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A Design of Laser Triangulation System with Combined Diffuse and Specular Reflection Modes for Dull and Shiny Surface Measurements

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Conventional laser triangulations are designed to measure the depth or height on a dull or rough surface. This can be done by projecting a light perpendicularly to the surface and capturing the spot of the diffuse reflection which is scattered from the surface. However, for a shiny or smooth surface, the specular reflection dominates, and it is difficult to detect diffuse reflection. We may modify the system setting to capture the specular reflection, with the cost of losing the diffuse reflection information. In this article, we proposed a design of dual diffuse and specular reflection mode of laser triangulation. The advantage is that there is no need to repeat alignment and calibration processes when we change the measuring mode, so we can easily select the measuring mode that is suitable for each surface. We have described the system setting, the calibration results, and the uncertainty evaluations for the laboratory-scale experimental demonstration, where we can achieve the resolution of micrometer for both measuring modes.

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