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# Abstract

The Professorship of Digital Signal Processing and Circuit Technology (DST) at the Technical University of Chemnitz conducts research in the fields of three dimensional data measurement using omnidirectional sensors and is developing methods and prototypes for human behavioural analysis. Furthermore, in the field of Ambient Assisted Living (AAL), it is making rapid progress in real time surveillance and assistance systems.

Motivated by the requirements of the AAL and surveillance systems, this master thesis deals with the capturing an entire room using a small amount of omnidirectional cameras with a field of view larger than 180 degrees. The goal of this master thesis is to derive a constellation and configuration of the three omnidirectional cameras that enhance the 3-D reconstruction capability of the scenes observed. The input varies from a static scene to different video streams and the output is a point cloud reconstruction and evaluation of the scene and the goodness measurement between the ground truth and point clouds.

The real 3D world scene (access granted by the Chair of Digital Signal Processing and Circuit Technology, Chemnitz University of Technology) is replicated virtually with the help of rendering software, Blender and the virtual scene is evaluated for two cases. One, being the baselines between the 3D cameras and second, being the angles between the cameras. The camera setup is that of an equilateral triangle, and it is tested for the above mentioned two cases to get the best configuration and constellation of the omnidirectional cameras for entire hemispherical view generation. The evaluation part deals with the point cloud reconstruction generated using XPCV (developed by Chemnitz University of Technology and uses all in-built functionalities of OpenCV) and testing the impact of the afore-mentioned cases on the different block matching algorithms.

This systems aims at real world scenarios and targets applications in surveillance, security, home automation, consumer electronics and assisted elderly care and behavioural analysis.

**Keywords: Stereo Vision, Omnidirectional Stereo Vision, Trinocular Camera Configuration, Fisheye Camera, Visual Indoor Surveillance**