Assessment of Temperature Distributions based on the Adaptive Cross Approximation

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Abstract

During the production process of rolled steel plates quality control plays an important role. The temperature distribution in the plate, which is determined with a temperature measuring device, has to be assessed on homogeneity. The temperature data is stored in a rectangular array. A real-time assessment is required. A new method, the Adaptive Cross Approximation (ACA) for the temperature assessment is proposed. The ACA-method is applied to a two-dimensional rectangular temperature array. The temperature array as a result of measurements contains a stochastic measuring tolerance. Nevertheless, the temperature field, which is usually a full matrix, can be approximated by a series of low rank matrices according to the ACA-method. The number of iteration steps is used as the criterion on homogeneity. Numerical examples, based on real industrial data, illustrate the efficiency of the ACA-method. In most cases, the subjective human evaluation of temperature fields matches with the assessment made by the ACA-method. Furthermore, the ACA-method leads to a significant compression of the temperature arrays and can be also used for archiving of the measured data almost without loss of information.

Keywords: Rolled Steel Plates, Quality Control, Temperature Distributions, Adaptive Cross Approximation, ACA-Rank, Assessment of Homogeneity