The RayCloud – a Vision Beyond the Point Cloud

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SUMMARY

In traditional photogrammetry, 3D points are measured by means of stereo in a similar way humans use their eyes to recover 3D info from the environment. Taking 2 images and their precise orientation, stereo stations implement a virtual plane sweeping through space. Both images are projected & blended onto that plane. If the images are in correspondence, ie the point of interest is sharp in both blended images, the virtual plane position corresponds to the 3D location of the Point Of Interest. Similarly, the Point of Interest can be measured in both images. The 3D location is then computed by the intersection (aka triangulation) of the 2 rays starting from the respective camera centers and go through the measured pixel coordinates. The accuracy of the 3D point estimation procedure is the same for booth methods and is proportional to the distance/ baseline ratio. This means that 3D points at a certain distance from the camera can be more precisely measured when the baseline (the distance between the two camera centers) gets larger. The novel rayCloud concept, that we introduce here, is a generalization of the stereo or two view triangulation towards multiple views. The final 3D point is computed from the intersection of many rays that all start from the camera centers and intersect the respective images at corresponding pixels. Due to this technology the accuracy of the 3D point estimate can be increased substantially. In this presentation we show the rayCloud concept on real examples for the modelling of buildings in centimeter range. We justify the approach by combining the results to the classical two view and stereo techniques and make the relation to LiDAR point cloud reconstruction. Speaker biography (69 words): Dr. Christoph Strecha received a PhD degree from the Catholic University of Leuven (Belgium) in 2008 under the supervision of Prof. Luc Van Gool for his thesis on multi-view stereo. He then worked as a post-doc and was co-chair of ISPRS Commission III/1. In 2011 he founded Pix4D, a Swiss company which develops and markets software for fully automatic production of 3D models and orthomosaics from UAV and aerial images.