

Human Machine Teaming: The Trust and Utilization of Robotic Systems during Infantry Operations in an Urban Environment



Combat Town Range at Camp LeJeune, NC and the Clearpath Husky Robot planned for the experiment

- Our approach is to first define a operation where Marines could easily employ autonomous systems in a relevant tactical environment. We will use building clearing at the Combat Town Range on Camp LeJeune, NC
- We will then develop a gaming environment where Marines can practice with a virtual robot to learn and understand its capabilities to impact mission effectiveness
- Clemson University International Center for Automotive Research (CU-ICAR) will provide and program Clearpath Husky robots to perform room clearing tasks for use in the experiment. They will use the Robotic Intelligence Kernel (RIK) to guide maneuver autonomously on the Combat Town Range
- For the actual experiment, 50 Marines will be able to train in the gaming environment before they select one of two options:
 - Group A will have the opportunity to select either a tele-operated robot or an autonomous Machine Learning or aML robot to perform room clearing
 - Group B will be able to select between a tele-operated robot or a user-trained (intelligent Machine Learning or iML) robot for the same task. If iML is selected, Marines will train its maneuver in the gaming environment
- We will measure time to complete room clearing task, change in secondary task performance, and parameters concerning trust identified during our experiment design

- The 2018 USMC Science and Technology (S&T) Strategic Plan identifies Advanced Robotic Systems in Support of Ground Maneuver as a key objective.
 - The Marine Corps plan is to develop affordable technologies to enhance effective and efficient employment of ground robotics
 - Focus on improving capabilities while reducing training and operating requirements of user Marines
 - Technologies that enable ‘supervised autonomy’ by the Marine user, to include teleoperation, machine vision, perception, obstacle avoidance, convoy following, and the ability to self-navigate pre-planned routes are desired capabilities
- In response, we plan to conduct an experiment focusing on the utilization and trust of robotic systems. Our objective is to begin to better understand how utilization of a gaming environment can help develop and transfer trust in human robot teams
- Our deliverables include a student thesis, final report and gaming software used by Marines during the experiment

- The 38th Commandant of the Marine Corps has identified a world that is becoming increasingly complex while our services are facing fiscal constraints
 - Given these challenges, he seeks to make strategic investments in autonomy and Artificial Intelligence (AI) now
- This work is critical in understanding methodologies to train for a battlefield where human machine teams operate in concert
- Many of our next generation of warfighters will grow-up using serious games prior to entering the service. It is an environment they are familiar with and enjoy. Our intuition is that these environments could be used to enhance utilization, adoption and trust in autonomous systems making human machine teams more effective.
- In addition, we want to test CU-ICAR’s RIK to measure it’s performance in a realistic tactical environment
- We also seek to expose Marines in the Advanced Infantry Training Battalion (AITB) to existing technologies on the Combat Town Range to solicit their feedback and inputs on the direction of future technology investments