

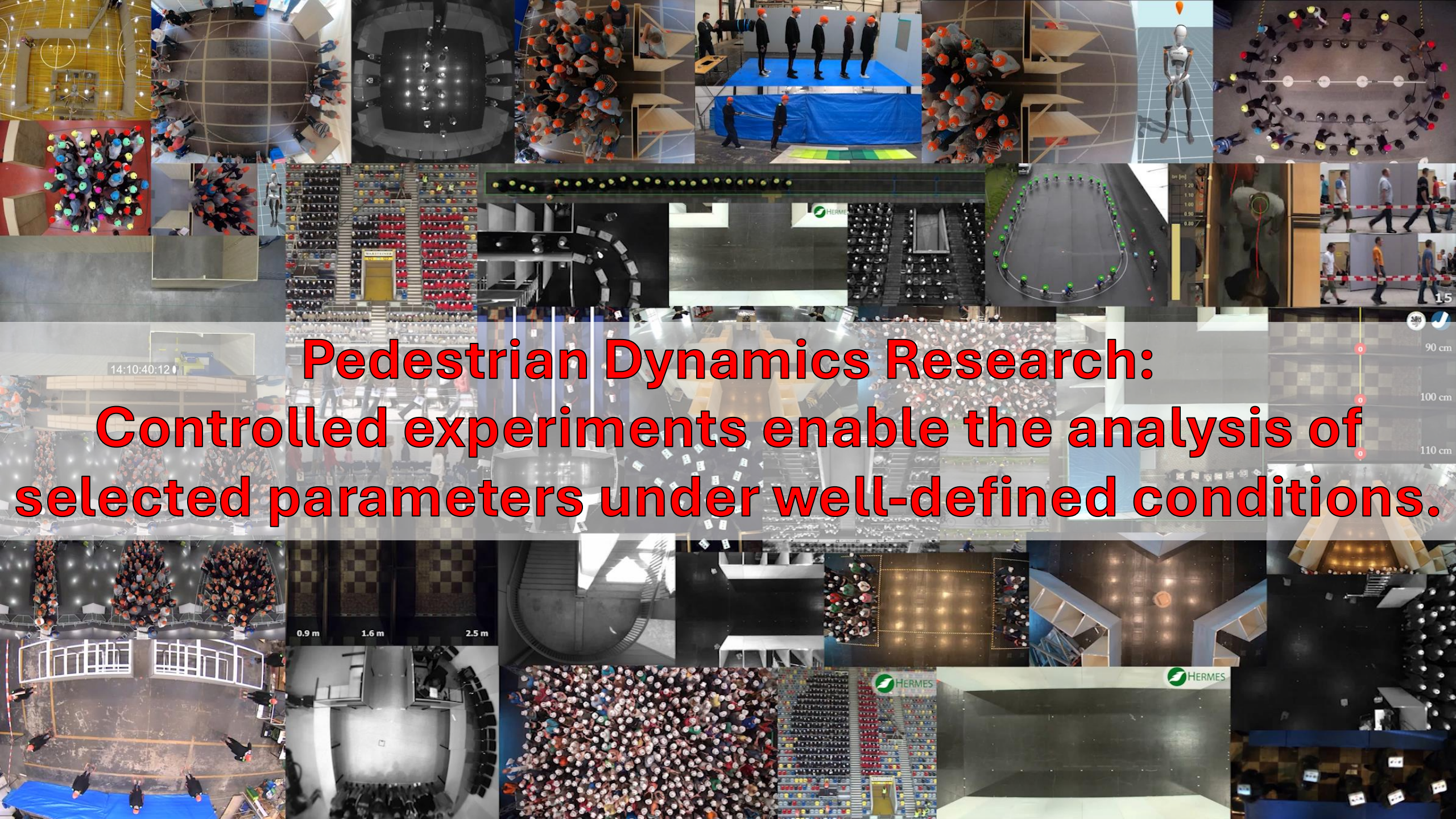
Using VR Studies for Pedestrian Dynamics Research

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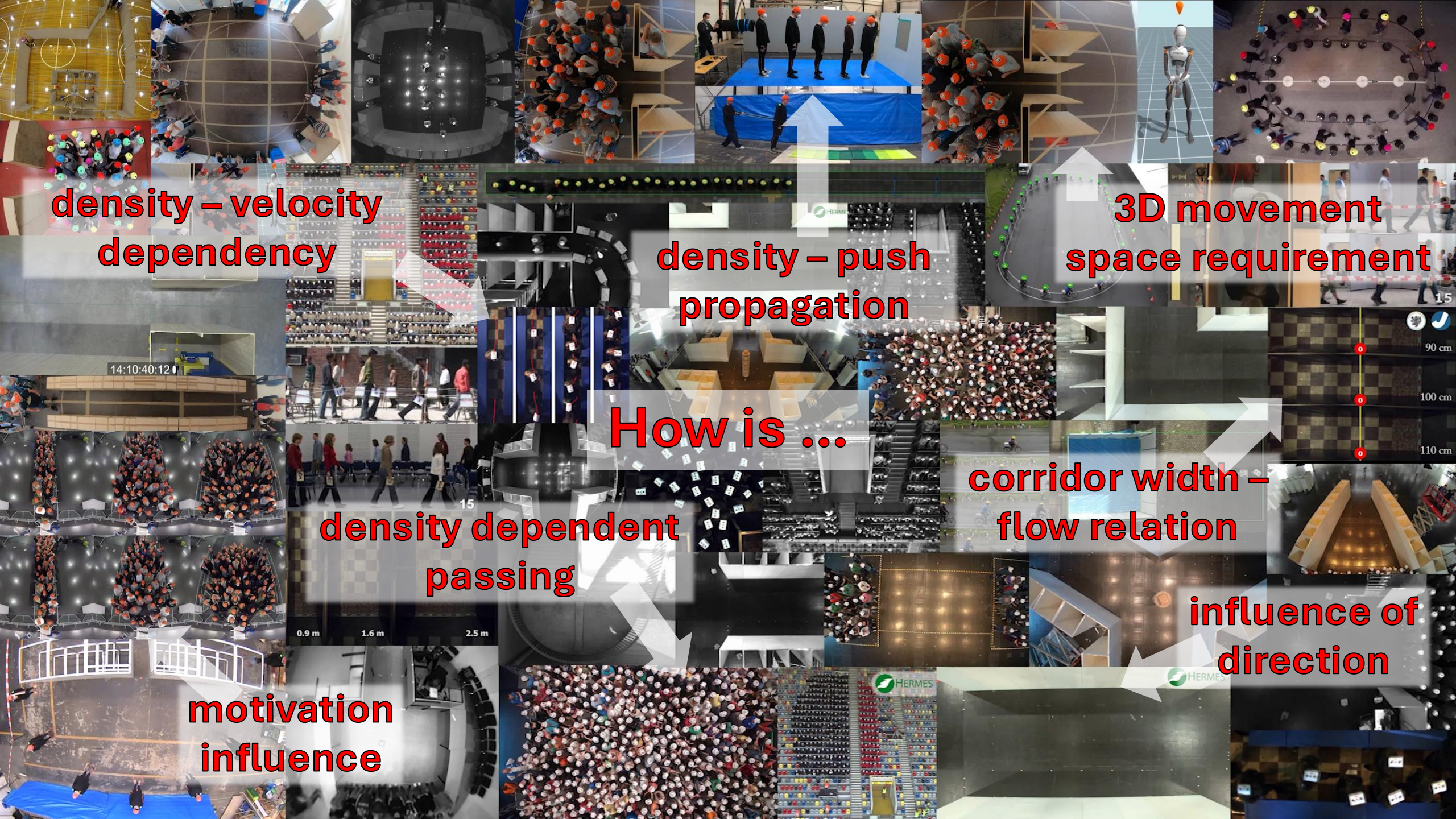




Pedestrian Dynamics Research: **Understanding the dynamics of pedestrian flows** **to increase safety, comfort and performance.**



Pedestrian Dynamics Research:
Controlled experiments enable the analysis of
selected parameters under well-defined conditions.



density - velocity
dependency

density - push
propagation

3D movement
space requirement

How is ...

density dependent
passing

corridor width -
flow relation

influence of
direction

motivation
influence

Project VR-CrowdCraft with



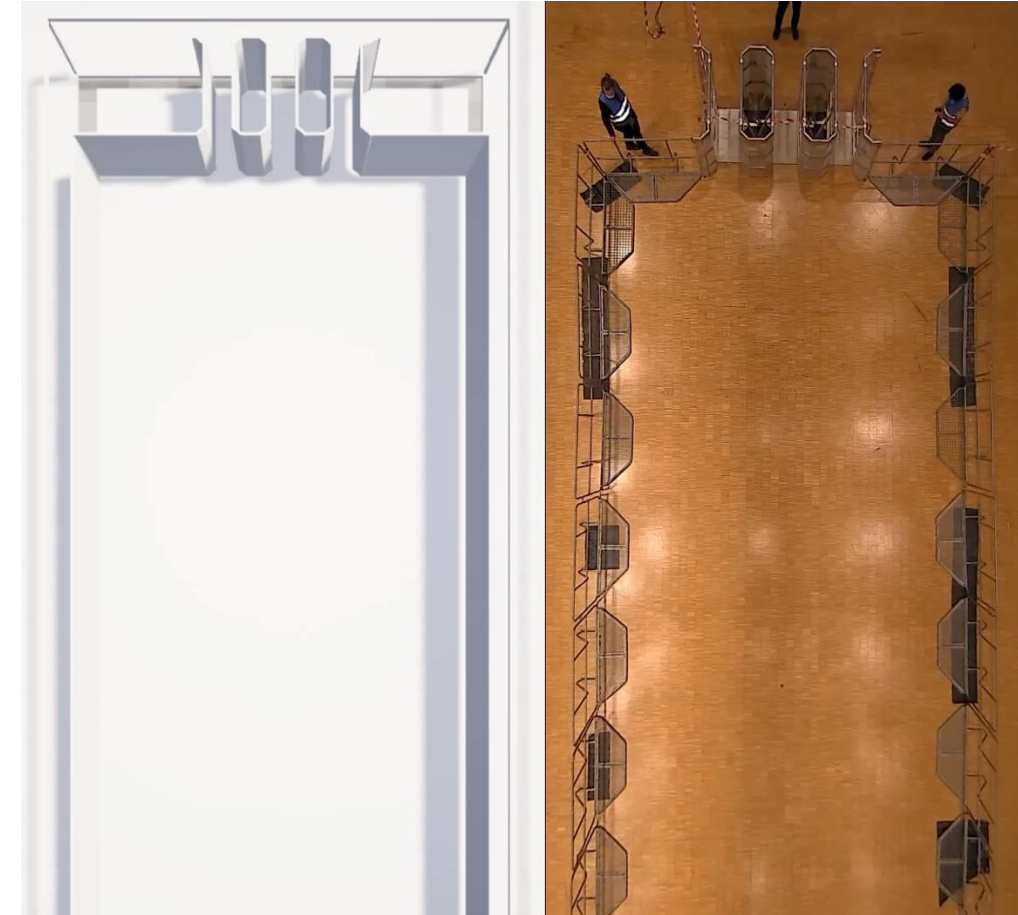
[Andrea Bönsch & Torsten Kuhlen]



Using social virtual reality for

1. **Immersive analysis** of empirical data derived from pedestrian experiments to perceive the situation as **part of the crowd** by adopting the perspective of an individuum:
 - e.g. experiencing visual restrictions or
 - proximity
2. Performing **VR-based studies** with authentic populated immersive environment and social reactions of surrounding people

[J. Hündlings. A VR-Driven Visual Analysis Framework to Advance Pedestrian Dynamics Research. Bachelor's thesis, RWTH Aachen University, Germany, 2024; Pedestrian Crowd Management Experiments, DOI: 10.17815/CD.2023.141]



Increase realism

[J. Hündlings. A VR-Driven Visual Analysis Framework to Advance Pedestrian Dynamics Research. Bachelor's thesis, RWTH Aachen University, Germany, 2024; Pedestrian Crowd Management Experiments, DOI: 10.17815/CD.2023.141]

- **Human-like and user-aware virtual agents**

- 3D full body motion
- Physical and social reactions

- **Force feedback** when touching

- Natural **sound** for correct atmosphere

Additional for VR studies:

- Realistic real-time pedestrian dynamics **model**
- Device for **natural motion** or augmented reality with real surrounding



[Project BaSiGo, bidirectional corridor, DOI: 10.34735/ped.2013.5]

Behavioral repertoires in crowds...



„A behavioral repertoire is a form of behavior in a crowd that is socially meaningful, such as a queuing, pushing, marching.“

Sieben, A., & Postmes, T. (2025). Behavioural repertoires in moving crowds: an observational approach. *Royal Society Open Science*, 12(2), 241561.

... and their transitions

Overtaking

Queuing

Racing
then: huddling



Standing
around

Sieben, A., & Postmes, T. (2025). Behavioural repertoires in moving crowds: an observational approach. *Royal Society Open Science*, 12(2), 241561.

... and their transitions

Overtaking

Overtaking

Huddling



Standing
around

Overtaking

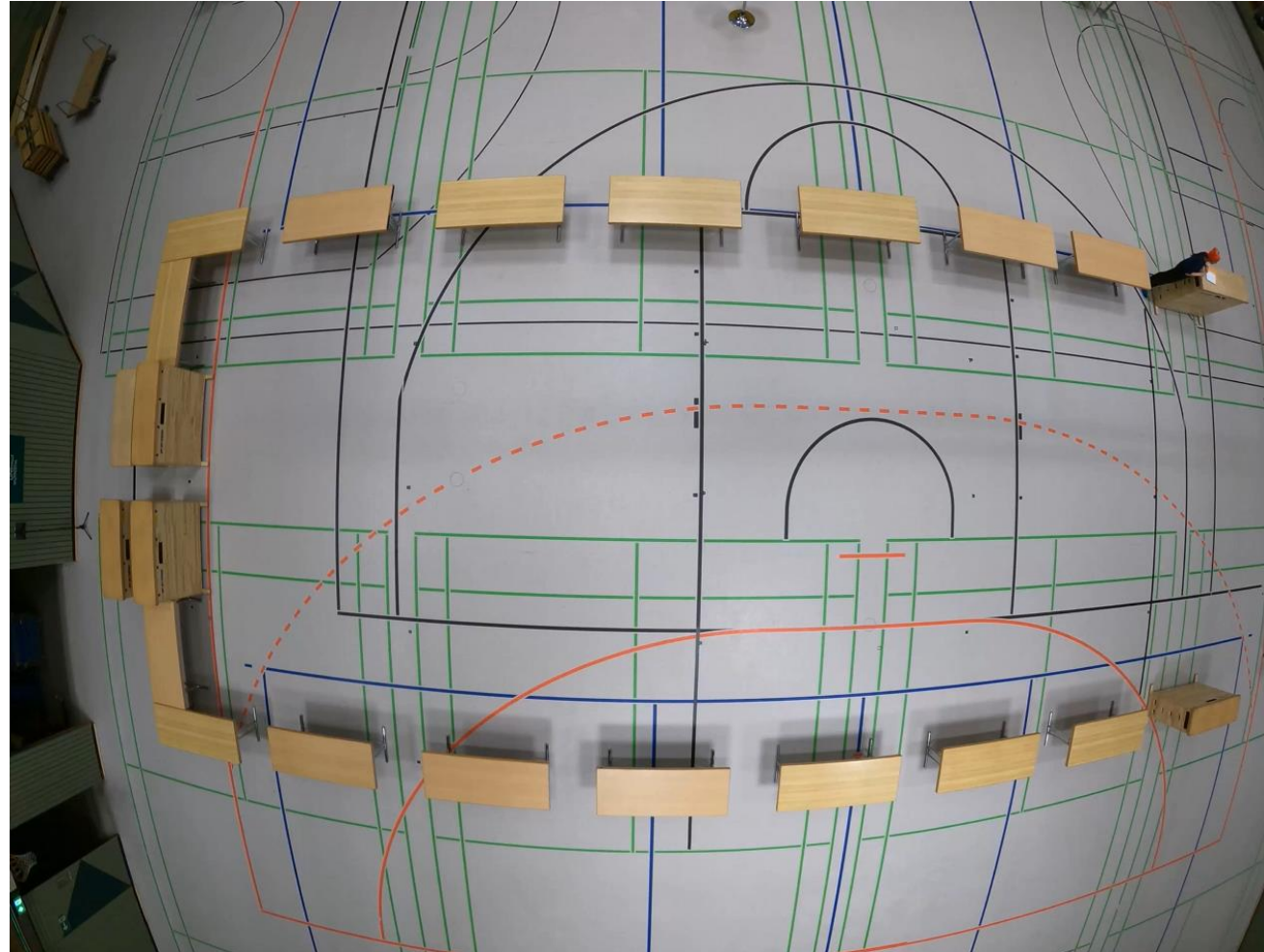
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Researching transitions –



- | | |
|--------------------|--|
| 1. Social norms: | Recognition of appropriate behavior |
| 2. Cognitive maps: | Representation of the crowd and navigation |
| 3. Gaze behavior: | Non-verbal communication through gazes |

Researching transitions –



from inside the crowd!



