Mech Aero-2013
OMICS Group Conferences
Accelerating Scientific Discovery
International Conference and Exhibition on
Mechanical & Aerospace Engineering
September 30- October 2, 2013 San Antonio, Texas, USA

Development of highly reconfigurable and maneuverable ground and aerial unmanned vehicles for confined spaces

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Abstract

The use of ground and aerial unmanned vehicles in Urban Search and Rescue (USAR) and other complex and confined environments is growing steadily. The first USAR robots were adapted from robots intended for tasks such as duct inspection, bomb disposal, aerial reconnaissance and have proved useful for exploring voids (spaces within the collapsed structure) deemed too dangerous or too small for either canine or human searching. Physically, the original designs have consisted of traditional vehicles such as solid robot bodies and traditional aircrafts scaled down. Despite years of progress, the core design of robots currently in use for USAR purposes has deviated little, favoring software/control development and optimization of the basic robot template to improve performance instead. However, there is a need to develop highly reconfigurable and manoeuvrable ground and aerial robots. Ground robots will need to have reconfiguration capabilities while aerial vehicles will need to be extremely manoeuvrable to cope with the environment complexities. In the UAV area there is a need to address the problem of surveillance, patrol and search & rescue operations with a scalable highly manoeuvrable VTOL (Vertical and Takeoff and Landing) Unmanned Aerial Vehicle (UAV) capable of safely navigating in highly obstructed urban environments. To provide adequate monitoring coverage in urban environments requires UAVs capable of placing its sensors in suitable locations impossible to reach by conventional small or big aircrafts. Thus new locomotion and flying mechanisms need to be developed

Biography

A. Ramirez-Serrano received his doctoral degree from the University of Toronto in 2000. He holds two Master of Science degrees: one from the Illinois Institute of Technology (1993, USA) in Mechanical and Aerospace Engineering, and another from the Monterrey Tech. (1996, Mexico) in the area of Artificial Intelligence. Dr. Ramirez-Serrano has work in diverse institutions performing R&D activities related to unmanned vehicles and Discrete Event Systems (DES). After completing his PhD Dr. Ramirez-Serrano worked for: ABB Corporate Research, Sweden, Argonne National Laboratory-West, USA. Dr. Ramirez-Serrano if also the Founder, Group leader, and Director of the “Autonomous Reconfigurable/Robotic Systems Laboratory (AR^2S-Lab)” at UofC