Daisuke Miyazaki, Katsushi Ikeuchi,
"Inverse Polarization Raytracing: Estimating Surface Shape of Transparent Objects," in Proceedings of International Conference on Computer Vision and Pattern Recognition, pp.II:910-917, San Diego, CA USA, 2005.06

# Inverse Polarization Raytracing： <br> Estimating Surface Shapes of Transparent Objects 

Daisuke Miyazaki，Katsushi lkeuchi Institute of Industrial Science，The University of Tokyo

## $\Rightarrow$ Objective

## Purpose

$\rightarrow$ Estimate the 3D surface shape of transparent objects

Input
$\rightarrow 3$ or more images of transparent object with different angle of the polarizer

Output
$\rightarrow$ One piece of height map of the frontal surface of transparent object


Calculate height and normal



Transmitted light

Raytracing


## Algorithm



Results


20 iteration
Front shape（estimated）
＂Front shape（truth）
Back shape（given）
Refractive index \＆ Illumination（given）


Initial［previous method］


10 iteration


Initial［previous method］ Error（height）： 2.8 mm Error（normal）：14deg


50 iteration
Error（height）： 0.61 mm
Error（normal）：7．0deg


Real object


10 iteration


Rendering example

## （D）Acknowledgement

This research was supported in part by Ministry of Education，Culture，Sports，Science and Technology under the Leading Project，＂Development of High Fidelity Digitization Software for Large－Scale and Intangible Cultural Assets．＂
Daisuke Miyazaki was supported by the Japan Society for the Promotion of Science．

## －Presented Paper

［1］Daisuke Miyazaki，Katsushi Ikeuchi，＂Inverse Polarization Raytrading：Estimating Surface Shapes of Transparent Objects，＂in Proceedings of International Conference on Computer Vision and Pattern Recognition，San Diego，CA USA，June 2005.
［2］宮崎大輔，池内克史，＂偏光レイトレーシング法による透明物体の表面形状の推定手法，＂電子情報通信学会論文誌 D－II，2005年8月．

