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Guest Editorial: Special Issue on Real-Time Defect Detection

Quality control is becoming a relevant issue for many products. In general, quality control presents the following interrelated aspects: the assessment of quality by means of a set of quality indicators, the detection of defects as resulting from the quality indicators or exceptional defects, the classification of defects in a multi-dimensional space, and the assessment of defect location and dimension.

Most traditional methods for defect detection in industrial manufacturing processes are rapidly changing. Real-time detection of defects in shape, colour, texture in many products (from tiles to cars, from food to airplane components, from chips to toys), made of a variety of materials (fabric, marble, leather, plastic and so on), is becoming mandatory to ensure the ever-increasing demand for quality.

For this reason, several researchers are studying fast algorithms, parallel architectures, and special chips for real-time defect detection. Since the materials and defect types are strongly different and heterogeneous, a very large collection of techniques has been proposed. Unfortunately, only few of these are suitable to build real-time detection machines. Thanks to new technologies, however, many applications are possible, and others, unfeasible today because of the limitations of inspection methods, are being developed and implemented. This is also due to the improvement of image processing techniques.

This special issue presents a mixture of papers proposing solutions for defect detection in four different application fields.

Lai and Fang (*An Accurate Fast Pattern Localization Algorithm for Automated Visual Inspection*) propose an algorithm for 2D pattern localization based on a modified optical flow constraint and on energy minimization. Fast defect localization constitutes the basis for increasing production and quality simultaneously.

The contribution by Garcia, Garcia, Obeso and Fernadez (*Real-Time Flatness Inspection System for Stell Strip Production Lines*) describes a solution for automatic flatness assessment in the control of hot strip mill in steel factories. Such a system offers a solution to an important production problem, as unsatisfactory, quality control in steel production can lead to relevant losses.

The paper by Weickert (*A Real-Time Algorithm for Assessing Inhomogeneities in Fabrics*) addresses the problem of cloudiness assessment for nonwoven fabrics. In this case, the result of the automatic quality assessment has to be compared with the result obtained by a human assessor.

Hajimowlana, Muscedere, Jullien, and Roberts (*An In-Camera Data Stream Processing System for Defect Detection in Web Inspection Tasks*) present a hardware solution for real-time defect detection. This solution is very suitable to cases where the defect detector is directly used as a sensor for controlling the production machines.

Although the problem of real-time defect detection has been only partially addressed by the papers included in this special issue, we are confident that the papers selected will be of benefit to our readers, especially when considering how frequently a technique used for a specific problem can be reapplied to solve other, similar problems in different application areas.

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