

DEFECT CLASSIFICATION FOR LCD COLOR FILTERS USING NEURAL-NETWORK DECISION TREE CLASSIFIER

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ABSTRACT. *A real-time automatic defect classification scheme is proposed to understand the situation of color-filter production procedure by analyzing the defect types. The proposed system consists of three stages: defect extraction, feature description, and defect-type classification. A reflex-lighted image and the same-area back-lighted image are both used for the defect classification. Four features extracted from the reflex-lighted images describe the shape of the defects and other four features extracted from the back-lighted images describe the appearance of the defects on the color-filter cells. A neural-network decision tree classifier is then designed for classifying the defect types. The neural network has the ability to analyze the complicated non-linear relationship between input signals and the desired outputs. A back propagation algorithm is used as the training method for the proposed classifier. The experimental results show that the proposed scheme can efficiently classify the defect types and the proposed neural-network classifier is superior to other classifiers.*

Keywords: Defect classification, Defect description, Neural network, LCD color filter

1. Introduction. In the manufacturing procedure of liquid crystal display (*LCD*) panels, several abnormal devices may cause panel defects in the production line and the abnormal devices may be found according to the panel defect types. Currently, the defects are mostly classified by human eyes. Such a classification result is inefficient to be used for finding the device faults. If there is an automatic defect-type classification on *LCD* panels, the fault of the production devices would be efficiently found. In other words, a proper detection and classification for the panel defects is useful to control the yield rate of the production line and to promote the process ability of manufacturing.

The production of *LCDs* consists of three stages: thin film transistor (*TFT*) array engineering, cell engineering, and assembly engineering. The *LCD* color filter (*CF*) is manufactured in the cell engineering stage. This study focuses on the defect description and classification in this stage. In the cell engineering, there is a high incidence of seven defect types in manufacturing process: color peeling, dot scratch, light-resisted matter, transparent matter, metal matter, black matter, and fiber matter on the *CF* surfaces as shown in Figure 1. A real-time automatic defect classification system would maintain the production procedure by recognizing these defects. Thus, it is important to detect any defect on the *LCD* panels and to recognize the defect type as soon as possible to promptly find faults in the production procedure.