

PROCESSING REFLECTIONS ON METALLIC SURFACES USING A SPECIAL RANDOM SAMPLING METHOD

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ABSTRACT. *In smooth metallic surfaces, specular reflection components are very strong while diffuse reflection components are very weak. This makes the automatic inspection of defects on a smooth metallic surface very difficult. In order to divide specular reflection and diffuse reflection components from surface reflected light, this paper presents a novel method, called the special random sampling method (SRSM) based on the photometric linearization method, in which a set of real images taken in various lighting conditions are converted successfully into synthetic images that contain only diffuse reflection components. Encouraging experimental results show that the SRSM is efficient in processing reflections on a chrome-plated ABS resin.*

Keywords: Specular reflection, Diffuse reflection, Photometric linearization, Metallic surfaces, Chrome-plated ABS resin

1. Introduction. Automatic inspection of defects on a smooth metallic surface is very difficult. This is because in the reflected light from the smooth metallic surface, a specular reflection component, which can cause erroneous results of surface inspection, is very strong and the diffuse reflection components are too weak, although the diffuse reflection components do include some useful information for surface inspection. Therefore, in order to create a defect inspection system for smooth metallic surfaces, it is necessary to divide strong specular reflection and weak diffuse reflection components from the surfaces' reflected light.

Generally, the reflected light from an object's surface has various elements caused by the material and the surface's characteristics. In the case of an inhomogeneous (dielectric) material, the following four reflected light elements shown in Figure 1 have been considered [1].

1. Light that reflects once by specular reflection off a surface that is flatter than the wavelength of the incident light.
2. Light that reflects at least two or more times off a rough surface, which consists of material smaller in size than the wavelength of the incident light.