Visual-based defect detection for product classification: a machine learning approach

A. Saragaglia*[a], N. Calafat[a]
[a]LYNRED, Actipole - CS 10021, 364, route de Valence, 38113 Veurey-Voroize, France

ABSTRACT

Visual inspection is the final stage for quality product testing of infrared detectors. Traditional methods for this type of work commonly rely on human visual inspection, which is the ultimate standard for determining the visual quality of the image. However, using human inspection can be problematic because of the statistical variation between observers. Automated methods based on machine learning techniques, and especially Deep Learning, have emerged in recent decades that are able to closely match the visual perception of the human eye, while providing the added benefits of speed and consistency.

In the present paper, we propose a hybrid method to classify images acquired from assembled detectors based on the combination of both infrared-adapted image processing techniques and machine learning approaches. The first classifier extracts several features from the infrared image and uses support vector machines (SVM) for classification. The second, a Convolutional Neural Network (CNN), is dedicated to the detection of specific defects, though to identify with traditional image processing techniques because of their low contrast. While CNN achieves precise and robust identification of special defects, the first classifier secures the global detection of new defects even if their shape is not clearly identified.

The proposed model has proven to be robust and able to accurately classify detectors images, regarding human visual inspection. The approach was developed with the capability to scale-up and evolve in order to take in consideration new products. We also show that using AI presents the double benefit of improving the quality of the products meanwhile reducing human time effort.

Keywords: Deep Learning, Visual Inspection, Image processing, CNN