DETERMINATION OF ANGULAR ERRORS BETWEEN RECTILINEAL POSITIONS

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The error caused by the fitting of a set of data points to two lines having a specified angle is defined as the angular error. The evaluation of angular error needs to find two pairs of parallel lines that follow the angular constraint and bound the data points under the minimum zone criterion. The evaluation of angular error is difficult in mathematics, so it is usually simplified by treating one line as the datum and the form error of the other line calculated from the datum as the solution. The datum is assumed to be perfect that doesn't tell the real properties of the actual line but gives incorrect solutions in general. To give an exact solution to the angular error problem based on the minimum zone criterion, a new mathematical model is proposed in this paper. The basic idea of this model is to rotate the data points of one line to the same direction as that of the other line so that the evaluation of angular error is simplified as solving a straightness problem.

The angular error obtained from the proposed model is proved to be minimum. The proposed model offers a simple approach to solve the tough angular error problem, and it also provides a feasible tool to explore more complicated problems, like 3D angular error and polygon error [1, 2].

Reference: 1. Preparata F.P. and Shamos M. Computational Geometry. N.Y.: Springer-Verlag, 1985. – 314 p. 2. Fukuda M. Algorithms for form evaluation methods for minimum zone and least squares // Proc of the Intern. Symp. On Metrology for Quality Production, Tokyo; 2004. p. 197-202.