

Polarization-based shadow analysis

Capturing hidden details with polarized light

Inventor

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STATE OF DEVELOPMENT

- Prototype

INTELLECTUAL PROPERTY

US Patent 8,396,319

DESIRED PARTNERSHIP

- License

REFERENCE MEDIA

Engheta et al. (2006). Separation and contrast enhancement of overlapping cast shadow components using polarization. Optics express, 14(16)

<https://www.osapublishing.org/oe/abstract.cfm?uri=OE-14-16-7099>

Problem

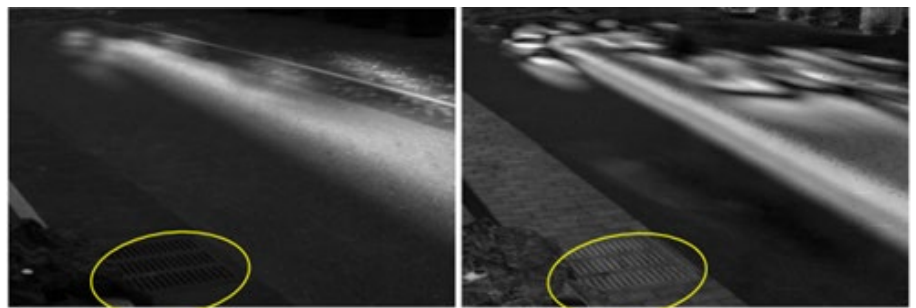
Most cameras only capture information on the intensity and color of light. Polarization is another characteristic of light that can provide useful information, but conventional cameras do not provide polarization data. Shadows pose a difficult problem for machine vision and image analysis techniques, because they can hide objects and make edges unclear. Polarization information could provide enhanced object recognition, edge recognition, and detection of shadow-occluded objects.

Solution

Researchers at the University of Pennsylvania have developed an imaging technique that captures data at 3 different polarization angles using a standard camera. This method of data capture shows more information that would not be detectable by the unaided eye or a normal camera. Polarization analysis can detect objects in shadows, segment and separate complex overlapping shadows from multiple sources, and help detect edges and hidden details that would not be visible in standard intensity-based images. This process could provide better object recognition for systems that require visual feedback to navigate and interact with the environment.

Advantages

- Improved analysis for images with shadows
- Detection of objects in dark areas of an image
- Implementation with standard cameras



Standard image (left) and polarization enhanced image (right). Hidden objects and patterns within complex overlapping shadows are revealed with polarization imaging

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