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## Editorial

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**Biographical notes:** Howard Li is an Associate Professor in the Department of Electrical and Computer Engineering, University of New Brunswick, Canada. He received his PhD from the University of Waterloo, Canada. He also worked for Atlantis Systems International, Defence Research and Development Canada, and Applied AI Systems Inc. to develop unmanned ground vehicles, unmanned aerial vehicles, autonomous underwater vehicles, and mobile robots for both domestic and military applications. He is a registered Professional Engineer in the Province of Ontario, Canada. His research interests include linear control, non-linear control, intelligent control, distributed control, unmanned vehicles, mechatronics, robotics, multi-agent systems, artificial intelligence, motion planning, and simultaneous localisation and mapping.

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Welcome to the special issue of *International Journal of Intelligent Defence Support Systems* dedicated to unmanned vehicles. There is a growing demand and interest in the sensing, perception and navigation control of unmanned ground vehicles (UGVs), unmanned aerial vehicles (UAVs) and autonomous underwater vehicles (AUVs). Unmanned vehicles could be used in many areas, such as surveillance, mine hunting,

automatic inspection of power plants and refineries, disposal of hazardous materials and ocean exploration.

Unmanned vehicles and robots usually are related to situations involving hazardous environments, repetitive and menial tasks. This special issue focuses on theoretical and practical research and development of unmanned vehicles. In addition to discussing the deployed systems, some future directions are given by active research into novel techniques.

This special issue includes five papers selected on a peer review basis. These papers present research results in UGVs, UAVs, AUVs, motion planning, cooperation of multiple vehicles, self reconfiguration, and so on.

The first paper by M. Seto focuses on the re-distribution of control authority in a torpedo-shaped autonomous underwater vehicle. The objective is fault tolerance in AUVs on long deployments when an AUV is unexpectedly under-actuated from a jammed control fin. The genetic algorithm is applied to evaluate optimal solutions based on the analysis of the AUV dynamics.

The second paper, which is by A. Benaskeur, A. Khamis and H. Irandoust, is about a distributed surveillance system where spatially distributed sensors of different modalities can sense collaboratively and continuously large-scale, dynamic, dense and semi-structured environments.

The third paper, which is by B. Beckman, J. Collier, D. Mackay, S. Monckton, M. Trentini, F. Wong, and P.R. Bilodeau, discusses the technical challenges of unmanned systems in support of dismounted operations and research efforts by Defence R&D Canada to support unmanned vehicles in this role. Future directions are also described that will focus on the mobility of legged vehicles for dismount support, adaptive simultaneous localisation and mapping (SLAM) technologies, and UAV technologies. These technologies will push the state-of-the-art research and development in unmanned vehicles for future Canadian Forces capabilities.

The fourth paper, which is by B. Janko, C.P. Turner, K.S. Cave-Ayland, M.K. Pittuk, S.O.H. Madgwick, and W.S. Harwin, is about the T3 team that participated the UK Military of Defence (MOD) grand challenge competition in August 2008. This paper outlines the structure of the UGVs and UAVs used to compete in the MOD Grand Challenge. The primary mission of the robots was to carry a range of sensors into a set of usable positions within the allotted time to get information back to the forward operating vehicle.

The last paper, which is by R.J. Mullen, S. Barman, P. Remagnino and D. Monekosso, describes a swarm robotics approach to the task of localising and monitoring generic targets, with reference to a counter IED scenario.

Despite all the challenges, unmanned vehicles have been widely used. This special issue not only captures a snapshot of the current research but also gives some future aspects. We hope it will motivate the readers to direct their effort into this rewarding area.