IEEE Western Australia Section
Joint Chapter ESP:
Electron Devices Society
Solid State Circuits Society
Photonics Society

TMOS
ARC CENTRE OF EXCELLENCE FOR TRANSFORMATIVE META-OPTICAL SYSTEMS

THE UNIVERSITY OF WESTERN AUSTRALIA | Institute of Advanced Studies

Optical systems: Data, Design and Commercialization

A joint workshop of the UWA Institute of Advanced Studies, the IEEE WA joint EDS/SSCS/IPS Chapter, and the ARC Centre of Excellence in Transformative meta-optical systems

Dr Duncan Hickman
Director of Tektonex, UK

21 - 23 February 2023 @ 9:00 AM (AWST)

Venue: Industry Hub, Room 1.13, 1st floor, EZONE North
The University of Western Australia, Crawley
Zoom link will be provided to online attendees after registration

This workshop is open to the public and admission is free to all IEEE members and non-members but registration is required. Please register at https://optical-systems-workshop.eventbrite.com or use QR code provided.

REGISTER HERE

Biography:

Duncan Hickman has over 35 years of research and development experience of some of the most advanced and high-performance imaging systems for defence, security, and commercial applications. His areas of expertise include sensor design, image and data fusion, image processing, and the mathematical modelling of complex systems. Duncan is a Director of Tektonex Ltd (2012 – present), a company which provides infrared design and development services for international customers. Recent projects have included the development of a real-time image stabilisation and fusion system, the development of a multi-band polarimetric sensor, modelling and simulation of the imaging systems for autonomous applications, and the development of tri-band image fusion for a handheld camera system. Current research interests include the use of smart imaging on drones and airborne platforms for the monitoring of the health of vegetation, assessing water resources, and detecting the dumping of oil at sea. Prior to Tektonex, he was a Director and Chief Engineer for Waterfall Solutions Ltd (2005 – 2011) where he led the development of numerous imaging systems for surveillance applications ranging from underwater to satellite platforms. He also authored a guidebook for the UK Government on the specification and deployment of infrared cameras. Before joining Waterfall, Duncan held several senior design posts within BAE Systems, Thales, and Marconi where he worked on several major sensor development programmes for land, airborne, and maritime platforms. Duncan's background is in Physics, and he completed his first degree at Manchester University and his Masters and Doctorate at Kings College. He has held academic posts at Oxford University and Surrey University and has published over 75 papers on imaging technology and applications. Duncan currently chairs several conferences for SPIE as well as giving training courses on Image Processing, and Modelling and Simulation. Duncan also provides mentoring to a number of small businesses and provides occasional presentations on different aspects of business operations.

Abstract:

This workshop will consist of three parts:

21 February (9:00 am – 3:30 pm) – Optical Domain Processing and Multi-Sensor Fusion
22 February (9:00 am – 3:30 pm) – Modelling and Simulation of Complex Imaging Systems
23 February (9:00 am – 3:30 pm) – Starting a Technology-Based Business

Dr Duncan L Hickman will be providing a series of presentations covering the use of optical domain information, and the modelling and simulation of imaging systems. He will also be discussing the challenges of starting a new business based on his experience over the last 20 years.

Optical Domain Processing and Multi-Sensor Fusion

The limitations of conventional imaging sensors will be discussed in terms of available information, image processing complexity, and system robustness. The benefits of using optical domain properties such as spectral information and polarisation will be reviewed and compared with intensity-based image processing. Different spectral and polarimetric systems will be described together with some example outputs.

Modelling and Simulation of Complex Imaging Systems

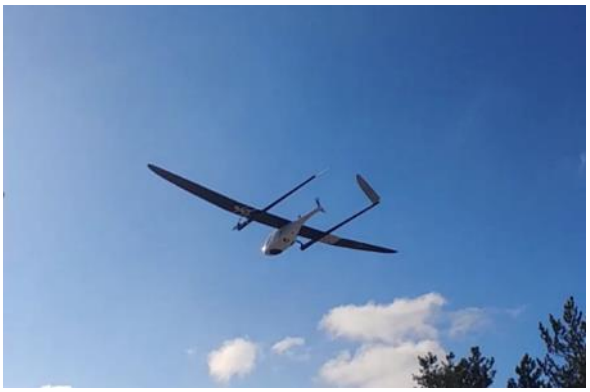
Modelling and simulation methods are beneficial for assessing design trade-offs, equipment acceptance, and performance analysis. However, with the advent of increasingly complex image and data processing, creating a model which provides an accurate representation of imaging systems has become an increasingly difficult task. The challenges of modelling modern imaging systems are discussed and potential methods are described. Two different approaches are then presented which use image sequences and statistical modelling methods.

Starting a Technology-Based Business

The success or failure of a business critically depends on its approach to the market. Technology-based businesses present different challenges, due to the nature of their products and the highly specialized market for them. Motivations for starting a new technology-based business are discussed together with business fundamentals, approaches, and common causes of failure. A common characteristic with many tech start-ups is that they have an inward focus on the products and the company instead of the marketplace. Unfortunately, this is the cause of many business failures. Understanding what the market requires and establishing a route to market for products are essential for success, and this often requires considerable flexibility in the business approach and indeed the end product.

Some Sample Images

Infrared Image from a drone



Fixed-wing drone

NIR Image

NIR Polarimetric Image

Daylight image

NIR Image