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Light Field Super Resolution Through Controlled Micro-Shifts of Light Field Sensor

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Abstract

Light field cameras enable new capabilities, such as post-capture refocusing and aperture control, through capturing directional and spatial distribution of light rays in space. Micro-lens array based light field camera design is often preferred due to its light transmission efficiency, cost-effectiveness and compactness. One drawback of the micro-lens array based light field cameras is low spatial resolution due to the fact that a single sensor is shared to capture both spatial and angular information. To address the low spatial resolution issue, we present a light field imaging approach, where multiple light fields are captured and fused to improve the spatial resolution. For each capture, the light field sensor is shifted by a pre-determined fraction of a micro-lens size using an xy translation stage for optimal performance.

Keywords: Light field, super-resolution, micro-scanning

1. Introduction

In light field imaging, the spatial and directional distribution of light rays is recorded in contrast to a regular imaging system, where the angular information of light rays is lost. Light field imaging systems present new capabilities, such as post-capture refocusing, post-capture aperture size and shape control, post-capture viewpoint change, depth estimation, 3D modeling and rendering.

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