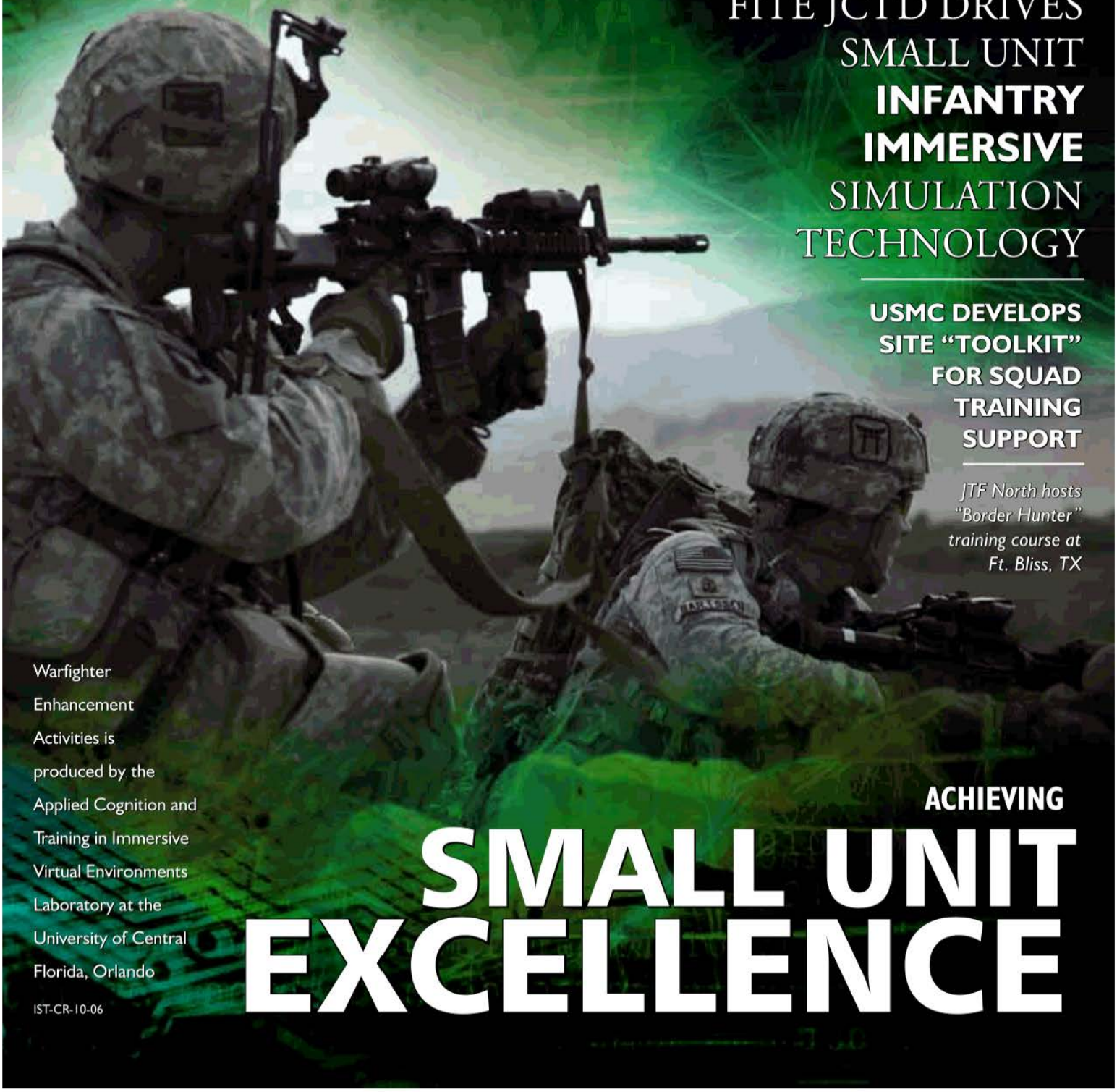
WARFIGHTER enhancement activities

Using tomorrow's technologies to enhance today's armed forces
Volume 4, Issue 1, Summer 2010

FITE JCTD DRIVES SMALL UNIT INFANTRY IMMERSIVE SIMULATION TECHNOLOGY

USMC DEVELOPS SITE "TOOLKIT" FOR SQUAD TRAINING SUPPORT

JTF North hosts "Border Hunter" training course at Ft. Bliss, TX



Warfighter Enhancement Activities is produced by the Applied Cognition and Training in Immersive Virtual Environments Laboratory at the University of Central Florida, Orlando

IST-CR-10-06

ACHIEVING SMALL UNIT EXCELLENCE

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UPCOMING EVENTS

HFES 2010
The 54th annual meeting of the Human Factors and Ergonomics Society
September 27–October 1, 2010 • San Francisco, CA • www.hfes.org

MODSIM WORLD 2010
A unique multi-disciplinary international conference for modeling and simulation
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The 27th Army Science Conference, with a focus on full-spectrum operations
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I/ITSEC 2010
The 2010 Interservice/Industry Training, Simulation and Education conference
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SPRING SIM 2011
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CHI 2011
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May 7–12, 2011 • Vancouver, BC • www.chi2011.org

HCI International 2011
14th International Conference on Human-Computer Interaction
July 9–14, 2011 • Orlando, FL • www.hcii2011.org

ABOUT THE NEWSLETTER

Warfighter Enhancement Activities' primary purpose is to facilitate communication and coordination of military Science & Technology (S&T) projects sponsored by organizations, such as ONR and RDECOM. This publication is produced by the Applied Cognition and Training in Immersive Virtual Environments (ACTIVE) Laboratory at the University of Central Florida's Institute for Simulation and Training (UCF-IST). IST publication tracking number: IST-CR-10-06.

UCF-IST ACTIVE LAB

Nestled in the heart of the Florida High Tech Corridor, UCF-IST's ACTIVE Lab is at the forefront of Modeling and Simulation research. The ACTIVE Lab is engaged in applied research and development for the analysis and improvement of human performance. Our multi-disciplinary research team of more than 35 members conducts cutting edge research in a variety of fascinating fields. The ACTIVE Lab is offering research opportunities in the following areas

- Human Systems Engineering
- Human–Robot Interaction
- Simulation–Based Training and Education
- Augmented Cognition
- Adaptive Automation

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COVER ART BY: JOY M. MARTINEZ, UCF-IST ACTIVE

PHOTO CREDIT:

U.S. Army Sgt. Maj. Mark Bartosch, right, and Staff Sgt. Bradley Watts pull security on the outskirts of the village of Margah, on a presence patrol, Paktika province, Afghanistan, May 6, 2010. Bartosch and Watts are assigned to Company ABU, 1-187th Infantry, Air Assault, Combat Outpost Margah. U.S. Army photo by Sgt. Derec Pierson.

researcher's corner

Dr. David Fautua (LtCol Ret.) served as Special Assistant to two U.S. Joint Forces Command (USJFCOM) commanders, and as USJFCOM Academic Chair and Professor of History and National Security at the Joint Forces Staff College. He now works in the USJFCOM Irregular Warfare Training division.

Up-Armoring Our Warfighters' Minds

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The Defense community realizes that the nature of warfare has profoundly changed. In an irregular, or hybrid, warfare setting amongst the people many new challenges are being felt down at the lower ranks, and our young Soldiers, Sailors, Airmen, and Marines must engage the enemy in ways previously reserved for more senior staff.

Key decision-making responsibilities that have strategic consequences are taking place at lower levels. More junior personnel are now responsible for complex decision-making and must act based upon broad understanding rather than by following rote procedures. To do this effectively, they need to possess numerous enabling competencies, including critical thinking abilities, situational awareness, tactical patience, cultural attentiveness, ethical/moral solidity, an adaptive stance, and the confidence to use their skills within the complex, ambiguous environment of the modern battlespace. However, most junior officers do not acquire such sophisticated cognitive aptitudes through experience alone.

"...the Defense community must continue to invest in innovative cognitive training capabilities..."

Thus, to the greatest extent possible, the Defense community must continue to invest in innovative cognitive training capabilities, like the work Joint Forces Command's FITE JCTD is performing with their immersive training for small unit decision-making (see page 2), and unique instructional approaches, such as the recent Border Hunter exercise (see page 6). Similarly, we must continue to emphasize our personnel's ethical/moral foundations and operationalize an "Adaptive Stance" currently being studied by OSD Readiness for Training. Our Service members are now challenged to become even more cognitively aware and self-regulating. To assist with this, USJFCOM recently co-hosted a symposium on ethical decision-making with cosponsors INSEL* and ACPME**(see page 13).

Our collective aim should be to expand the range and availability of such complex training—to unleash the power of small units, enabling them to operate autonomously at increasingly lower echelons, disaggregate against unconventional or hybrid threats, quickly aggregate against more conventional threats, easily integrate joint capabilities such as intelligence, surveillance, and reconnaissance (ISR) and joint fires, and not be limited in action. The intent is not to make regular forces into special forces but to recognize that the individual, the leader, and the small unit are critical players on an increasingly decentralized and dispersed battlefield.

Joint Forces Command's contribution in this effort is to collaborate with the services and other partners to find the best-of-breed ideas, build upon them, and bring them to the attention of the Defense community in a way that reinforces the Services' best products, insights, and capabilities on a Joint "shelf."

We are all in the same persistent conflict, which is full of intricate conflicts and convoluted battlespaces. The Defense community must come together to "up-armor our warfighters minds," that is, to give them the cognitive tools that support their success in today's fight and the operations to come.

** Institute for National Security Ethics and Leadership*
*** Army Center for the Professional Military Ethic*

future immersive training

U.S. Marines assigned to 2nd Battalion, 8th Marine Regiment, train wearing the Future Immersive Training Environment (FITE) Joint Capabilities Technology Demonstration (JCTD) virtual reality system, in the simulation center at Camp Lejeune, N.C., Feb. 24, 2010. The FITE JCTD allows an individual wearing a self-contained virtual reality system, with no external tethers and a small joystick mounted on the weapon, to operate in a realistic virtual world displayed in a helmet mounted display. Photo Credit: John F. Williams/U.S. Navy

Improving Decision-making Training for All Ranks

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Eighty-five percent of casualties since World War II have been from infantry units, however only a small fraction of the training simulation budget has been allocated to infantry simulation in the past. The Future Immersive Training Environment (FITE) is the only Joint Capability Technology Demonstration (JCTD) focused on small unit training. This initiative, sponsored by the United States Joint Forces Command (USJFCOM), has successfully demonstrated both technology and training strategies for improving immersive infantry training capabilities. The two-year, $36 million program is drawing to a close, but its impact on infantry small unit training will be felt for years to come.

The Deputy Secretary of Defense recently dedicated $285 Million to Close Combat/ Infantry Immersive Training across fiscal years 2011-2015.

The FITE program demonstrated Individual Worn Virtual Reality (IWVR) systems at Camp Lejeune, NC and Fort Benning, GA early in 2009. The individually worn system integrated Virtual Battlespace 2 (VBS2) as the virtual environment with COTS hardware to provide an immersive squad training environment. Using innovative training strategies, the FITE

JCTD team demonstrated how this technology could improve infantry small unit decision-making training. FITE efforts are already impacting the services. The Army has been pursuing an Immersive Infantry Trainer (IIT) as part of the Close Combat Tactical Trainer Dismounted Soldier (CCTT DS) and hopes to begin fielding systems in 2011. Although the USMC, USAF, and USSOCOM had not previously considered immersive training capabilities, they are pursuing funding to conduct training transfer analyses and are eager to establish programs focused on defining small unit training requirements.

The second demonstration of the FITE JCTD, known as Operational Demo 2 Mixed Reality, will be conducted at the IIT in Camp Pendleton, CA. The Iraq-themed IIT has been transformed into an Afghan village. Ultra-wide band tracking technology has been added, allowing the system to identify the exact location of all trainees and role-players at all times. Strategically placed Pan Tilt Zoom (PTZ) cameras can automatically record critical events to support after action review activities and provide feedback to training personnel. Innovative technologies have been borrowed from the theme park industry, including animatronics, which provide background characters and critical environmental cues. Most importantly, the IIT's projected virtual characters have been improved by increasing their level of interactivity and enhancing their "situational awareness". A demonstration of Augmented Reality for Infantry Training will showcase the potential of this technology for allowing infrastructure-free training

ISS System in use at the FITE JCTD. Photo Credit: Richard Shaffer/Lockheed Martin

NEW-IT SUPPORT

BY SAE SCHATZ, PH.D., UCF-IST ACTIVE, SSCHATZ@IST.UCF.EDU

FITE JCTD works closely with other Department of Defense (DoD) projects in order to incorporate the latest available research and technology. The Next-generation Expeditionary Warfare Intelligent Training (NEW-IT) program is among the initiatives contributing to FITE. Sponsored by the Office of Naval Research (ONR), NEW-IT is developing improved instructional support solutions for simulation-based training. More specifically, NEW-IT researchers are creating novel methods and prototype technologies that can improve the training of higher-order cognitive skills via simulation. As one part of their investigations, the team is trying to advance the science of scenario-based training, including the development of new scenario design strategies, extension of the definition of scenario complexity, and development of automatic scenario generation software.

FITE JCTD is leveraging NEW-IT tools and scenario design concepts. First, to facilitate the operation of both the Dismounted Soldier systems and the Infantry Immersive Trainer (IIT), FITE began using the NEW-IT Instructional Support System (ISS). This software helps the exercise operators perform a variety of functional and instructional tasks, such as launching distributed systems simultaneously, viewing trainee actions in real-time, and continuously monitoring the hardware/software status.

Second, FITE's scenario design approach was inspired by NEW-IT's "scenario vignette" method of scenario creation. This scenario design technique breaks a scenario into quantifiable pieces, which are then dynamically assembled by following specific rules and constraints. For NEW-IT, this approach helps facilitate computer-driven scenario construction, and although FITE investigators have not yet incorporated the prototype NEW-IT scenario generation software, they have found the design methodologies to be relevant and useful.

In the near future, the NEW-IT team hopes to extend its work on scenario generation, making further headway on automatic scenario generation strategies and software. In the next few years, the team hopes to make scenario generation—currently one of the major bottlenecks of scenario-based training—into an efficient, trainee-centric, turn-key solution.

The theoretical basis of NEW-IT's research and development matches with FITE JCTD's desire to bring the state of the art in scenario-based training to small unit training. Programs like FITE JCTD present valuable opportunities for lab-based research efforts to be demonstrated and tested in field training environments. For more information on NEW-IT, visit the ACTIVE Lab Website at: WWW.ACTIVE.IST.UCF.EDU.

anywhere and anytime. While Augmented Reality is not ready for immediate fielding to support training, the potential of this capability is promising. Adjacent to the current IIT, a new Joint Improvised Explosive Device Defeat Organization (JIEDDO) funded IIT Phase 2 outdoor Afghan village is currently under construction. It will use some of the technologies that have been pioneered by the Office of Naval Research (ONR) at the IIT and in the FITE JCTD.

The FITE JCTD has brought critical attention and focus to immersive infantry training. The results of this work will impact the training and performance of multiple levels of the chain of command, and it is this type of work that empowers all ranks to make better decisions in the heat of combat.

For more information about the technologies and innovations pioneered by the FITE JCTD program, several papers are available through the Interservice/Industry Simulation Training and Education Conference (I/ITSEC) proceedings at www.iitsec.org.

Top: Camp Pendleton's 32,000-square-foot Infantry Immersion Trainer simulator was remodeled in early 2010 to look like an Afghan village.
Photo Credit: John Gastaldo/The San Diego Union-Tribune

Middle: Advanced Infantry Training Batallion members of the 1st Battalion, 7th Marine Regiment (1/7) clear a mock village in the simulator when a simulated RPG exploded above their heads.
Photo Credit: John Gastaldo/The San Diego Union-Tribune

Bottom: Marines conduct a room entry exercise at Camp Pendleton's Iraq-themed Infantry Immersive Training (IIT) Center.
Photo Credit: 1st Marine Division Combat Camera Unit

CHAOS SUPPORT

BY JULIA KIM, PH.D., USC-ICT, KIM@ICT.USC.EDU

The University of Southern California's Institute for Creative Technologies (ICT) is developing the Combat Hunter Action and Observation System (CHAOS), a mixed-reality training environment that helps small units hone their skills and instill the confidence necessary for irregular and asymmetric conflicts where interacting with the local populace is crucial to success.

CHAOS is a part of the United States Joint Forces Command (USJFCOM) Future Immersive Training Environment (FITE) Joint Capability Technology Demonstration (JCTD) focused on small unit excellence. Located at the Infantry Immersion Trainer (IIT) at Camp Pendleton, CA, the training will occur in a small house compound modeled after those found in Afghanistan's Helmand Province. The physical space will be "intelligent," containing sensors and other technologies that detect trainees' actions, such as walking through a door or approaching a window, which allows scenario elements to be triggered.

Inside CHAOS, virtual characters will serve as the primary role-players, residents of the house compound. Soldiers and Marines will try to gather information from these residents and to make sound tactical and ethical decisions. The scenario, which is based on learning objectives identified in collaboration with subject matter experts and educational psychologists, drives the CHAOS learning experience.

The virtual characters integrate state-of-the-art virtual human research from the ICT and its collaborators, including speech recognition, natural language understanding, non-verbal behavior generation, and computer vision. They interact with the trainees and with each other based on their goals and intentions. The trainees must assess the threats and opportunities posed by these virtual characters as they do in theatre.

By integrating physical space with virtual characters, CHAOS adds another training tool for preparing our infantrymen for the complex conditions they will face in-theatre.

squad-level training

The USMC's Squad Immersive Training Environment (SITE) Initiative

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Cpl. Nicholas Escobedo, a squad leader with 2nd Squad, 1st Platoon, Echo Company (Co. E), Battalion Landing Team 2nd Battalion, 7th Marines (BLT 2/7), 31st Marine Expeditionary Unit (MEU), signals Marines to move forward during an airfield seizure exercise. Photo Credit: US Marine Corps

The Marine Corps' *Vision & Strategy 2025* offers new guidance on training and education for small units and their leaders, including requirements to improve the ability of small unit leaders to intuitively assess, decide, and act; and an imperative to leverage current and emerging training systems, simulations, and devices to enhance small unit teamwork and improve small unit leader tactical acumen and decision-making.

To help meet these training goals, the Marine Corps Training and Education Command (TECOM) has been pursuing an effort called the Squad Immersive Training Environment (SITE). Once complete, SITE will be a system of systems, a "toolkit" for Marine Corps trainers to support training along the infantry squad training continuum. In other words, SITE is not a physical location or specific training tool, but rather a package of training capabilities and their supporting materials.

The SITE effort began by examining the current squad training environment. The SITE integrated product team identified 11 gaps requiring both materiel and nonmateriel solutions. These needs were articulated in the SITE Initial Capabilities Document (ICD), which was formally approved by senior Marine Corps leadership in April 2010 (validating the identified gaps as official requirements).

Presently, the Marine Corps Systems Command (MARCORSYSCOM) is conducting the SITE Analysis of Alternatives (AoA), in which various private and public "portfolios" are examined to determine whether existing capabilities can mitigate the gaps outlined in the ICD. The AoA process will likely continue through much of FY11, and at its completion, senior leadership will be briefed on potential and recommended courses of action.

SITE is an important enabler of the larger Marine Corps vision of Enhanced Company Operations (ECO). This strategy pushes greater responsibility down to smaller decentralized tactical units, who can then respond more flexibly to a range of threats. In ECO, the squad is the smallest maneuver element. Squad leaders and even fire-team leaders must perform highly complex and rapid tactical and ethical decision-making tasks in the contemporary operating environment.

Consequently, SITE is only one part of the TECOM vision for supporting ECO training and education. SITE, which focuses on squad-level training, represents a "bottom-up" first step towards enabling ECO. The follow-on TECOM initiative, called the Small unit Integrated Training Environment (SuITE), will emphasize platoon- and company-level training capabilities. SuITE builds on the SITE foundation and expands its focus beyond infantry training to include other elements of the Marine Corps, such as ground combat, aviation, and logistics.

Through efforts such as SITE and SuITE, the Marines continue to pioneer new strategies for maintaining excellence in the ambiguous environment of irregular warfare. In the years to come, TECOM plans to develop new integrated training systems, home station immersive training capabilities, and full spectrum Live-Virtual-Constructive training tools to better support on-going and future operations.

border hunter

Bringing the "Magic" of Combat Hunter to the Rest of our Forces

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In April of 2010, Joint Task Force North (JTF North) arranged for a special 20-day "Border Hunter" course to be delivered at Fort Bliss, in El Paso, Texas. This course, derived from the Marine Corps' Combat Hunter curriculum, was taught by Combat Hunter subject matter experts David Scott-Donelan and Greg Williams, as well as their hand-selected teams of instructor assistants.

Forty-three Soldiers and Law Enforcement Agents attended the course. Of these, most were from the U.S. Army (n=21) and Border Patrol (n=18). Two were from the FBI (n=2), and both the Texas Rangers (n=1) and Parks Services (n=1) sent one attendee. All trainees were highly experienced, with an average of 9 years in the military or law enforcement.

In addition to the course attendees, twenty-two Soldiers (n=22) were recruited from Fort Bliss to play as the opposing force for the Combat Profiling exercises. These Soldiers received training in human behavior patterns, insurgent tactics, and Middle Eastern culture. Most of these Soldiers held junior ranks (mainly private or private first class), and they possessed an average of 3 years military service.

CURRICULUM

Border Hunter was divided into two halves. The first 10 days (6–15 April 2010), dedicated to Combat Tracking, were taught by master tracker David Scott-Donelan, an internationally recognized man-tracker with more than 40-years experience. Scott-Donelan assembled a team of five hand-picked experts to assist in the training. Together, these experts boast more than 180 years of collective experience.

Combat Tracking involves conducting "follow-ups" of a quarry while operating in small, tactical teams. Trainees learned to read their enemies' *spoor* (i.e., footprints, human signs, environmental cues, slight ground disturbances). They were taught to build social/biometric profiles of their quarry; anticipate their targets' actions by gaining the "mind of the quarry;" and apply tactics, techniques, and procedures (TTPs) to hunt down their targets. Combat Tracking, a human-centric competency, is particularly useful in irregular warfare settings to support offensive operations, intelligence collection, clandestine movement into hostile areas, and counterinsurgency operations.

Soldier poses as a villager in "The Ville" during a Border Hunter Profiling Exercise.
Photo Credit: Sae Schatz/UCF-IST ACTIVE

The second 10 days (16-25 April 2010) were dedicated to Combat Profiling and Enhanced Observation. Greg Williams led this instruction. Williams, a highly-decorated former undercover police officer from Detroit with more than 30-years experience, assembled a team of nine hand-picked experts to assist in the training. Many of these instructors are still active in their professional disciplines.

Combat Profiling is concerned with perceiving, analyzing, and articulating critical events within the human terrain. Its main goal is to identify pre-event indicators through humans' behavior "left-of-bang," (i.e., before a destructive event occurs). Combat Profiling does not use stereotyping based upon race, religion, or ethnicity. Rather, it trains individuals to look for behaviors that are anomalous, beyond the baseline of a culture or location. Through Combat Profiling, warfighters and law enforcers learn to be more situationally aware and to accurately interpret the subtle cues that forewarn a critical event. Along with Combat Profiling, Williams and his assistants taught Enhanced Observation, which involves advanced methods of using optics. The instruc-

A Soldier learns about urban tracking during the Border Hunter course.
Photo Credit: Sae Schatz/UCF-IST ACTIVE

tors trained novel ways to make the best use of optics, including binoculars, ACOGS (Advanced Combat Optical Gunsight), and thermals (i.e., "night optics"). For instance, thermals can be used (day or night) to detect whether someone is wearing a body-bomb under their clothing.

FORT BLISS FACILITIES

JTF North provided outstanding facilities for the course. All trainees, instructors, and researchers were invited to stay in barracks located at the Ft. Bliss Biggs Airfield, just minutes from the classroom, and lectures were carried out at the Ft. Bliss Battle Command Training Center (BCTC), a new, modern classroom facility equipped with projectors, wall-to-wall whiteboards, and plenty of seating.

For the Combat Tracking exercises, JTF North arranged for the course to have access to and transportation to/from a variety of Ft. Bliss ranges. Tracking exercises were conducted across several different terrains, from soft sand to rocky mountains.

For the Combat Profiling exercises, JTF North reserved Ft. Bliss ranges Golf and Foxtrot. Range Golf was drastically altered for the course—transforming into a "cognitive range" where trainees could apply their Combat Profiling decision-making skills. To achieve this, Ft. Bliss brought in dozens of CONEX boxes (i.e., large, metal freight containers), which became one- and two-story homes and businesses. They also provided heavy equipment to create new roads and prepare the range. Greg Williams and his team dictated the placement of each of building; they added customized props around the new village, dubbed "The Ville," and personally painted graffiti in the "bad" section of town in order to create an appropriate context.

RESEARCH

Joint Forces Command (USJFCOM) sponsored 13 researchers to attend the course in order to conduct scientific observation, experimental testing, and a formative evaluation. The research team was led by USJFCOM's Dr. David Fautua and the chief scientist was Dr. Sae Schatz, from the University of Central Florida. Other research team members included Emilie Reitz, USJFCOM; Dr. Denise Nicolson, UCF; Dr. Joan Johnston, Naval Air Warfare Center Training Systems Division; Dr. David Kobus, Dr. Erica Palmer, Jason Kobus, and Jared Ostertag, Pacific Science & Engineering; Dr. William Ross, Dr. Nic Bencaz, and Laura Militello, Cognitive Performance Group; and Dr. Alan Spiker, Anacapa Sciences, Inc.

The experimental team conducted a within-subjects, repeated-measures design for collecting data from the trainees, the role-player trainees, and the instructors. The 43 Border Hunter trainees completed demographics surveys, cognitive attributes batteries (i.e., looking for cognitive traits that moderate performance), declarative knowledge pre/posttests, photo vignette pre/posttests, situated judgment pre/posttests, perceptual aptitude (i.e., field of view) pre/posttests, heart-rate monitoring (i.e., level of awareness), behavioral observation, and daily reactions surveys. The 22 role-player trainees completed demographics surveys, declarative knowledge pre/posttests, photo vignette pre/posttests, situated judgment pre/posttests, and daily reactions surveys.

In addition to these metrics, the 6 tracking instructors and 9 profiling instructors completed structured interviews with Ross and Militello. The instructors were also given the same cognitive battery that the trainees completed, with the hope of uncovering those innate traits that comprise an expert Border Hunter instructor.

Under the direction of Fautua, the research team analyzed the data collected during the course and edited the 126 hours of video footage. The team delivered (1) a technical report, (2) a high-level program of instruction, (3) training video-clips, and (4) a pocket guide in late July 2010. In addition, the research team conducted a longitudinal study, following twelve (n=12) trainees after the course to measure their retention, as well as the informal transfer of training to their peers (i.e., measuring Kirkpatrick's organizational change). Data collection for the longitudinal study took place in May and June 2010, and results are available in the final technical report.

For additional information or to request a copy of the research products, contact Dr. David Fautua at DAVID.FAUTUA@JFCOM.MIL.

small worlds project

A Model for Multi-Disciplinary Teams in High Risk Environments

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Children from a small school in Haiti are among thousands trying to recover from the devastating earthquake from early 2010.
Photo Credit: Tracy St. Benoit/UCF-IST SMALL WORLDS

In early 2010 a catastrophic earthquake struck the nation of Haiti. In response, the University of Central Florida's (UCF) Haitian Studies group launched H.O.P.E. (Healing, Outreach, Partnership and Education) for Haiti.

In May of 2010, a team assembled to embark on a mission to Haiti. The UCF Haitian Studies group partnered with two groups from UCF's Institute for Simulation and Training (IST); the Mixed Emerging Technologies Integration Lab (METIL), and the SMALL WORLDS Project.

Although conditions in Haiti were intellectually, physically, and emotionally challenging, UCF's Team to Haiti was able to accomplish its Phase One Mission. Phase One's goals were to lay foundational research to explore the use of mobile technologies for the distribution of humanitarian assistance and to garner a better understanding of the potential for mobile platforms to provide distance learning for students affected by the earthquake.

UCF's Team to Haiti was a unique six-person group that represented a variety of disciplines including: English, Information Technology (IT), Ethnographic Videography, Computer Science, Public Health, and Anthropology. The team converged not only to support Phase One's goals but also to serve as a case study of an interdisciplinary team model working in a high-risk fieldwork (HRF) environment.

HRF serves as the backbone of a holistic process model implemented by the SMALL WORLDS Project. This effort, funded by an Office of Naval Research grant, was created to train, educate, and deploy small interdisciplinary teams (such as UCF's Team to Haiti) to conduct research where conditions are dangerous and methodologies must be adjusted for these mitigating factors. Part of the SMALL WORLDS Project's goal is to prepare researchers and other personnel to collect, aggregate, and manage, complex social data. The Project's objective is to provide research and analysis from disaster areas such as Haiti and transition these methodologies to conflict zones like Iraq and Afghanistan.

The SMALL WORLDS Project, while based out of IST, is supported not only by its labs, but a confederation of other academic institutions and companies who provide the expertise in computational modeling, IT, team performance, and the social and physical sciences. One goal is to provide a template for the dissemination of data and make it available to academic and business partners. The partners in turn plan to use the data collected for computational modeling, taxonomy/ontology development, and geo-spatial integration. The data can also be provided to other agencies assisting in disaster and humanitarian response as well as Stability, Security, Transition, and Reconstruction (SSTR) missions.

Since their return, UCF's Team to Haiti is preparing the data and preliminary research findings to present to their sponsor (the National Science Foundation). In conjunction, raw data will be disseminated to academic and business partners for further computational modeling analysis, data management, and technology development.

For more information on this and the upcoming Phase Two Mission, contact Tracy St. Benoit at TSTBENOIT@IST.UCF.EDU.

physiologically speaking

Measuring the Physiological Components of Neuroergonomics and AugCog

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Neuroergonomics and Augmented Cognition (AugCog) have propelled physiological measures into the foreground of many simulated environments and are used for training, explaining, predicting, and aiding performance. Along that line, the ACTIVE Lab at the University of Central Florida (UCF) utilizes Electroencephalogram (EEG), Electrocardiogram (ECG), Galvonic Skin Response (GSR), and Eye Tracking in projects involving multitasking situations, dynamic environments, simple tasks, and live versus virtual environment comparisons. The above-mentioned sensors are used independently as well as simultaneously. That ability is amplified by the logging capabilities pioneered by the ACTIVE Lab, enhancing the opportunity for application of physiological measures to virtually any task. Specifically, physiological measures have been implemented in tasks concerned with triggering adaptive automation to assess mitigation of situation awareness (SA) and to determine the method and task recommended for invoking automation. The potential use of physiological state for triggering automation is great because it seems that adaptive automation is the best solution for maintaining performance and SA. EEG, ECG, and GSR have revealed some interesting differences between participants who performed an identification task in a virtual environment compared to performance of the same task in a live environment. The results provide insight for follow-on studies to better understand the importance of particular environmental, cognitive, or physiological components for successful training transfer. Another example of physiological response used to assess the human element of human–machine systems involved a simple task in which participants were shown an internationally validated set of emotion-evoking pictures. The goal for that study was to categorize overall physiological state for the classified emotions and to be able to identify categories pertaining to the entire sample of participants regardless of their individual differences. Accomplishing that objective goes beyond literature presenting correlations between types of physiological responses, which are usually low, to indexing patterns of physiological behavior. That model would allow for the classification of overall state, regardless of an individual's direction or rate of change from baseline, to inform when a person is experiencing, for example, high or low workload, high or low stress, positive or negative moods, increased or decreased engagement, and so forth.

The capacity to generalize overall physiological state change enables better assessment of team shared models and performance. The logging capabilities designed and built by the ACTIVE Lab synchronize all of the physiological measures and the simulated tasks, allowing for the identification of a person or a team's exact state for a given event. As members of a team often "read" each other's emotional responses and need for assistance, so physiological measures can be built into a system to provide an objective measure of one's requirement for intervention. Thus, in a team, information provided by physiological assessments has potential to adapt a task to automated control, allowing resource allocation elsewhere, to enhance team member intercession, and to improve SA of the entire situation.

Dr. Lauren Reinerman-Jones demonstrates several of the ACTIVE Lab's physiological sensors. Photo Credit: Joy M. Martinez/UCF-IST ACTIVE

base-it

Towards the Next-generation of Instrumented Training Ranges

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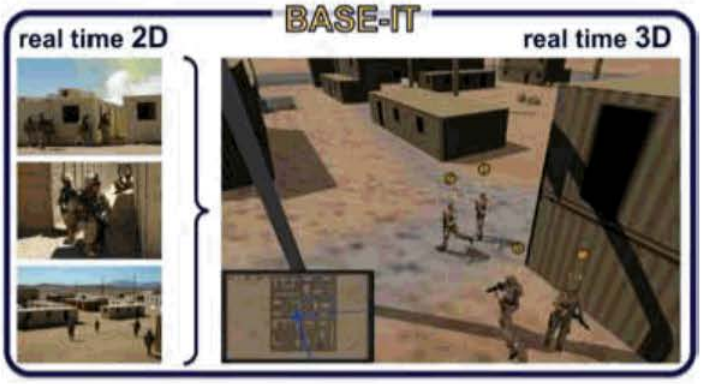
Military training conducted on physical ranges that match a unit's future operational environment as closely as possible, provides an invaluable experience. To conduct a training exercise in an urban environment while ensuring a unit's performance is closely observed, evaluated, and reported on in an After Action Review (AAR); requires a number of highly experienced instructors to accompany the unit throughout its training run. It is not only hard to find a large number of instructors available to assume this role, but they also may not be able to remember all details of the long training (some training courses may last for 72 consecutive hours). Although a unit receives a take-away package in the form of multiple DVDs containing video footage of the training course, reviewing this material may take many hours, a luxury that no unit can afford with their current heavy deployment schedule.



To address all of these issues, the Behavior Analysis and Synthesis for Intelligent Training (BASE-IT) project team, comprised of researchers from the Naval Postgraduate School (NPS), Sarnoff Corporation and the University of North Carolina (UNC) at Chapel Hill, suggested a radically different concept. Instead of a traditional approach of recording multiple video streams that need to be reviewed in their entirety by a number of instructors, their system focuses on technology-supported capturing of non-linear information about exhibited performances based on dynamic individual warfighter poses (3D position, and torso, head, and weapon orientation) and posture (standing, kneeling, prone) data. This type of data enables us to apply an automated performance analysis and evaluation that requires minimal to no human intervention. As a result, the automated system provides a set of quantitative metrics about the recorded performances and skills that were trained. Such a solution is omnipresent—sensors can be everywhere; it has a perfect memory (it records everything), and it produces and delivers relevant information in a timely fashion and in a format that is useful to both the instructors and the warfighters. An essential component of the overall BASE-IT system is a data acquisition framework consisting of an *in situ* network of automatically controlled Pan Tilt Zoom (PTZ) video cameras, and personal position and orientation sensing devices—GPS and Inertial Navigation Systems (INS) devices. While in this system we incorporated only three types of sensors, in the future the systems for instrumented ranges should also incorporate sensors that capture audio (commands and shouts), weapon deployment, and other information pertinent to unit activity.

The most direct benefit for an individual unit will be the ability to conduct training with fewer human resources, while having a more quantitative account of their performance (dispersion across the terrain, "weapon flagging" incidents, number of patrols conducted), and being able to define quick searches of their training run. The instructors will have immediate feedback on some elements of the unit's performance. Having data sets for multiple units will enable historical trend analysis, thus providing new insights and benefits for the entire service.

The BASE-IT research project is sponsored by the Office of Naval Research, Capable Manpower program, with PM TRASYS and TECOM as project transition customers. Website: WWW.MOVESINSTITUTE.ORG/BASE-IT.

adaptive marksmanship

Breakthrough Training for Marksmen

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The U.S. Army's Research, Development & Engineering Command - Simulation & Training Technology Center (RDECOM-STTC) and Defense Advanced Research Projects Agency (DARPA) are developing a close quarter marksmanship next-generation training platform that will be fully automated and self diagnostic. This system, known as the Tactical Ocular Reaction Area (TORA) system, will guide soldiers through drills and trigger corrective activities that address deficiencies identified in their marksmanship skills. This effort, with Conflict Kinetics as the performer, began as a DARPA Phase 1 Small Business Technology Transfer (STTR) effort, led by LCDR Joseph Cohn, and has recently transitioned as a Phase 2 effort to RDECOM- STTC, Orlando, FL, under Mr. Frank Dean's management.

This cost-saving platform's training approach is based on professional sports training methodologies, which have been adapted to support modern marksmanship training. The end product will be a system that will dramatically increase the marksmanship abilities of Warfighters, transforming them from novice to expert by providing adaptive and tailored marksmanship drills based on a thorough analysis of how expert marksmen train and perform.

There is clearly a need for alternatives to live ammunitions training. Police departments, military units, federal security agencies, private security companies, and allied foreign military sources are seeking new, cost-efficient, and innovative methods for increasing marksmanship precision and effectiveness. Elite soldiers trained using a prototype of the TORA training system have shown up to 300% improvements in peripheral target acquisition after a single session. Typical gains depend on shooter level and previous commitment to ocular training. Even advanced snipers have benefited, showing up to 18% improvement in peripheral target engagement.

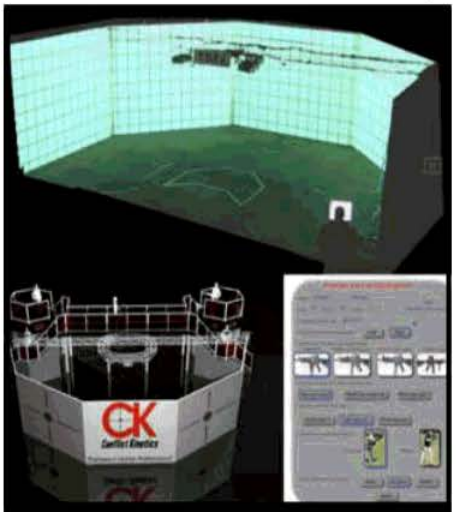

Figure: Current TORA system (top), design prototype (bottom left), amd touch screen programming (bottom right).

In Phase II, the current marksmanship trainer will become fully operable by the user through touch screen technology, eliminating the need for live ammunition and expert trainers. The system will use advanced algorithms and machine learning software to analyze performance data in near real-time. The system will also incorporate data captured from heart rate monitors. These data serve as another element that feeds the data mining and adaptive nature of the TORA system, and supports the ability to predict the best corrective path. Adaptive techniques include the modification of drill sets so as to alternate between exaggerating and simplifying situations where the shooter is deficient, and then ultimately bringing the shooter back to the baseline to measure improvement. The entire system will be robust, stable, and deployable to military locations at homestation and abroad. During Phase 1, Conflict Kinetics received numerous awards for their efforts to capture and improve the knowledge, skills, and abilities of expert marksmen, including an award of outstanding performance from C3-3 Special Forces group (Fort Bragg, NC), an award of appreciation from Drug Enforcement Agency (DEA), and an award of outstanding Performance from Directorate of Emergency Services (Airborne–Fort Bragg, NC).

in brief

Robotics Club at UCF

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On June 9, 2010 the Robotics Club at the University of Central Florida, a volunteer student-run organization sponsored by RDECOM's Simulation & Training Technology Center and UCF's Institute for Simulation and Training, departed to Virginia Beach for the third annual Autonomous Surface Vehicle Competition (ASVC), sponsored by the Association for Unmanned Vehicle Systems International (AUVSI) and the Office of Naval Research. This international student event included challenges that resemble real military unmanned systems operations: navigation through openings in gates/fences, channel navigation, etc. This year's theme was "The Lord of the Rings," where the robotic boats needed to retrieve a 6 inch diameter golden ring on a floating buoy, transport it around buoys, through channel markers, and eventually drop it into a 3 foot octagon representing "Mordor" from the famous books. After a challenging weekend of late nights spent testing, fixing, and revising software, the UCF team won 2nd place, $5,000 in prize money, and an additional $500 award for sportsmanlike conduct. The UCF Team was also the only school to successfully complete the Joint Architecture for Unmanned System (JAUS) Interoperability Challenge.

For more information, or to become a sponsor, contact Daniel Barber at: DBARBER@IST.UCF.EDU.

1ST PLACE *University of Michigan*

2ND PLACE *University of Central Florida*

3RD PLACE *University of Rhode Island*

4TH PLACE *Virginia Tech*

5TH PLACE *U.S. Naval Academy*

Robotics Club at UCF takes 2nd place at the third annual ASVC RoboBoats Competition. Photo Credit: AUVSI Staff

New Implications of Robotics CTA

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A battlefield populated by teams of human and robot Soldiers is no longer the stuff of science fiction. In fact, emerging thought among military strategists is that future battlefield superiority will require the assistance of autonomous systems. How these systems will team with Soldiers, and more importantly, how systems will be designed for acceptance and effective interaction with humans, is the objective of a new five-year U.S. Army Research Laboratory-sponsored Robotics Collaborative Technology Alliance (RCTA).

Led by General Dynamics Robotic Systems, the eight-partner consortium (UCF, Boston Dynamics, Carnegie-Mellon University, California Institute of Technology Jet Propulsion Lab, Florida A&M University, QinetiQ North America, and the University of Pennsylvania are the other members) will strive to develop autonomous robots that will become members of human–robot teams.

This focus on relatively small teams capable of performing a wide variety of missions will require some technology leaps to get beyond existing soldier-controlled robots toward soldier–robot interaction and collaboration.

The consortium intends to overcome these hurdles by integrating four research components: *perception* (understanding the environment in which the mission occurs), *intelligence* (an artificial intelligence that learns, adapts, and communicates), *human–robot interface* (effective human–robot communication and interaction), and *mechanical capabilities* (system dexterity, multi-modal locomotion, terrain adaptation). Although various members have specific responsibilities for one of the four components, integrated research themes will promote the exchange of ideas.

The team adopted a "light touch" management style that places work flow in the hands of members responsible for innovative results. Leaders of each of the research components will measure progress with quantitative research metrics rather than top-down, time-based milestones that lack flexibility to adjust to scientific discovery. For further information on the RCTA, visit: WWW.ARL.ARMY.MIL/ROBOTICS.

Sustaining Future Success

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The recent symposium on *Ethical Decision Making and Behavior in High Performing Teams: Sustaining Future Success* brought experts from around the nation to the Virginia Modeling and Simulation Center on June 2, 2010. Co-hosted by U.S. Joint Forces Command (USJFCOM), West Point, and the National Defense University, this two-day gathering served as a forum on best practices for helping junior leaders develop and trust their moral/ethical judgments in irregular conflicts.

Gen James N. Mattis, USMC, Commander of USJFCOM, delivered the keynote address. He opened the meeting by emphasizing the strategic, as well as moral, imperative to support junior leaders' ethical decision-making. LtGen Robert L. Caslen, Jr, USA, Commanding General of the Army Combined Arms Center at Fort Leavenworth, provided the second keynote address. He asserted that "there is hardly a sliver of difference between ethics and leadership," and went on to stress the critical connection between ethics and the "Warrior Ethos."

The remaining sessions included four panels and three breakout discussions. The panels were comprised of a range of military and civilian personnel and focused on highlighting different perspectives on ethics. The first panel, made up of five seasoned NCOs, gave their firsthand perspectives on ethical decision-making in the field. Subsequent panels shared views and thoughts from academia as well as high-ranking military trainers and educators. Breakout discussions were intermixed with the panels and keynotes. In these sessions, the participants debated the best practices for ethical decision-making from across the Services, including training, education, and other reinforcement approaches. The breakout groups identified a range of issues, from the need to consistently trust junior leaders (i.e., equally in theater and in garrison) to the importance of emphasizing the Warrior Ethos across all ranks. These ideas were outbriefed at the close of the symposium. USJFCOM personnel are currently authoring a symposium report, which should be available to the military community by the end of Summer 2010.

TTPC HUM Workshop

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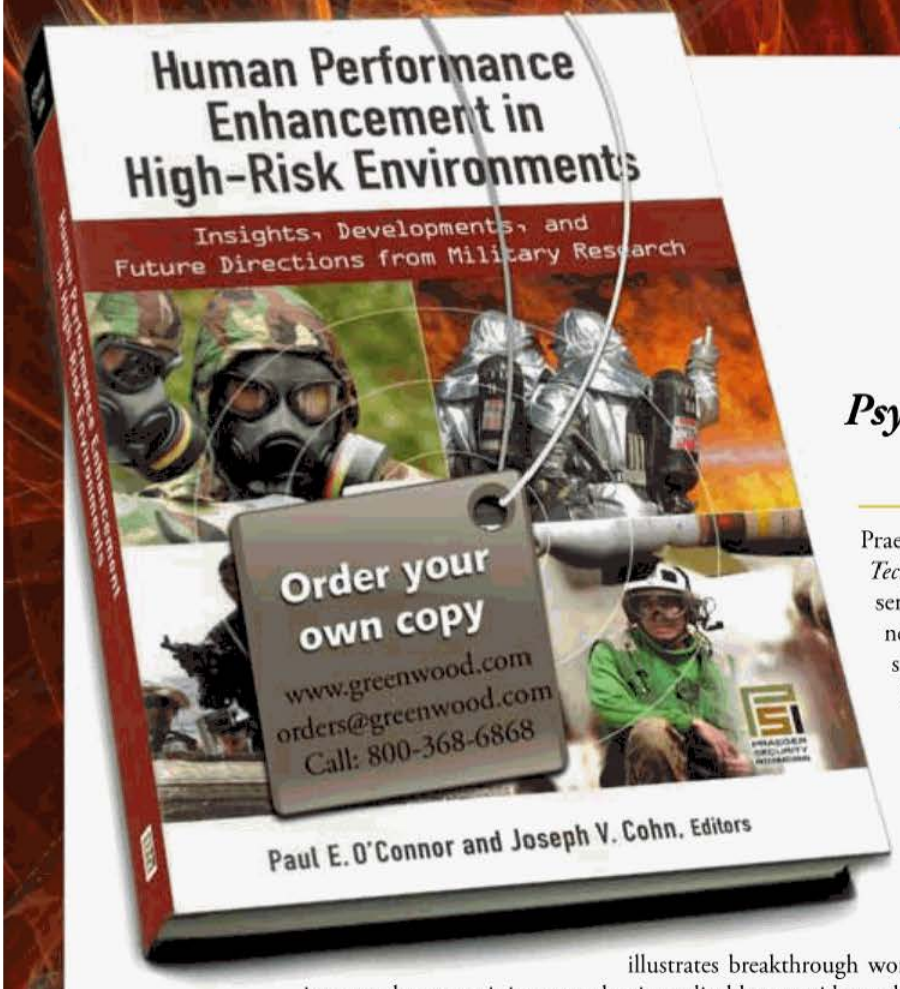
Numerous advances have been realized within the field of robotics in recent years. Specialized areas such as speech, gestures, and facial recognition have seen great improvements. However, along with these developments, new issues and challenges sometimes arise. In early 2010, a collaborative workshop was held for experts from around the globe to discuss how to cope with today's challenges and to explore the advantages of new strengths being discovered.

Attendees from TTCP HUM TC15 Workshop 2010. Photo Credit: Joy M. Martinez/UCF-IST ACTIVE

This workshop stems from "The Technical Cooperation Program" (TTCP). TTCP includes a partnership of 5 nations (Australia, Canada, New Zealand, the United Kingdom, and the United States) and serves as a multi-disciplinary forum for defense science and technology collaboration. Presently there are eleven groups under the TTCP umbrella, including the Human Resources and Performance Group, or HUM.

The recent TTCP HUM TC15 workshop, based on Multimodal Interfaces for Supervisory Control of Robots Workshop, was held at the University of Central Florida's Institute for Simulation and Training in Orlando, FL on Feb 6–7, 2010. Attendees traveled from TTCP– and NATO–affiliated countries. Presenters, such as Robert Arrabito from Defence R&D Canada, Leo van Breda from TNO Netherlands, and others in academia and industry shared insights from their specified fields of research and/or related areas of robotic development. For more information on upcoming collaborative events, visit: WWW.DTIC.MIL/TTCP.



Human Performance Enhancement in High-Risk Environmnents

Part of the Technology, Psychology & Health Book Series

edited by Schmorrow & Nicholson

Praeger Security International's newest addition to the *Technology, Psychology and Health Development (TPH)* series has been recently released to the public. This new addition, following the first set of books in the series (the *Handbook of Virtual Environments for Training & Education*), supports the overall theme of providing a comprehensive consolidation and dissemination of psychology and technology developments from fields such as neuroscience, cognitive psychology, biomedical engineering, computer science, and systems engineering.

This volume focuses on Insights, Developments, and Future Directions from Military Research, and illustrates breakthrough work being done by the military on human performance issues and presents it in a way that is applicable to a wider audience of high-risk professions and industries. Among the 16 chapters of the book, readers will find essential information written by military experts, detailing lessons learned from the field that are applicable across a wide spectrum of high-risk jobs including police forces, fire fighters, the security industry, military contracting, and more.

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