# Redirected Walking in Obstacle-Rich Virtual Environments

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# Redirected Walking

- Head-mounted displays allow us to explore virtual environments intuitively
- Ideally we'd traverse those environments with natural locomotion
- But this limits the size of virtual environments we can create to the available tracking space

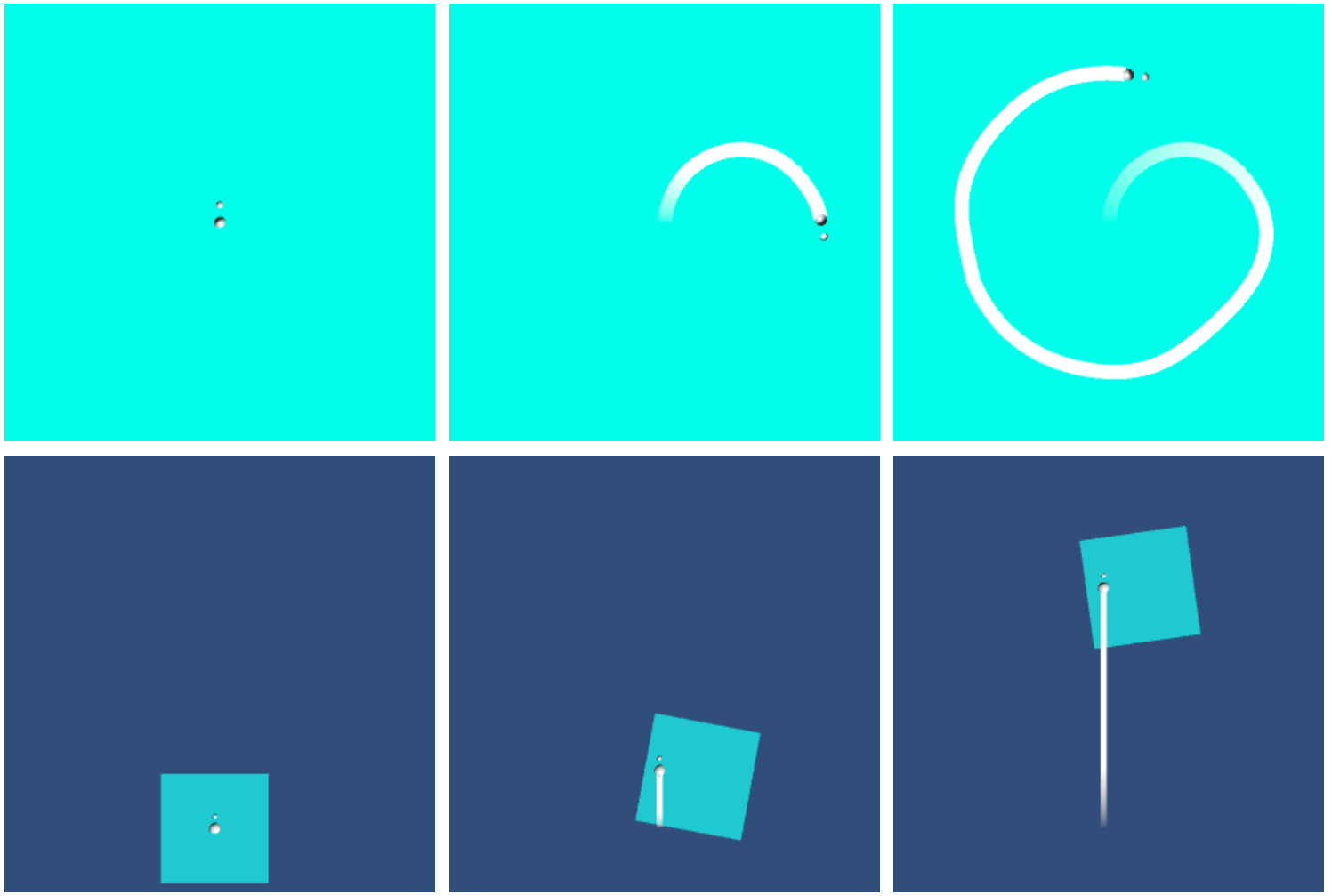
# Redirected Walking II

- Redirected walking attempts to solve the problem of limited track space
- Apply subtle transformations to user movements
- Disrupt the mapping between track space and virtual environment

# Redirected Walking III

Track Space

Virtual Environment



# Research Problem

- Redirected walking currently requires a huge amount of space
- 15m x 15m is a conservative estimate
- Improving performance would:
  - Make track space requirements more achievable
  - Reduce expense on tracking systems

# Research Problem II

- Redirected walking can apply different redirections
  - Rotation gain
  - Translation gain
- Upper limit is defined by perceptual thresholds
- Requires an algorithm to decide direction and magnitude of gains

# Research Problem III

- Current techniques choose poor redirection strategies
  - Steer-To-Center (S2C)
  - Steer-To-Orbit (S2O)

Steer To Center

Steer To Orbit

# Research Problem IV

- Existing techniques assume users will move in the direction they are looking
- We aim to show that a more sophisticated understanding of user path (path-prediction) combined with redirection algorithms capable of using that information (path-aware) will lead to improved redirection performance

# Steer-To-Dynamic

- Project suggestion
- Combines simple path-predictor and path-aware algorithm
- Calculate consistency of user movement with smoothed moving average over a short window
- Dynamically place steering target between S2C and S2O targets based on consistency measure

# Steer-To-Dynamic II

- Evaluate performance through simulations and user study
- Place participants in a virtual environment and have them walk a way-point path
- Comparison metrics
  - Mean distance from track space center
  - Mean rate of unsigned redirection
  - Boundary collisions

# Future Project Suggestions

- Optimisation-based redirected walking with patches
- Monte-Carlo simulation for optimization based redirected walking

# Future Project Suggestions II

- A study into the effect of rate of redirection change on the perceptibility of redirected walking
- A survey of path prediction techniques with performance comparisons based on live user data and simulations

# Questions