

عنوان مقاله:

Automatic Detection and Localization of Surface Cracks in Continuously Cast Hot Steel Slabs Using Digital Image Analysis Techniques

محل انتشار:

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خلاصه مقاله:

Quality inspection is an indispensable part of modern industrial manufacturing. Steel as a major industry requires constant surveillance and supervision through its various stages of production. Continuous casting is a critical step in the steel manufacturing process in which molten steel is solidified into a semi-finished product called slab. Once the slab is released from the casting unit, the surface often has longitudinal or transverse cracks. Being exposed to air, the crack surfaces oxidize and do not weld during rolling. The early detection of these defects on the slab saves significant time, effort and production expense, reduces costs, and prevents wasted processing steps and rolling mill faults. Traditionally, the inspection process has been carried out visually through human inspectors. However, human inspection is subjective, error-prone, tedious and time consuming. This paper presents an initial study to validate the feasibility of automated inspection of continuously cast hot slabs using computer vision techniques. An automated inspection system such as the one described in this paper can inspect a slab coming out of a caster while it is still hot. The image processing techniques applied in this work including wavelet transform, morphological operations, edge detection and clustering are time-efficient and simply applicable in industrial applications which demand online computations. The experimental results with ۹۷.۰% sensitivity and ۹۶.۰% specificity demonstrated that the proposed algorithm was effective and reliable. To the best of our knowledge, this is the first time that such a computerized algorithm has been applied in Iran's steel industry for quality inspection of continuously cast hot slabs.

کلمات کلیدی:

Automatic inspection, Continuously cast slabs, Surface crack, Morphological operations, Edge detection, Color clustering, Neural network

