TransCut: Transparent Object Segmentation from a Light-Field Image

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Introduction

Appearances of transparent objects under different backgrounds

How to segment the transparent object?

Light field image makes it possible to segment the transparent object

Light Field Image

Central View

TransCut

Segment Object

- We propose a method to solve the challenging transparent object segmentation problem.
- The method is automatic, requiring no human interaction.
- An energy function is defined using the LF-linearity, and occlusion detector.

LF-linearity

Background — Viewpoint — Image

su phase space

Background — Viewpoint — Image

Transparent object

su phase space

Rays from background are linear distributed

Rays from transparent object are not linear distributed

Occlusion in light field

Left View — Central View — Right View

backward matching — backward matching

forward matching — forward matching

Forward-backward matching is used to detect occlusion

TransCut Framework

Background: Good LF-linearity

Trans Obj

Transparent Object: Poor LF-linearity exclude the occlusion

Occlusion: Extracted by occlusion detector

Regional term

Boundary term

Central view

Graph Cut [1]

Segmentation task is formulated as a pixel labeling problem

$$E(l) = \sum_{p \in P} R_p(l_p) + \alpha \sum_{(p,q) \in N} B_{p,q} \cdot \delta(l_p, l_q)$$

Experimental Results

Comparison of single object dataset with 7 objects and 7 scenes

	F-measure	Recall	Precision
Finding glass	0.30	0.82	0.19
LF-linearity thresholding	0.50	0.65	0.41
Proposed	0.85	0.96	0.77

Images from the central viewpoint

Results from Finding glass [2]

Results from LF-linearity thresholding

Results from TransCut

Ground Truth

Results of Multiple Objects

Images from the central viewpoint

Results from Finding glass [2]

Results from LF-linearity thresholding

Results from TransCut

Results of Real Scene

Additional results and dataset with ground truth can be found on our website:
http://limu.ait.kyushu-u.ac.jp/transcut/transcut.html

References
1. Y. Boykov and G. Funka-Lea. Graph cuts and efficient nd image segmentation. *IJCV*, 70(2): 109–131, 2006
2. K. McHenry, J. Ponce, and D. Forsyth. Finding glass. CVPR 2005.

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