Adaptive Illuminance Control of Uniform and Uneven Topographies

This technology offers a shape adaptive lighting for non-uniform topographies in robust machine vision and inspection. This system can allow the generation of different lighting patterns, structures, and colors for complex, reflective components, and improve classical imaging capturing systems.

Technology ID

BDP 8712

Category

Hardware/Machine Vision
Selection of Available Technologies

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What is the Problem?

What is the problem?

Minor defects in engine parts such as scratches and pits could lead to imbalances in air flow and part fatigue, and as a result, premature engine wear and even engine failures. These are avoided by inspections. Not only are conventional inspections slow and tiring, but the outcomes are also subjective and prone to inaccuracies, leading to limited streamlining of production and in turn a negative impact on competitive pricing. As a result, robotization and automation have become essential and have made large strides in recent aerospace production. Challenges that face the manufacturers include the large variety of materials, variety of shapes and topography, and the reliability of automation systems. The variety of materials gives rise to different inspection requirements since polymers, transparent parts and metals reflect light differently and hence have different solutions in optimal machine vision inspection solutions. Different shapes and topographies cause more complex reflection patterns and more difficult imaging processes. The reliability of automation systems brings into question the known improvement of automation to throughput and lead times. Due to the strict quality and accuracy standards for inspections, it remains manual labor-intensive and nonsystematic in the pursuit of optimal quantity and quality. To automate the visual inspection process, an opto-mechanical system must capture images of a workpiece and then analyze the resulting data. Therefore, it is critical to understand how the light will reflect from the surface desired to be studied. The factors that affect the integrity and characteristics of the reflected lighting are the material of the workpiece, its topography, and surface characteristics such as finish and color.

What is the Solution?

The solution is shape adaptive lighting for uneven and non-uniform topographies for robust machine vision and inspection for complex, reflective components common in manufacturing. The central approach entails the use of several small light sources tightly packed and equidistant from each other, with each being addressable and controllable independent of the others, allowing for the generation of different lighting patterns, structures, and colors. This technology takes into consideration the geometric complexity of parts in the environment and the surface topography of the workpiece to be inspected, hence complementing and improving

the capabilities of a classical image capturing system. Defect identification with this adaptive lighting has shown an increased validation accuracy, and a reduction in false alarms and miss rates. This technology will empower the rising machine vision inspection methods to increase quality control standards.

What is the Competitive Advantage?

Existing methods are manual, slow, and high cost. This technology will improve inspections and enable future computer vision approaches.

Patent Information:

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