

Machine Vision Applications in the Nuclear NDE Industry

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Nuclear power plants perform a variety of non-destructive visual examinations of critical assets; examples vary from reactor components to containment buildings. Many of these inspections are subjected to unfavorable human factors as examiners are required to maintain a high level of focus for prolonged times while performing monotonous activities in challenging environments. While these conditions challenge inspection reliability, there are numerous opportunities to leverage machine vision technology in support of these examination activities that can help alleviate many of these issues and potentially lead to increased reliability. In this presentation, the authors will discuss examples of such applications, including the remote visual examination of reactor internals and of concrete containment buildings, as well as different implementation methodologies, from real-time annotation through edge devices to support for post-processing and later review. While most of these examinations are recorded, often the necessary data to support the development of machine vision solutions is either scarce or highly sensitive, and mostly unavailable. The authors will share this and other challenges in each case and some of the potential solutions and approaches being pursued, such as synthetic data. In the process, the presentation will showcase the range of potential applications and provide a review of the efforts and results obtained to date.