Advanced machine vision system

PHYSICAL SCIENCES: Monitoring

The Challenge	The increase in machine vision systems (such as self-driving cars and drones) requires imaging devices capable of acquiring low latency depth and intensity data in high dynamic range environments. Machine vision requires high speed data capture to maximise system performance. Current high-speed imaging techniques produce huge volumes of data, which increases the required computing complexity. Current commercial 3D imaging systems are bulky and expensive limiting their broader use. Operation in photon-starved applications requires extremely high sensitivity sensors. Commercial single photon sensors are costly and bulky. There is clearly a need for improved vision systems for use in a number of applications.	
The Solution	Our solution is a novel fully-integrated 3D image sensor capable of simultaneously imaging depth, motion and intensity from a single optical path. Our system uses advanced hybrid imaging techniques to significantly increase the utility of image data, whilst decreasing the image latency and data rate. This system has the potential to be the sensor platform for a broad range of machine vision applications.	
Key benefits	• Simultaneous depth and intensity imaging • Low latency event-based temporal contrast capture	• High dynamic range • Advanced machine vision and autonomous vehicle applications
Development Stage	Proof of Concept – prototype system developed which demonstrates sensor capabilities	
Brief Description & Differentiation	• An image sensor and system able to simultaneously capture 3D images comprising depth, intensity and motion. • Utilises a single optical path, resulting in increased image quality with reduced size and cost. • Sensor uses a spatio-temporal image capture mode to reduce latency of output of localised intensity changes to micro-seconds. • Sparse event data output massively reduces image processing computation power. • Sensor counts individual photons hence is capable of imaging over an extremely broad dynamic range. • Ideal for use in applications where minimising total system size and mass is desirable. • Sensor design is amenable to implementation in standard commercial CMOS processes, minimising manufacturing cost.	
Research Team	Led by Simon Kennedy (Electrical and Computer Systems – Faculty of Engineering)	
Intellectual Property	US and Australian patent applications filed (2018).