

Enhancing Efficiency and Reliability in Nuclear Power Plant Component Inspection through Automated Anomaly Detection and Imaging Techniques

Andrew Young, Zhouxiang Fei, Graeme West, Paul Murray, Jamie Zabalza, Chris Kennedy, and Harpreet Barpugga

Bruce Power launched its Major Component Replacement program in 2020, with a particular emphasis on the replacement of critical parts within the CANDU reactors. The scope of the program includes the replacement of critical components such as steam generators, pressure tubes, calandria tubes, and feeder tubes. The examination of Calandria Tubesheet Bores (CTSB) is a particularly time-consuming activity within this program. Currently, engineers manually evaluate inspection footage to detect any defects that might lead to leak test failures. The inspection videos, however, include a large amount of visual noise due to the high radiation levels. This noise poses a considerable challenge to the accurate identification of defects, often leading to time-consuming and costly re-inspections. With the primary objective of automating this inspection process, a collaborative project was formed between Bruce Power, the nuclear operator, the University of Strathclyde, an academic institution, Prolucid, a software engineering company, and ATS Corporation, a leading automation and robotics specialist. This successful collaboration enabled the University of Strathclyde to conduct fundamental research into video denoising and automated defect detection, Prolucid to create a QA-grade software application to integrate the academic outputs, and ATS Corporation to provide the necessary robotics and automation expertise to implement the solution on-site. This partnership will result in a cutting-edge automated inspection system that greatly improves the efficiency and accuracy of the CTSB inspection process. By first reducing noise from the inspection videos, then identifying any indications on the CTSB surface, and lastly classifying these indications according to their type and severity. This automation not only streamlines Bruce Power's inspection procedures but also includes engineers in the final decision-making process, ensuring comprehensive evaluation.

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