

[DC] Towards Comprehensible and Expressive Teleportation Techniques in IVEs

Daniel Rupp
Visual Computing Institute, RWTH Aachen University



To the extended
abstract



Abstract

Teleportation, a popular navigation technique in virtual environments, is favored for its efficiency and reduction of cybersickness but presents challenges such as reduced spatial awareness and limited navigational freedom compared to continuous techniques. In my thesis, I would like to focus on three aspects that advance our understanding of teleportation in both the spatial and the temporal domain. 1) An assessment of different parametrizations of common mathematical models used to specify the target location of the teleportation and the influence on teleportation distance and accuracy. 2) Extending teleportation capabilities to improve navigational freedom, comprehensibility, and accuracy. 3) Adapt teleportation to the time domain, mediating temporal disorientation. The results will enhance the expressivity of existing teleportation interfaces and provide validated alternatives to their steering-based counterparts.



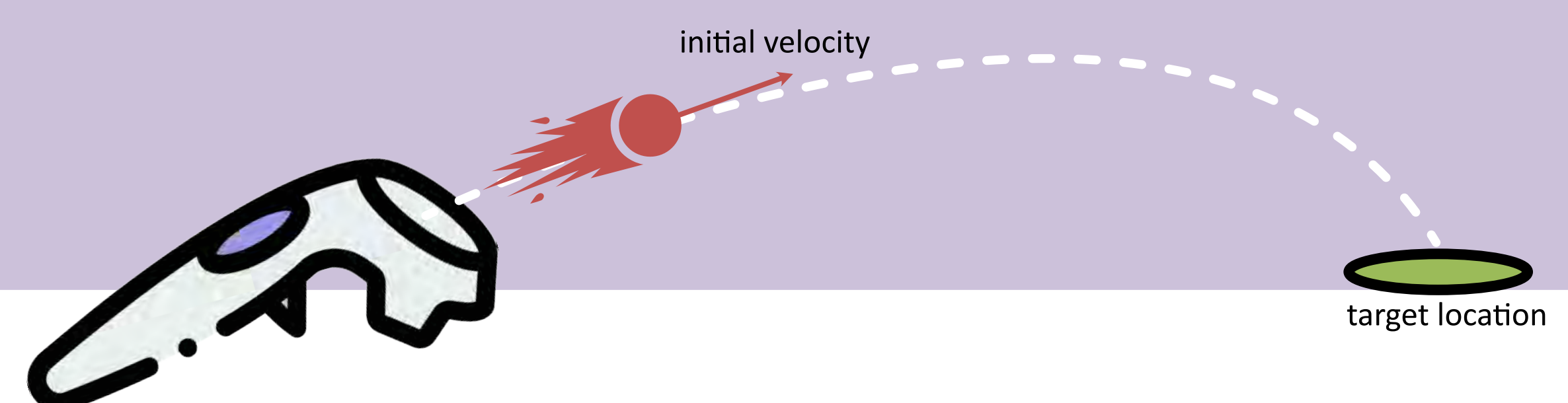
Q1: Parametrization of Target Specification

Motivation:

- Default teleport techniques provided by game engines simulate a projectile following the projectile motion equation, whose intersection point with the scene's geometry determines the target location.
- The initial velocity has a strong influence on the maximal teleportation distance and accuracy of the teleport. However, almost nobody specifies it.

Proposed Solution:

- Explore the influence of the initial velocity on accuracy and teleport distance mathematically.
- Conduct a user study where users have to find a balance between far and accurate teleports and compare objective to theoretical results.



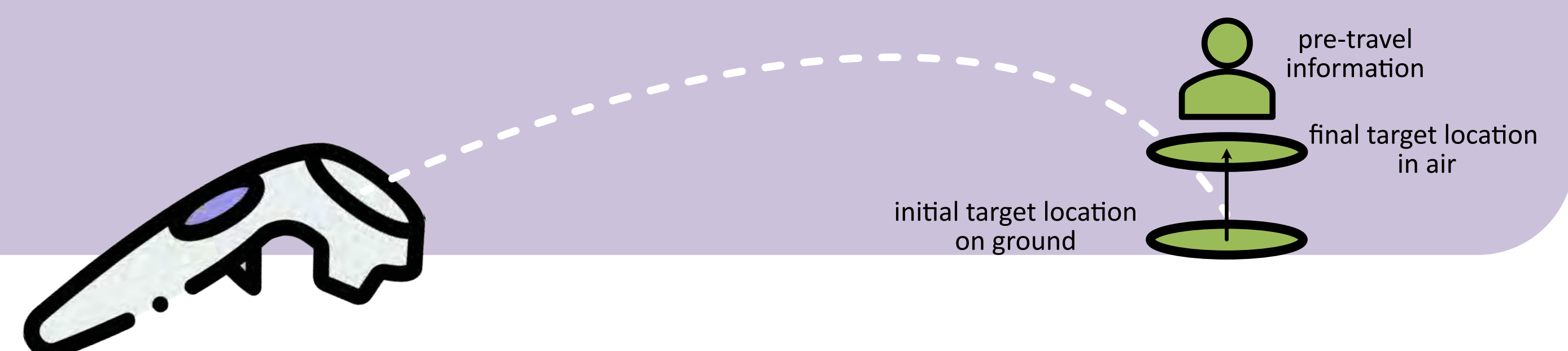
Q2: Improve Navigational Freedom in a Comprehensible Manner

Motivation:

- Traditional teleportation is limited to targets on existing geometry. While prior work exists allowing users to teleport to mid-air targets or to targets at different scales, additional challenges regarding the comprehensibility of these more complex techniques arise.
- Traditionally, horizontal changes are mediated by adding suitable pre-travel information to reduce spatial disorientation. However, it is unclear how they can be adapted to mediate vertical or scale changes.

Proposed Solution:

- Compare different types of pre-travel information like rendering only a sphere, a preview avatar, or a complete preview of the surroundings in the form of a WIM or interactive portal to further improve the comprehensibility of teleportation to mid-air targets.
- Combine height and scale navigation into a single technique.



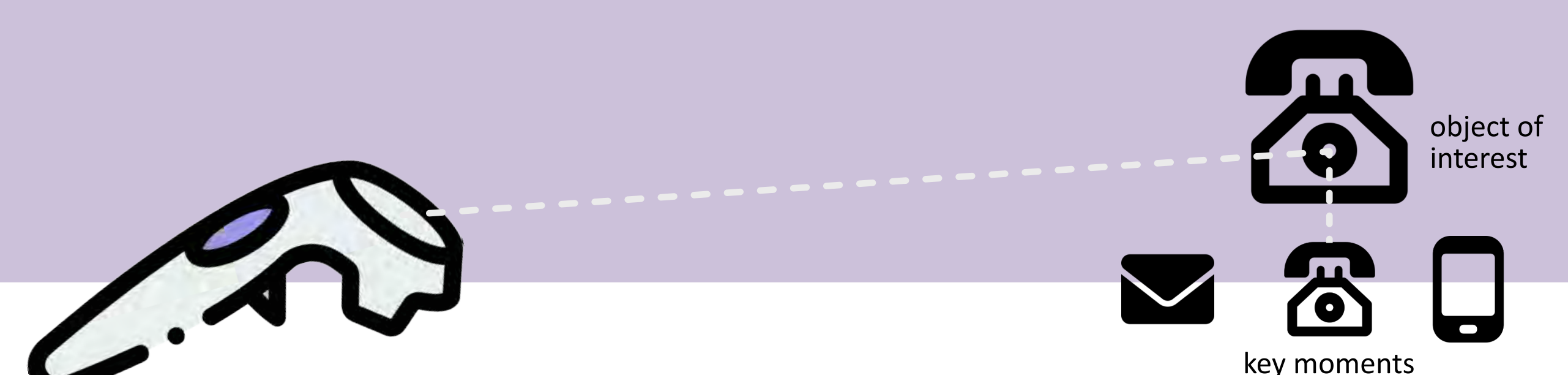
Q3: Extend Teleportation to the Time Domain

Motivation:

- So far, teleportation is used mainly for spatial navigation, while navigation through time is usually done via time sliders. However, the issue with these continuous approaches is that these interfaces often suffer from accuracy when locating specific events in a recording.

Proposed Solution:

- Break down continuous recordings into key moments, moments in time where properties of an object of interest have changed, and use them as target points for teleportation.
- Mediate transition with pre-travel information showing a preview of the scene at the target point-in-time before the transition.



Contact: daniel.rupp@rwth-aachen.de