# Space Walk: A Combination of Subtle Redirected Walking Techniques Integrated with Gameplay and Narration

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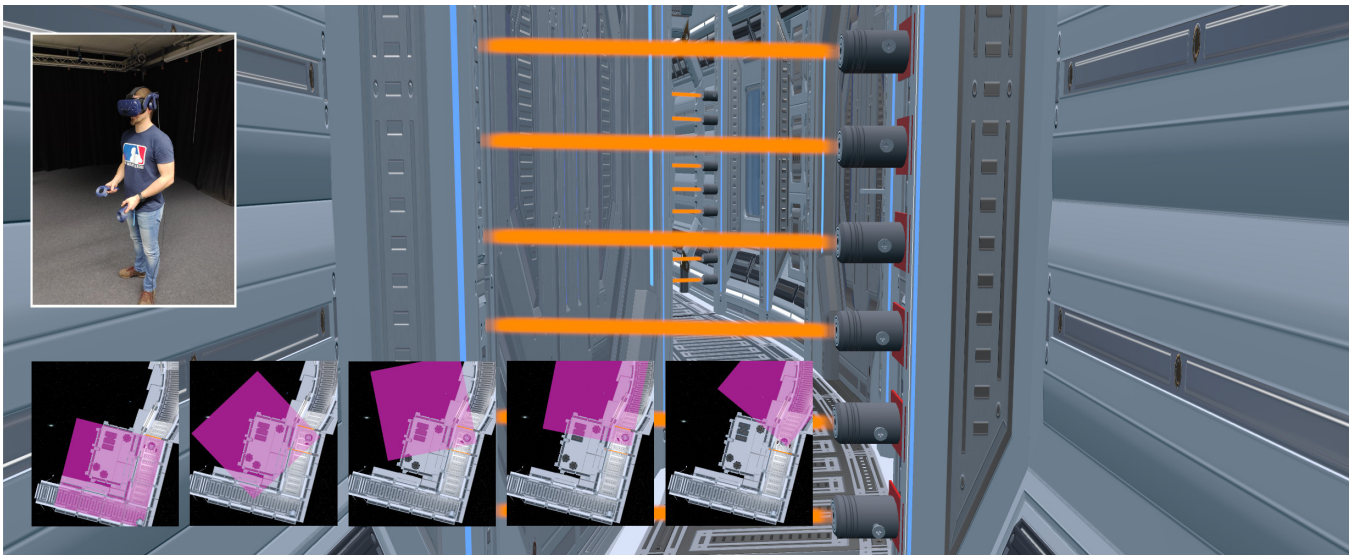

**Figure 1: Illustration of an interaction task which is integrated within a rotation gain: The user (top left inset) has to move each laser beam (background image) from one wall to another while the virtual environment is turned around him (bottom).**

## ABSTRACT

Redirected walking (RDW) denotes a collection of techniques for immersive virtual environments (IVEs), in which users are unknowingly guided on paths in the real world that vary from the paths they perceive in the IVE. For this Emerging Technologies exhibit we present a playful virtual reality (VR) experience that introduces a combination of those RDW techniques such as bending gains, rotation gains, and impossible spaces, which are all subtly integrated with the gameplay and narration to perfectly fit the given environment. Those perceptual tricks allow users to explore a virtual space station of $45m^2$ in a room-scale setup by natural walking only.

## CCS CONCEPTS

• **Computing methodologies** → **Virtual reality**; • **Human-centered computing** → **Virtual reality**.

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## 1 INTRODUCTION

Locomotion is still one of the most challenging interactions in VR. There is a lot of evidence that natural walking is the ideal locomotion technique regarding criteria like presence, VR sickness, wayfinding, spatial cognition, or usability [Langbehn and Steinicke 2018]. However, natural walking in VR is limited by the available physical space surrounding the user.

RDW enables natural walking in confined spaces by manipulating the user's visually perceived path [Matsumoto et al. 2016; Suma et al. 2015]. For instance, the user could experience a virtually straight path while actually walking in circles in the real world [Langbehn and Steinicke 2018]. Up to certain detection thresholds, such manipulations remain unnoticeable [Steinicke et al. 2010]. Several different redirection techniques have been proposed during the last 15 years [Langbehn and Steinicke 2018], e. g., curvature gains, rotation gains, impossible spaces, or distractors.

However, the previous approaches to RDW often focused on finding generalized solutions for unlimited walking in VR which