

# OmniLantern: A Portable Omnidirectional Projector-Camera System in the Shape of Lantern

Ruopeng Xu\*    Toshiki Sato<sup>†</sup>    Hideki Koike<sup>‡</sup>

**Abstract.** We present a lantern-like projector-camera system named OmniLantern, which is composed of an ultra-wide-angle lens and a projector-camera unit. Unlike other existing projector-camera systems, OmniLantern can detect the objects and project to all directions with one projector-camera unit. We introduced the design concept of the OmniLantern firstly. Then we showed our implementation of the hardware and the software. Finally, we developed some applications of this system and discussed the limitations and future work.

## 1 Introduction

There are a lot of ways of enhancing the users' vision experience using a wide-angle lens. For instance, Maeda et al.[1] show a tabletop system with an omnidirectional lens and Kasahara's HeadLight[2] is a wearable projector system with a large field-of-view. However, the existing works have limitations. Maeda's work is set under the table and it is hard to be moved. HeadLight is designed for the first-person perspective using and does not support multiple people using.

That's why we present OmniLantern, a novel projector-camera system with an omnidirectional lens. We combined the projector, camera, and wide-angle lens together so that OmniLantern can be a movable system. The users can take the OmniLantern walk around, share the information with others, or put it wherever they want, which is impossible with the normal projector-camera system.

Considering this system is a novel system and the users may be confused about how to use it, we also show a lantern metaphor for it. The appearance of the OmniLantern likes a lantern, and it can be used as a lantern as well.

## 2 Implementation

We developed the design of the OmniLantern shown in Figure 1. OmniLantern is composed of a 37mm Opteka 0.3X ultra fish eye lens, a small LB-UH6CB laser projector, a CM3-U3-13Y3C-

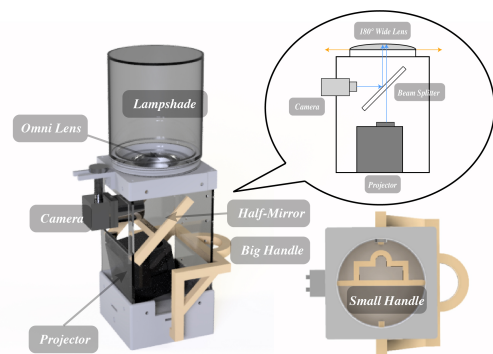


Figure 1. Hardware composition and principle

S-BD Chameleon3 camera, a half-mirror from Edmund Optics with reflection-transmission ratio 20/80, and the 3D-printed case.

To make the users easy to understand how to use OmniLantern, we designed two special parts. Firstly, we added a lampshade to the OmniLantern, like the lampshade of the real lantern. When OmniLantern is equipped with the lampshade, OmniLantern is a small size cylindrical display. On the other hand, when the lampshade is moved, contents can be projected to other surfaces with AR markers. These two different modes make the system more flexible to be used.

Secondly, in order to realize the portable system, we designed two different handles for the system. The bigger handle is used for grabbing OmniLantern. Users can easily hold the handle and walk around. The smaller handle is for hanging OmniLantern on the top. Using these handles can let the users understand the usage of a novel interactive device naturally. Figure 2

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\* Tokyo Institute of Technology

<sup>†</sup> Japan Advanced Institute of Science and Technology

<sup>‡</sup> Tokyo Institute of Technology

