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Introduction

The Unmanned Systems Technology XX Conference consisted of four sessions and two joint sessions over two days and covered several areas within robotics, primarily from a defense perspective. The conference's list of papers showed a good variety of applications within unmanned systems, with many papers pertaining to unmanned aerial vehicles (UAV's), but also several for ground and sea vehicles. The conference also included a number of papers from international authors.

This year the conference began Tuesday afternoon with a session on Perception, which consisted of four papers: the first on the subject of visual homing and navigation without using a metric map for a ground robot [10640-2], followed by three papers on airfield damage assessment via UAV's. Of the latter, the first described a two air vehicle approach with a quick survey followed by more detailed analysis of suspect sites [10640-4], the second described a convolutional neural network approach to image analysis [10640-5], and the third discussed closed loop control and mission planning for the aircraft [10640-6]. Unfortunately, the first and third airfield assessment papers were not submitted in time for inclusion in the proceedings.

The second session on Tuesday was the Special Topics session, which included papers on: creating an interface between the Joint Architecture for Unmanned System (JAUS) and Multi-robot Operator Control Unit (MOCU) version 4 [10640-7]; a description of an architecture for testing autonomy algorithms [10640-8]; the development of a low-cost physical method to counter UAV's [10640-9]; the creation of a system to assist people with low vision in riding a bicycle [10940-10]; and a game theory approach to ground vehicle mobility [10640-11].

Tuesday concluded with the conference's poster session, which included a paper on voice control of a camera on a UAV [10640-26], the addition of time history information into a world model [10640-27], the connection between stopped random walks and uncertainty in control systems [10640-30], and the construction of confidence regions for feature extraction in high dimensional spaces [10640-31]. The poster session was well attended again this year.

Wednesday morning began with a session from the Army Research Laboratory's (ARL) Robotics Collaborative Technology Alliance (CTA) that started with an overview of the program [10640-13], which includes research to realize operational tempo of robots in unstructured environments, human-robot interactions in complex missions, and mobile manipulation. This was followed by papers on experimental analysis of a combined RGB-D vision and manipulation task [10640-14], modeling of vegetation as spring/damper system with associated measures of trafficability [10640-15], a method for understanding and maintaining

human intent in robot path planning [10640-16], and development of a fast any-time planning algorithm for a legged platform [10640-17].

The second morning session involved Navigation and consisted of three papers: the first on joint planning and control for UAV's [10640-18], followed by papers on combining visual odometry with an IMU during GPS dropouts for a UAV [10640-20], and methods to correct visual odometry errors for UAV's performing infrastructure inspection [10640-21].

Wednesday afternoon consisted of an informal joint session with Conference 10639, Micro- and Nanotechnology Sensors, Systems, and Applications X, entitled Deep Learning and Neuromorphic Sensing/Computing for Small Autonomous Systems. The session started with an overview of research interests at ARL in machine learning and artificial intelligence, followed by papers on the creation of a database for visual odometry taken with an event-based camera, sparse coding and event-based processing, and advantages of using an event-based camera, such as high frame rate and high dynamic range.

The conference concluded on Thursday morning with a joint session with Conference 10651, Open Architecture/Open Business Model Net-Centric Systems and Defense Transformation 2018. The session was on Collaborative Robotic Teams and seven papers were presented, with the first discussing the challenges associated with autonomous underwater vehicles, including communications and navigation [10651-20]. This was followed by papers on a graph-theoretical approach to swarming UAV's [10651-21], a system for managing a team of UAV's from within a cockpit [10640-22], a comparison between multi-view stereo-vision and LIDAR for autonomous runway damage assessment [10640-23], a nodding LIDAR system for helicopter obstacle avoidance [10640-24], a game theory analysis of radar-based electronic warfare [10640-25], and an auction-based system for decentralized control of autonomous systems.

In its twentieth year, the conference returned to Orlando, Florida (United States) where it began in 1999 as the Unmanned Ground Vehicle Technology Conference with original conference chairs Grant Gerhart, Robert Gunderson, and Chuck Shoemaker. Douglas Gage joined as a conference chair in 2002, Robert Karlsen joined in 2011, and Hoa Nguyen joined in 2017. In 2006, the conference adopted its current name of Unmanned Systems Technology in order to broaden the scope to include unmanned air, sea, and space vehicles.

Through the years we have seen tremendous advancements in many areas of autonomous systems, both in defense and civilian applications, and expect to see much more in the years to come. 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 in Baltimore, Maryland (United States).

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Douglas W. Gage
Charles M. Shoemaker
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