Method of the Reference Materials for Fiber-reinforced Concrete

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Abstract

In this paper, we present a new approach for materials detection in the transverse CT scans of a fiber-reinforced concrete. The method is based on the stepwise minimization of distances among reference values of the materials and remaining values of an input image pixels. In our approach we combine techniques from various, not only mathematical fields, e.g. mathematical analysis, graph theory and data analysis for better determination of the region of interest (ROI) of detected materials. After each step of the minimization our method semi-automaticaly verifies the solution and decides, whether achieved solution is optimal or next computations are needed; or alternatively, the validator modifies a mode of computation for the next minimization step. Moreover, we have developed a semi-automaticaly technique for proper selecting of the reference values for the detected materials; and we have proof that ROI of this materials can be computed in a values distribution of one CT scan independently to values distribution of others input images. It is of a great importance for massive parallel computations on HPC systems. Real application concludes the paper and we show, how we build a tetrahedral mesh from sequence of approximately 1300 transverse CT scans of a fiber-reinforced concrete, which is composed from 3 types of materials: an air, a concrete and specific material fibers.

References

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