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A real-time photogrammetric algorithm for sensor and synthetic image fusion with application to aviation combined vision

M. A. Lebedev, D. G. Stepaniants, D. V. Komarov, O. V. Vygolov, Yu. V. Vizilter, and S. Yu. Zheltov
State Research Institute of Aviation Systems, Moscow, Russia

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Abstract. The paper addresses a promising visualization concept related to combination of sensor and synthetic images in order to enhance situation awareness of a pilot during an aircraft landing. A real-time algorithm for a fusion of a sensor image, acquired by an onboard camera, and a synthetic 3D image of the external view, generated in an onboard computer, is proposed. The pixel correspondence between the sensor and the synthetic images is obtained by an exterior orientation of a "virtual" camera using runway points as a geospatial reference. The runway points are detected by the Projective Hough Transform, which idea is to project the edge map onto a horizontal plane in the object space (the runway plane) and then to calculate intensity projections of edge pixels on different directions of intensity gradient. The performed experiments on simulated images show that on a base glide path the algorithm provides image fusion with pixel accuracy, even in the case of significant navigation errors.

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