

## Artificial Intelligence and Machine Vision-Based Defect Detection Methodology for Solid Rocket Motor Propellant Grains

**Authors :** Sandip Suman

**Abstract :** Mechanical defects (cracks, voids, irregularities) in rocket motor propellant are not new and it is induced due to various reasons, which could be an improper manufacturing process, lot-to-lot variation in chemicals or just the natural aging of the products. These defects are normally identified during the examination of radiographic films by quality inspectors. However, a lot of times, these defects are under or over-classified by human inspectors, which leads to unpredictable performance during lot acceptance tests and significant economic loss. The human eye can only visualize larger cracks and defects in the radiographs, and it is almost impossible to visualize every small defect through the human eye. A different artificial intelligence-based machine vision methodology has been proposed in this work to identify and classify the structural defects in the radiographic films of rocket motors with solid propellant. The proposed methodology can extract the features of defects, characterize them, and make intelligent decisions for acceptance or rejection as per the customer requirements. This will automatize the defect detection process during manufacturing with human-like intelligence. It will also significantly reduce production downtime and help to restore processes in the least possible time. The proposed methodology is highly scalable and can easily be transferred to various products and processes.

**Keywords :** artificial intelligence, machine vision, defect detection, rocket motor propellant grains

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