

# An Indoor Navigation System using a Wide-view Head Mounted Projective Display with a Semi-transparent Retro-reflective Screen

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## ABSTRACT

We demonstrate a simple indoor navigation system using a wearable Hyperboloidal Head Mounted Projective Display (HHMPD). We have been developing a HHMPD which has unique characteristics such as a wide field-of-view (FOV), a large observational pupil, and optical see-through capability. However, a conventional HHMPD requires a stationary retro-reflective screen in the environment thus is unable to be used in a wearable environment. The wearable HHMPD has been prototyped using a newly developed semi-transparent retro-reflective screen. A user of the demo system is able to observe indoor annotations through the wearable HHMPD.

**KEYWORDS:** Wide field-of-view, Head mounted projective display, Wearable augmented reality

## 1 INTRODUCTION

Our research goal is to realize a wearable computing system with a more intuitive and flexible information display by employing a wide field-of-view (FOV) video display. An optical see-through head mounted display (HMD) is commonly used in a wearable augmented reality (AR) system to enjoy a variety of IT services. We have developed a wide FOV optical see-through HMD suitable for wearable AR based on a Hyperboloidal Head Mounted Projective Display [1]. The wearable HHMPD is composed of a pair of custom-made mirrors (see Figure 1) and two pocket projectors (3M MPro110, VGA, 17.7 by 14.4 degrees), and a pupil-division semi-transparent retro-reflective screen [2]. It provides a 109.5-degree horizontal view angle and a 66.6-degree vertical view angle. Note that the HHMPD's optical design is theoretically capable of providing a horizontal field of view wider than 180 degrees [1], if appropriate mirror parameters and wider horizontal projection angles (~50 degrees) are given.

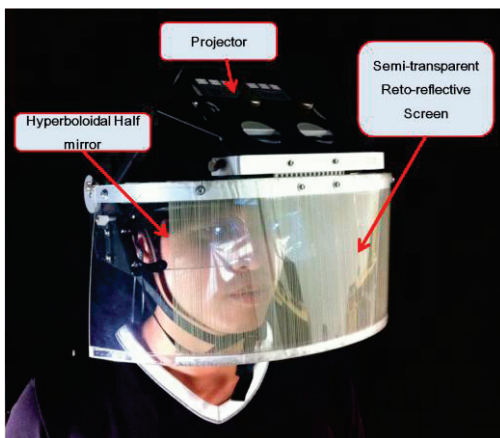


Figure 1. Wearable HHMPD

## 2 INDOOR NAVIGATION SYSTEM

In this demonstration, we present a simple indoor navigation system using a wearable HHMPD. An optical tracking system OptiTrack is used to track user motion. Thanks to the retro-reflective projection technology and a semi-transparent retro-reflective screen, a user is able to observe annotation information as well as the real objects they refer to at the same time comfortably (see Figure 2).

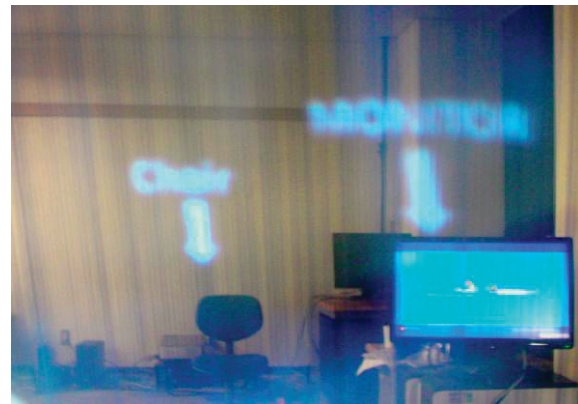


Figure 2. Implemented AR application using Wearable HHMPD

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