ABSTRACT

Ubiquitous Self-Powered Ambient Light Sensing Surfaces

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Conventional sensing technologies, such as cameras and battery-powered sensors, cannot keep up with the ubiquitous deployment of large-scale sensory systems due to cost, power, privacy, and form factor limitations. We present a general-purpose self-powered sensing system which senses ambient light at the surface level of everyday objects as a high-fidelity signal to infer user activities and interactions. The system leverages flexible optoelectronic components with varying sensing dimensions (0D, 1D, 2D) and fields of view (wide, narrow) to detect activities ranging from object use and indoor traffic detection, to liquid sensing and multitouch input. We also replace the silicon-based sensors with organic semiconductors (OSCs) that are ultra-thin, flexible, and cost effective to scale. Ongoing work of in-sensor computing explores preprocessing of sensory signal in analog domain, which drives down the latency, power consumption, and offers better privacy protection.

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