Self-calibration of vision parameters via genetic algorithms with simulated binary crossover and laser line projection

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Opt. Eng. 54(5) 053115 doi: 10.1117/1.OE.54.5.053115

Published in: Optical Engineering Volume 54, Issue 5.

Abstract.

A self-calibration technique based on genetic algorithms (GAs) with simulated binary crossover (SBX) and laser line imaging is presented. In this technique, the GA determines the vision parameters based on perspective projection geometry. The GA is constructed by means of an objective function, which is deduced from the equations of the laser line projection. To minimize the objective function, the GA performs a recombination of chromosomes through the SBX. This procedure provides the vision parameters, which are represented as chromosomes. The approach of the proposed GA is to achieve calibration and recalibration without external references and physical measurements. Thus, limitations caused by the missing of references are overcome to make self-calibration and three-dimensional (3-D) vision. Therefore, the proposed technique improves the self-calibration obtained by GAs with references. Additionally, 3-D vision is carried out via laser line position and vision parameters. The contribution of the proposed method is elucidated based on the accuracy of the self-calibration, which is performed with GAs.