**Multi-band visible and IR light emission from highly efficient Tetracene/PCPDTBT:Fullerene photodetectors**

*Tasnuva Hamid (1), Ajay K. Pandey (1,2)*

(1) Robotics and Autonomous Systems, School of Electrical Engineering and Computer Science, Queensland University of Technology, Brisbane, QLD, Australia; (2) Australian Centre for Robotic Vision, Brisbane, QLD, Australia

E-mail: [Tasnuva.hamid@hdr.qut.edu.au](mailto:Tasnuva.hamid@hdr.qut.edu.au); [a2.pandey@qut.edu.au](mailto:a2.pandey@qut.edu.au)

Organic optoelectronics has made a huge impact on design, appearance and operation of modern day electronic systems. Ability to tune optoelectronic response at will offers un-paralleled future prospects and we are increasingly seeing penetration of organic semiconductors into new application areas, as diverse as e-textiles to soft bionics and neuro-engineering. Multi-band light emission and multi-spectral light sensing plays an important role in object detection, proximity and range sensing in robotics and autonomous systems. Usually a dense array of optoelectronic pixels are required to perform light emission or light detection. Molecular engineering approaches to the integration of light emission and photosensing sensing over a broad spectral range in so called bi-functional pixels offer advantages associated with intelligent integration and sensing with ease of fabrication and high throughput.

In this work, we will present our efforts on extending the organic optoelectronics as a platform technology for robotics. We will report on visible and IR electroluminescence band emission without compromising the excellent photosensitivity in the spectral range of 300-900 nm from highly engineered organic heterojunctions of Tetracene and Polycyclopentadithiophene-benzothiadiazole (PCPDTBT) in a double donor- double emitter role with fullerene. Our results show that a delicate balance between photon absorption and exciton transfer events can be achieved with resultant devices producing emission at 560 nm and 820 nm bands. The mechanistic details behind multi-functional operation will be discussed in detail.