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SELECTED PAPERS FROM
ICOM'01, ICOM'05 AND
ICOM'08

Editors

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Proposed Intelligent Algorithm for IC Marking Image Inspection

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ABSTRACT

The paper proposes an intelligent algorithm for inspecting IC marking. A TSSOP-DGG IC package from Texas Instruments is used. The algorithm is divided into two stages. Inspection and verification. The first stage uses fuzzy logic to detect global marking defects. This detection is based on area, offset and orientation parameters analysis over all marking symbols. The second stage is a verification stage in which every character (or symbol) is verified individually. To perform verification, a fuzzy system is trained via an ANFIS engine then used for verification. The performance of the proposed algorithm in terms of its ability to correctly classify marking defects is found to be satisfactory as it is highly reliable, greatly reduces the effect of noise and its dependency on human input or involvement during marking inspection.

1. INTRODUCTION

This paper does not resolve to OCR to handle marking inspection. It rather uses part of the techniques found in some OCR systems [5] i.e. blobs extraction and feature analysis. It also incorporates the concept of fuzzifying measured features since they are calculated with an uncertainty component [7] which is a result of the imaging device inaccuracy, noise and inherited quantization error. Neural networks (NN) are widely used to detect defects using extracted blob features in IC inspection [2]. However, NN is a technique that relies on training and is best suited for classification/recognition purposes. IC marking inspection imposes thresholds on certain parameters to deem an IC defective. This research aims at combining NN and fuzzy systems to add a sense of measurement to the NN classical approach used in marking inspection, thus, providing a more reliable system that satisfies the manufacturer inspection requirements.

2. IMAGE PRE-PROCESSING

An unprocessed ROI for an IC image is shown in Figure 1. This Figure as it can be seen has noise that can affect the segmentation quality.



Fig. 1. A sample IC marking image after each preprocessing operation

To eliminate noise, the image is downsampled then upsampled. For downsampling, a 5x5 Gaussian pyramid decomposition is applied. This method convolves the source image with the specified filter