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Introduction

The Unmanned Systems Technology XIX Conference consisted of eight sessions and three joint sessions that spanned two and a half days and covered a variety of areas within robotics. The conference's list of papers shows a wide breadth of applications for unmanned systems, primarily in the defense arena, with a good mix of papers from the ground, air, sea and space domains. This variety demonstrates why robotics is such an interesting and exciting area within which to work.

This year the conference began Tuesday afternoon with a session from the Army Research Laboratory's (ARL) Robotics Collaborative Technology Alliance (CTA) that included papers on an experiment involving a small robot maneuvering towards and grasping an object of interest, the use of deep learning for understanding of covert behavior, gait strategies for efficient legged locomotion, and the incorporation of dynamics in self-righting. This was followed by a session on Mobility and Navigation, with papers discussing energy efficiency of skid steering robots, a comparison between neural networks of escalating complexity for the modeling of a simple legged robot, the use of fuzzy logic and possibility theory in adding a priori knowledge to UAV search algorithms, previous location recognition for an indoor UAV using computationally efficient image keypoint descriptor and detector, and control mechanism for a CubeSat. A small Perception session had two papers, one on tactical autonomy that included experiments differentiating mannequins, cardboard cutouts and humans and the other a conceptual paper on the potential for a radar system patterned after a fly's eye. Tuesday concluded with the conference's poster session, which included a paper on rapid wireless energy and data transfer via laser diodes, a concept for automated repair of spacecraft, a concept for navigation of a UAV without GPS using cell network signals, efficient text recognition using an angle-distance map, and fuzzy logic model for vehicle collisions and countermeasures. The poster session was well attended again this year.

Wednesday morning involved two joint sessions with Conference 10194, Micro- and Nanotechnology Sensors, Systems, and Applications IX, consisting of work performed under the Office of the Secretary Defense (OSD) Autonomy Research Project Initiative (ARPI) and focused on Human Machine Teaming. The first session began with a keynote address that described a number of projects on human machine teaming. Subsequent papers involved an experiment involving driving with variable-reliability automation, an operator interface that provided uncertainty information to the operator, an autonomy system that interacts with the operator to gain understanding, and models and experiments on human cyber physical systems involving teleoperation. The second session consisted of papers on the conceptual use of multi-UxV planning and task loading with

machine learning, decentralized planning in a UAV target search scenario, and cognitive understanding of the objects in an environment.

Wednesday afternoon consisted of two sessions concerning research from the Office of Naval Research (ONR) Code 30 in Ground Vehicle Autonomy, which were organized by Space and Naval Warfare Systems Center Pacific (SSC Pacific). The first session led off with an overview of ONR 30 research projects supporting the development of autonomous expeditionary capability, followed by papers on end-to-end perception processing, traversability estimation and world models, wheel placement near obstacles, and fusing vehicle sensor data with data from other sources. The second session had papers on mission planning for a team of unmanned route clearance vehicles, formation control using a virtual spring/damper mechanism, development of an operator control unit built on MOCU 4, a process for conducting unmanned vehicle experimentation, and methods to achieve reliable autonomous systems.

Thursday morning led off with a joint session with Conference 10205, Open Architecture/Open Business Model Net-Centric Systems and Defense Transformation 2017. The session was on Self-organizing, Collaborative Unmanned Robotic Team and two papers were presented, the first on the architecture for a small team of UAS with members possessing different RF capabilities and the second on an experiment involving heterogeneous surface vessels performing a harbor patrol mission. Immediately following was a session on Communication Systems for Small Unmanned Ground Vehicles, which began with a paper on the development of a joint architecture for communications and radios, followed by a paper on developing a small modular secure radio and another describing issues and procedures for implementing cyber security in unmanned systems.

The conference concluded with the afternoon sessions on Thursday, the first of which involved papers on Human Robot Interactions (HRI), including research on multi-modal speech and gesture interactions, a head-worn display and eye-control mechanism, shared control with a variety of semi-autonomous assistance functions, and a method for unobtrusive guarded teleoperation. The final session of the conference was the Special Topics session that included a wide range of topics including papers on assessing the vulnerability of autonomous truck convoys, a collegiate robotics competition, an all-weather orientation sensor for munitions, a deep learning trust algorithm for unmanned convoys, a flocking UAV algorithm that is robust to communication packet dropping, and a UAV controller that learns how to adapt to a suspended load.

The conference for the first time was held in Anaheim, CA, which provided a very nice facility and location. Next year the conference will hit the twenty-year mark and will take place in Orlando, FL, where it began in 1999. We want to thank all those that helped make the conference a success this year and we hope that you enjoy these proceedings and are able to attend and participate in the conference next year.

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