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(54) SYSTEMS AND METHODS FOR DIFFRACTION LINE IMAGING

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(57) **ABSTRACT**

A novel class of imaging systems that combines diffractive optics with 1D line sensing is disclosed. When light passes through a diffraction grating or prism, it disperses as a function of wavelength. This property is exploited to recover 2D and 3D positions from line images. A detailed image formation model and a learning-based algorithm for 2D position estimation are disclosed. The disclosure includes several extensions of the imaging system to improve the accuracy of the 2D position estimates and to expand the effective field-of-view. The invention is useful for fast passive imaging of sparse light sources, such as streetlamps, headlights at night and LED-based motion capture, and structured light 3D scanning with line illumination and line sensing.