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Going Polarized - Polarization Adds A New Perspective To The Imaging Industry

In many machine vision applications the use of polarization cameras can provide information that cannot be obtained with standard monochrome, color, multi-spectral or hyperspectral cameras. In this White Paper, LUCID Vision Labs provides a deeper insight into how polarizing light works, what makes the Sony IMX250MZR and IMX250MYR polarized sensors unique, and what type of applications polarization can be used for. In addition, we explain some of the existing polarization methods and give a brief perspective into the future of polarization in the imaging industry.

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Cover Image: Polar camera representation for angles of polarized light from transparent objects (plastics and cell phone cases)

GOING POLARIZED
POLARIZATION ADDS A NEW PERSPECTIVE TO THE IMAGING INDUSTRY

WHAT'S INSIDE

- Polarizing Light
- All About a Single-Chip Parallel and Perpendicular
- Coating The Way
- Reducing Stress
- Future Perspective

In many machine vision applications the use of polarization cameras can provide information that cannot be obtained with standard monochrome, color, multi-spectral or hyperspectral cameras. Applications that benefit from the use of polarization cameras are those in which reflected and transmitted screens must be separated, the shape of transparent objects must be analyzed, and where removing specularities and noise is important.

To appreciate how such applications can benefit from the use of polarization, the nature of light and how it interacts with such materials must be understood. Light is an electromagnetic wave that is composed of an electric field and a perpendicular magnetic field. The direction of the electric field is used to define the polarization direction of the light. It is the interaction of light's electric field with materials that can be leveraged in vision applications with polarization.

Most light sources encountered every day are not polarized. Unpolarized light from the sun or from an incandescent light bulb, for example, will have electric fields that are oscillating in random directions. To polarize this light, a polarizer is used to absorb components of the random directions, passing components of the light that are aligned in only one oscillation direction. Such polarization is referred to as linear polarization since the electric field points in a single direction always. If the polarizer is polarized in the vertical direction the polarizer will block the horizontal component of all other polarizations.

Light reflecting from highly directional sources such as the sun or incandescent lamps can cause glare. Fortunately, this glare can be identified by the polarization signature it carries. When unpolarized light reflects from the surface of an object it becomes partially linear polarized. The amount of polarization is dependent on the angle of reflection and the surface characteristics. Polarizers can then be used to remove the glare.

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