

Tentative Outline (Preliminary Proposal of Thematic Issue)

Special Thematic Issue for the *International Journal of Sensors, Wireless Communications and Control*

Title of the Thematic Issue: Optical Imaging and Sensing In Autonomous Vehicles

Guest Editors: *Dr. Mustafa M Matalgah*

- **Scope of the Thematic Issue:**

Advances in communication, controls and embedded systems now pave the way for autonomous vehicles, which use sensors and software to control, navigate and drive the vehicle without any human intervention, to a predetermined destination. Autonomous vehicles help in increasing car utilization by 5 %-75 %, thus reducing CO2 emissions also helping in saving fuel and time, reducing congestion, parking utilization, and even from accidents.

Autonomous vehicles with Optical imaging and sensing technologies incorporate safety systems such as lane departure warning systems, sign detection systems, parking assistance, collision avoidance, and accident recorders. Radars, Lidars, sensors, and cameras are the main components in the development of self-driving cars. Radars lag in the detection of the exact size and shape of an object, whereas lidar, though more accurate than radar, its detection distance is critical. Lidars can help in generating 3D point maps around the vehicle. These components provide the necessary information about the environment around the vehicle in real-time.

Optical sensors and image processing systems are indispensable for modern driver assistance systems and autonomous driving. So, these vehicles utilize vast amounts of data from image-recognition systems, along with machine learning and neural networks, to build systems that can drive autonomously. As multispectral imaging provides more information, the processing time is a vital problem, for making quick decisions. Almost all cameras rely on ambient light, which varies widely with the weather, time, and vehicle condition. Therefore developers need to work on developing low-light cameras.

Each type of sensor has its limitations, whether it be glare that distorts video, radar's poor vision abilities, ultrasonics' distance challenges, or lidar's inability to cope with poor weather. For the autonomous vehicle to be roadworthy, its perception must be accurate enough to enable the classification of any object at a variety of distances.

This special issue aims to present the recent advances in Optical imaging and sensing in autonomous vehicles. It is an opportunity to gather researchers in developing fundamental principles to discuss and share original research works and practical experiences.

Keywords: Embedded systems, optical imaging, parking systems, ambient light, autonomous vehicles.

Sub-topics:

The sub-topics to be covered within the issue should be provided:

- Optical fibers for imaging and sensing;
- Advances in optical sensing techniques;
- Quantum imaging and Computational imaging;
- Deep learning for optical imaging, sensing and devices
- Optical signal processing for imaging and sensing;

- Advanced driver assistance systems (ADAS)
- Sensor fusion techniques
- Uncertainty modelling
- Dynamic modelling
- Decision making

Schedule:

- ✧ Thematic issue submission deadline: 10 January 2023

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