## 3-D Reconstruction through Monocular Vision for Mobile Devices

Alexandr Prozorov, Vladimir Volokhov, Andrew Priorov P.G. Demidov Yaroslavl State University Yaroslavl, Russia alexprozoroff@gmail.com, volokhov@piclab.ru, andcat@yandex.ru

Abstract-One of the most common methods to scan objects non-contact for three-dimensional models is stereo vision, i.e. the process to obtain a three-dimensional picture of the world through video data or a set of static images built by a stereo camera. However, 3D reconstruction is possible by using monocular vision. Camera movements allow receiving information about third dimension positions. This article concerns the algorithms of stereovision and visual odometry, which can be applied to solve a three-dimensional reconstruction problem through monocular vision and describes the basic stages of the system, advantages and disadvantages of the abovementioned methods. To reduce the affect of lens distortion and noise of camera matrix is proposed to use hierarchical method. The images are downsampled and the disparity map of a lower level is used like 'offset' disparity map at a

higher level. To assess the camera movements through a set of visual data, there can be applied visual odometry. It is the method to assess the position and orientation of cameras by means of analyzing a sequence obtained from these images. Movements of the mobile camera can be represented on the images as the optical flow. It is an apparent motion of objects, surfaces or sides of the stage that results from movements of the observer relative to the scene. The synthesis of these algorithmic complexes allows scanning the observed scene object in three dimensions. Finally, the algorithms were implemented; examples are given in this paper.

Keywords—Stereovision, Visual odometry, 3d reconstruction, Disparity map, Optical flow.