Image Stitching for Usage in Photogrammetric Algorithms

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Abstract

A distributed camera system can consist of multiple camera groups. An image stitch is created by each group and transmitted to a central processing unit. The central processing combines all received images into an image stitch. The camera groups can have cameras with large overlapping areas and transmitting a stitched image will reduce the required bandwidth. Unfortunately, photogrammetric algorithms such as stitching, assume images adhere to the pinhole camera model. Thus, photogrammetric algorithms cannot be applied to image stitches created by currently available grid generation techniques. In this paper a grid generation method to create a stitched image with the properties of a pinhole camera is presented. The method is evaluated by simulating eight cameras, forming two groups, each group covering a quarter-hemisphere. The intrinsic and extrinsic parameters of each camera is known. A groundtruth is created by a spherical stitch of all eight cameras covering the half-hemisphere. To test, each camera group is stitched using the pinhole camera transformation. The transformation produce artificial intrinsic and extrinsic parameters for each stitch. A half-hemisphere spherical stitch is created using the two camera group stitches, each with their relative intrinsic and extrinsic parameters. The half-hemisphere stitch is compared to the groundtruth, producing almost perfect correlation. The high correlation indicates the success of the pinhole camera transformation. The pinhole camera transformation enable the usage of stitched images in photogrammetric algorithms