

# Light Field Reconstruction Using Shearlet Transform

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**Abstract**—In this article we develop an image based rendering technique based on light field reconstruction from a limited set of perspective views acquired by cameras. Our approach utilizes sparse representation of epipolar-plane images in a directionally sensitive transform domain, obtained by an adapted discrete shearlet transform. The used iterative thresholding algorithm provides high-quality reconstruction results for relatively big disparities between neighboring views. The generated densely sampled light field of a given 3D scene is thus suitable for all applications which requires light field reconstruction. The proposed algorithm is compared favorably against state of the art depth image based rendering techniques.

**Index Terms**—Image-based rendering, light field reconstruction, shearlets, frames, view synthesis.



## 1 INTRODUCTION

SYNTHESIS of intermediate views from a given set of captured views of a 3D visual scene is usually referred to as image-based rendering (IBR) [1]. The scene is typically captured by a limited number of cameras which form a rather coarse set of multiview images. However, denser set of images (i.e. intermediate views) is required in immersive visual applications such as free viewpoint television (FVT) and virtual reality (VR) aimed at creating the perception of continuous parallax.

Modern view synthesis methods are based on two,

needs to sample the LF such that the disparity between neighboring views is less than one pixel [9]. Hereafter, we will refer to such sampling as dense sampling and to the correspondingly sampled LF as densely sampled LF. In order to capture a densely sampled LF, the required distance between neighboring camera positions can be estimated based on the minimal scene depth ( $z_{min}$ ) and the camera resolution. Furthermore, camera resolution should provide enough samples to properly capture highest spatial texture frequency in the scene [10].