System Architecture

Network Architecture

- Unity's UNET
 - Client: a HoloLens
 - Unity game server
- Web server

Network architecture overview



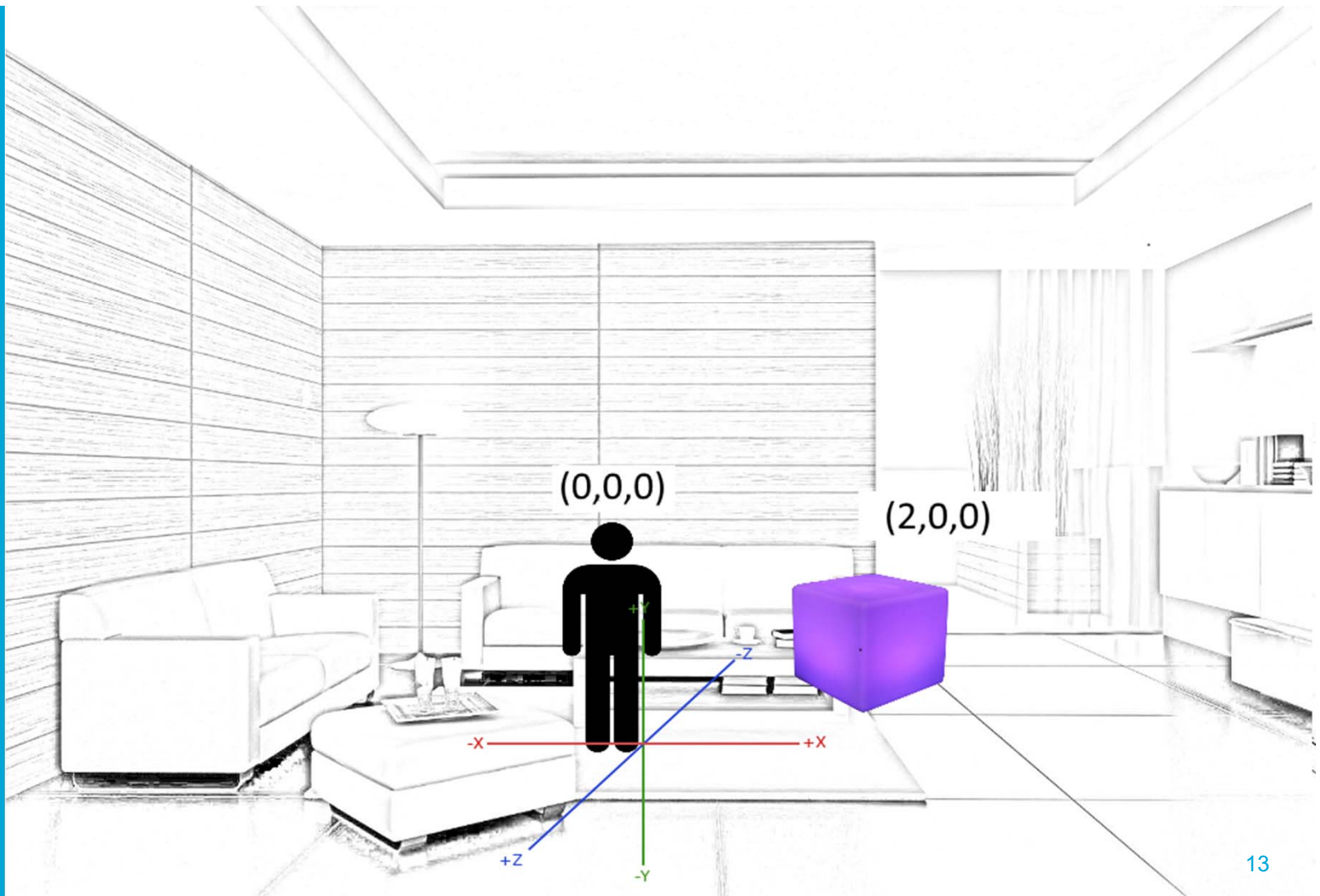
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System Architecture

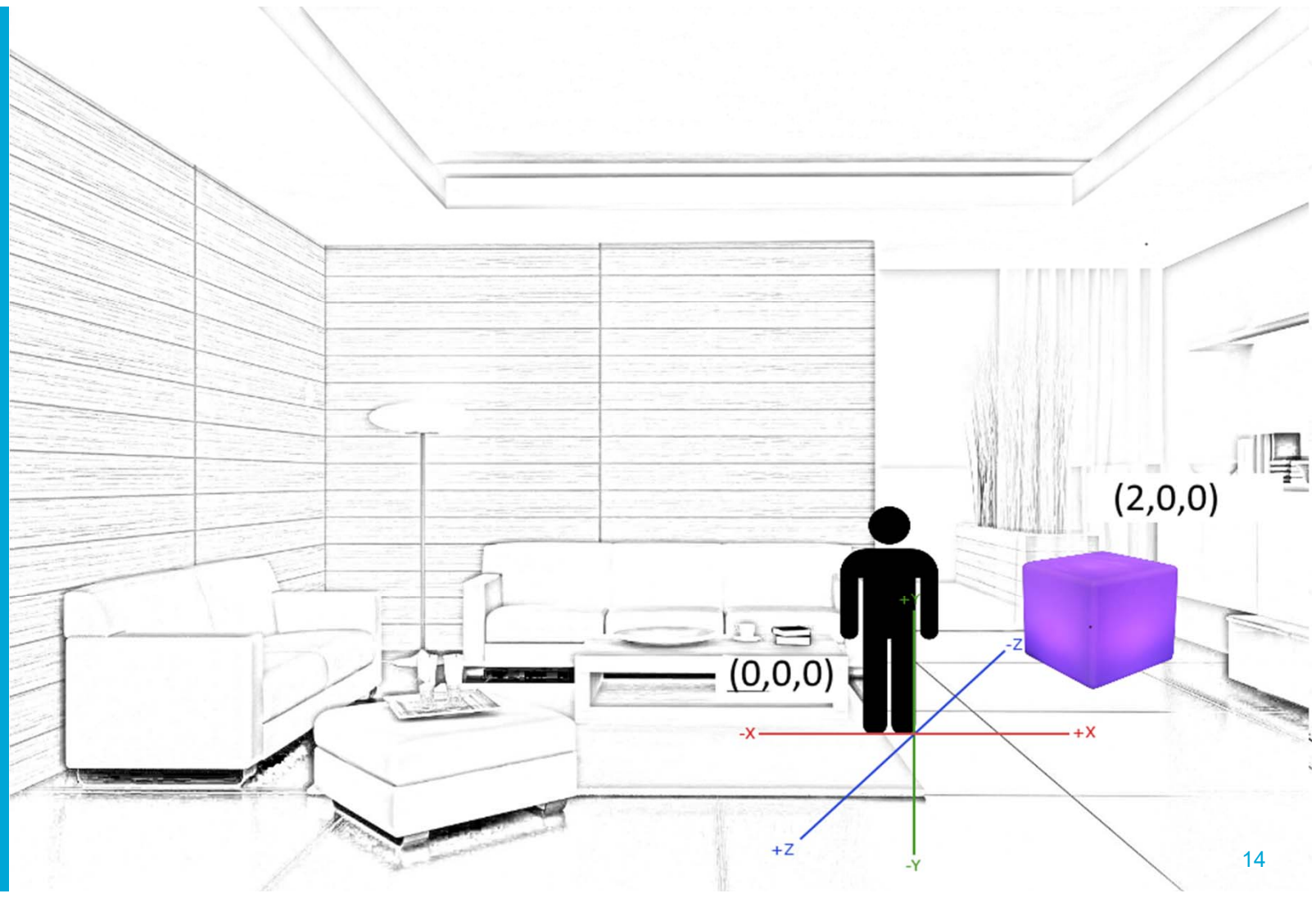
Localisation

- Naive method:
 - Share game positions between players
 - Doesn't work due to position offsets

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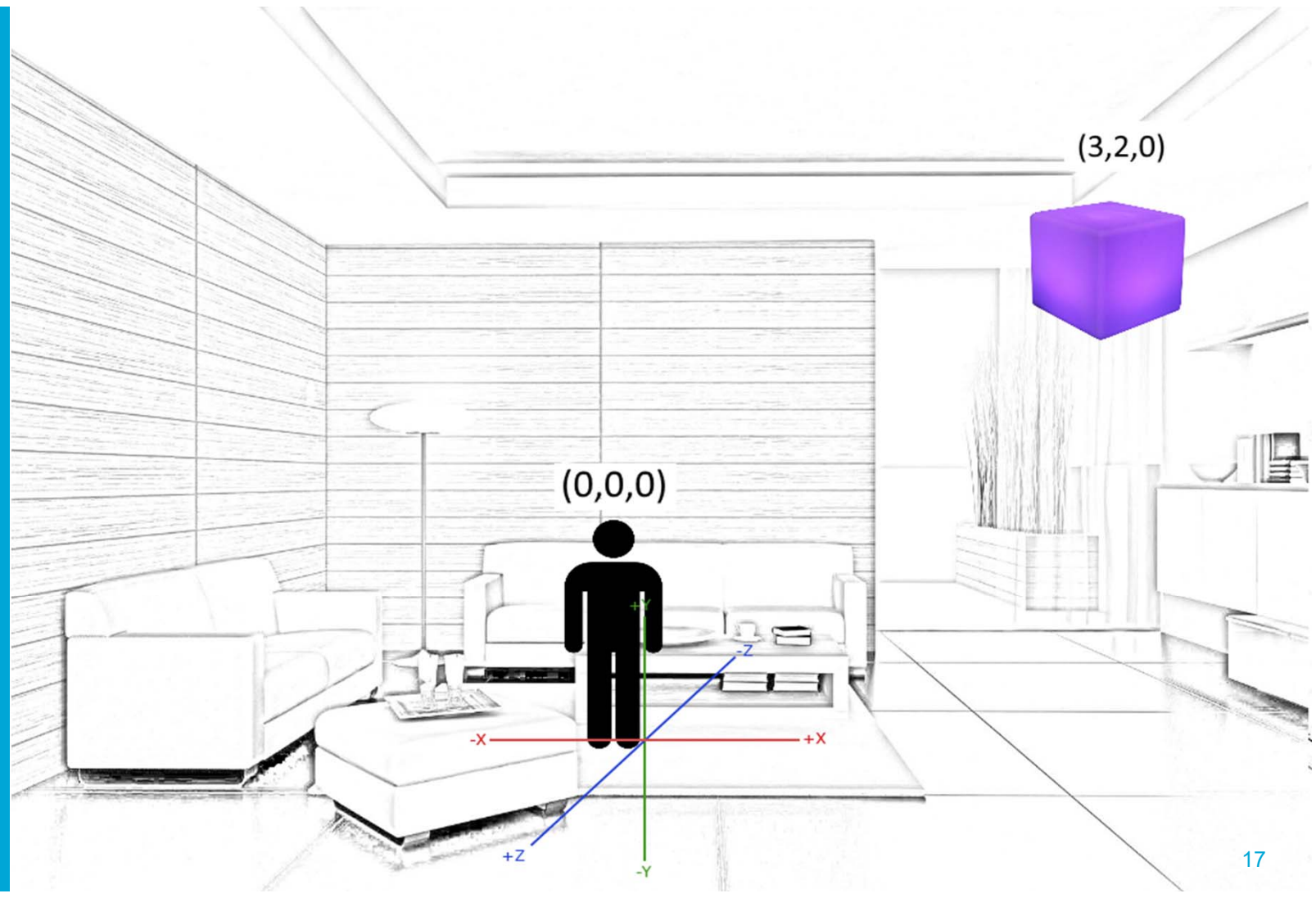


System Architecture

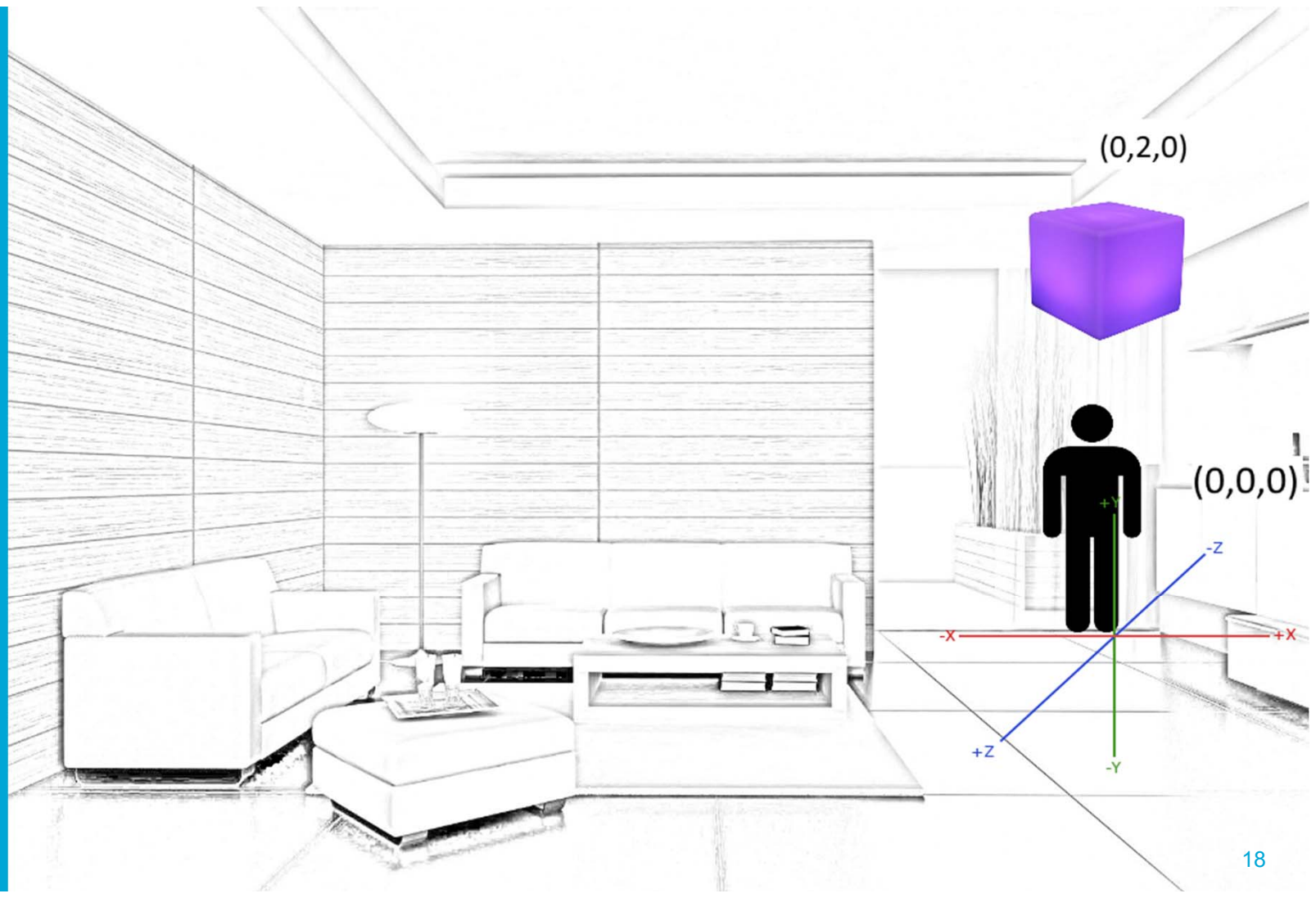
Localisation

- Spatial Anchors:
 - Based on spatial features
 - Precise
 - Shareable
- Limitations:
 - Server does not know this concept
 - Accurate in a 3-5 meter range

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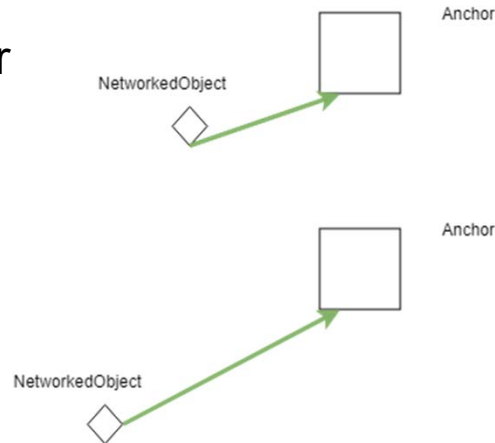
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System Architecture

Localisation, solution:

- Use positions relative to anchors
- Relate game objects to the nearest anchor



Objects share their position relative to the nearest anchor



Lighthouse (source: [Flickr](#))

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User Study

- Tests @ TuDelft Gamelab Anniversary
- 32 Participants
- UEQ and GEQ questionnaires



Photo League of Lasers Virtual Playground event


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User Study

Results

- Players praised novelty and attractiveness
- High rating on immersion, competence, positive affect and flow
- Low amount of annoyance and negative affect
- Observed lots of laughter

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User Study

Discussion

- Skill-based: easy to learn, hard to master
- Fun
- Intuitive: feels like a “sport”

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Conclusion

League of Lasers:

- Fulfils superhuman sports criteria
- Keeps interaction simple and focussed

- Hololens is a suitable device for superhuman sports

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