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Implementation of a Steel Ladle Identification and Localization System Based on Image Processing

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Process optimization in industries, particularly steel, is a fundamental priority for enhancing productivity and reducing costs. In this study, an advanced system for the identification and localization of molten material transfer ladles has been designed and implemented using image processing and deep learning technologies. By integrating into various levels of process control (Level 2 and Level 3), this system significantly contributes to improving ladle circulation efficiency, increasing production, reducing operational downtimes, and enhancing safety. The proposed method employs advanced image processing algorithms to identify ladle numbers and determine their positions in steelmaking and casting workshops under challenging conditions such as high temperatures, dust, and noise. Industrial cameras installed at designated workstations capture images of the ladles while a programmable board analyzes specific patterns placed on them. The extracted data, including ladle number, location, time, date, and the detected pattern image, are transmitted in real time to a central server. Experimental results demonstrate that the proposed system reliably identifies and tracks ladles with high accuracy. Furthermore, using convolutional neural networks (CNNs) enhances recognition precision and speed in complex environmental conditions. This system can play a crucial role in improving operational management and efficiency in related industries.

Speaker Country

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