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# Metallurgical Quality Assessment Of Continuous Casting Combining AI, Sensor Information and Machine Vision

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Continuous casting has long relied on inspection methods that often detect defects too late, leading to wasted energy, time, and costs. Late detection also limits the ability to intervene in defect formation. Sapotech aims to improve continuous casting control by developing a real-time defect detection system that integrates AI-driven predictions, machine vision, and process sensor data. This approach enhances automation, optimizes process flow, reduces unnecessary processing, and improves safety.

This study explores AI-driven enhancements to reduce latency in defect detection by integrating additional computational blocks into the existing UNet3+ deep learning architecture. The process involves capturing surface images, processing them through an initial stage of the UNet3+ network, passing them through optimized computer vision modules, and then completing analysis within the full architecture to identify defect locations and types in real time.

Additionally, we are investigating the integration of process sensor data—such as mold friction, oscillation frequency, casting speed, and mold temperature—with machine vision for early defect detection. Synchronizing this data with visual information enables a more comprehensive understanding of defect formation mechanisms and lays the foundation for fully automating the continuous casting process.

The effectiveness of our approach is evaluated based on processing speed, hardware requirements, detection accuracy, and true positive versus false positive rates. Future work will focus on fully integrating sensor data for early defect detection, further advancing the automation of metallurgical casting.

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