



Behavioral Analysis and Synthesis for Intelligent Training — BASE-IT

Multi-Institutional Collaboration in Support of Urban Warfare Training

Written by: Amela Sadagic



Herman Towles, UNC Chapel Hill, conducts calibration of the motion capture suit for a data capture study held at the NPS in January 2009. The suit is worn by a student from the Defense Language Institute (DLI).

The Behavioral Analysis and Synthesis for Intelligent Training (BASE-IT) is a new project led by the NPS MOVES Institute, and is conducted in collaboration with research teams from Sarnoff Corporation and University of North Carolina (UNC) at Chapel Hill. This three-year-long project is sponsored by the Office of Naval Research (ONR) and represents a \$6.5 million Navy investment in advancing technologies that will support USMC training for full spectrum operations in urban terrain. A primary objective of the BASE-IT project is to develop a state-of-the-art intelligent instrumentation system for physical training ranges. The system and the data sets collected during the training sessions are designed to amplify a unique value

of physical training ranges and provide new opportunities to units' training (1) before they go to training ranges, (2) to support instructors while the unit is on training ranges, and (3) offer new insights and opportunity for remediation of skills for the units after they leave physical ranges. The project suggests a radical departure from current data collection that is usually performed on similar ranges, and introduces a paradigm shift in the way such information is treated both during and after training. Current approaches rely on collecting a discrete set of multiple two dimensional (2D) camera views that ultimately need to be viewed by teams of instructors to resolve useful information and identify events that happened during the training session. Conversely, researchers in the BASE-IT project employ and develop a set of approaches and technologies that continuously 'scan' the situation on the ground and generate a unified dynamic environment with three dimensional (3D) data sets - 3D models of each Marine with information about

his position, body posture, torso, head and weapon orientation. The process of 'scanning' the environment is done using a network of automatically-controlled pan, tilt and zoom (PTZ) cameras, and personal position and orientation sensing devices. These types of 3D data sets, together with the knowledge base about the specific military techniques and procedures, enables an automated analysis of unit performances (a process called 'behavior analysis') and performance metrics exhibited by the unit during their training on the range. (Continued on Pg. 4)

**Announcing the
MOVES Annual
Research
Summit
2009!
July 21st-23rd**

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Introducing the MOVES Newsletter!

Welcome to the first edition of the MOVES Newsletter! The commotion of 2008 is behind us and the potential of a new year gleams before us. Despite some of 2008's economic woes for the Nation, the MOVES Institute still found reasons to cheer. This past year we've seen new projects launched, students graduate, MOVES faculty represented at high-profile

speaking engagements, papers published, and more! And while we are grateful for a productive past year, we are always looking for ways to improve. Thus, one of our resolutions is to bring you a quarterly newsletter. Our newsletter objectives are to increase communication, improve outreach, involve our important sponsors,

include and stay connected with alumni, and start networking relationships with experts in the Modeling and Simulation field. We hope you'll enjoy reading!

Please send your comments and feedback to:

hehatlo@nps.edu



CDR Joe Sullivan makes himself available to both faculty and students during the workday in WA 271.

Director's Corner: A word from CDR Sullivan

Welcome aboard to CDR Duane Davis! Some of you may remember Duane – he earned a PhD in Computer Science from NPS in 2006. Duane is already making tremendous strides pushing some key initiatives – including coordinating our curriculum review. I'd also like to welcome Holly Hatlo, a recent addition to the MOVES Administrative Support team. It's a distinct pleasure to congratulate our recent graduates. In September we graduated our largest section to date with 19 new M&S experts crossing the stage. We

would love to hear from all of our graduates, and hope you'll join us at this year's Research Summit in July. Your feedback is greatly appreciated, so be sure to check in. There are many growth opportunities and exciting challenges ahead for the MOVES team. As always we're intent on aligning technical proficiency and tactical relevance to continue our press for close connectivity with operational environments. Standards, interoperability, effective re-use and business cases continue to play a key role and present significant re-

search challenges. Current projects run the gamut from reliable means to provide staff-level training for Irregular Warfare to computer vision and intelligent agent methods to develop next-generation instrumented ranges. As the scope and application of Modeling Virtual Environments and Simulation continues to evolve we'll continue to update our academic program and research agenda. Each of you has an opportunity to contribute to this important effort so... Please stay in touch!

"The MOVES program provided me with the technical foundation of simulations. This education when combined with my previous experience as an Infantry Officer assists me in providing informed recommendations to my boss."

-MAJ Johnny Powers

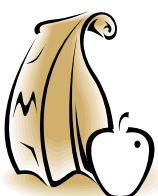
Where Are They Now? Alumni Update Featuring: Major Johnny Powers

Recent MOVES Alumni, MAJ Johnny Powers, took some time after the holiday break to share with us what he has been up to since he graduated from MOVES this last September, and how his experience here has assisted him in the working world. Johnny is currently in the process of transitioning to the Program Lead position with the Battle Command Training Support Program; part of the Department of the Army G-3/7 Directorate

of Training, working in the Training Simulations Division. The program is responsible for the oversight of all virtual and constructive non-systems Training Devices used for collective training in the Army, and for gaming solutions for Army training. He also oversees the Battle Command Training Centers (BCTC) used to train Army battle staff at the Battalion/Brigade Combat Team and higher, as well as *(Continued on Pg. 4)*

Tradition Continues: Brown Bag Lunch Seminars at the MOVES Institute

It's a Thursday, the time is 1200 and something inside you is grumbling and hungry. That's your desire for knowledge and a nutritious meal talking! Look no further than Watkins rm. 275/285 to satisfy both cravings.



The tradition of the Brown Bag Lunch Seminar is still a mainstay with the MOVES Institute. The seminars

take place approximately 8-10 times per quarter, and are open to everyone. Topics are based on emerging interests, typical themes include:

- Current Technologies
- Featured Speakers from NPS and Prestigious Guests
- Student Research, Dissertation Topics & Results, & award recipients
- Visiting Researchers & Subject Matter Experts



Professor John Falby, the person responsible for setting up the presentations, comments: "The lunches are a great opportunity for students, faculty and staff to listen, and comment on, topics of interest to the Institute, as well as to interact with one another during the informal discussion at the end of each seminar."

Contact Professor Falby for seminar ideas and meeting dates:

falby@nps.edu

Dan Kaufman, Program Manager, Defense Sciences Office, Defense Advanced Research Projects Agency (DARPA) speaks at a lunch seminar in Oct. '08. The topic was 'The RealWorld Program, Building Simulations Without Programmers.'
Photo by: *Amelia Sadagic*

We're Proud of Our 2008 Graduates!

We'd like to congratulate the following individuals for completing their degree with the MOVES Institute in 2008:

Graduated: March '08

-Boone, Brian S./LT USNR
-Stoykov, Sevdalin H./MAJ Army, Bulgaria

Graduated: June/July '08

-Azimetli, Sevdalin H./1LT Air Force, Turkey
-Fletcher, Andrew S./MAJ USA

Graduated: Sept. '08

-Beris, Jonathan V./LCDR USN
-Betts, Robert L./LT USN

-Conger, Nathan W./LT USN
-Hatt, Ronald V./LT USN
-Kammerzell, Robert/MAJ USA
-Kibel, Brian M./MAJ USMC
-Milliken, Michael S./LCDR USN
-Platte, William L./MAJ USA
-Powers, Johnny J./MAJ USA

-*Rippeon, Ryan A./LT USN
-Thomas, Brandon K./Capt. USMC
-Tiwari, Andrew N./LT USN
-*Whittington, Eric S./MAJ USMC

-Ouerghi, Nabil/1LT Navy, Tunisia
-Alver, -Yucel/1LT Air Force Turkey
-Bitik, Arif B./1LT Air Force Turkey

-Külünk, Bülent/1LT Air Force Turkey
-Ozdogan, Murat/1LT Air Force Turkey
-Sebalj, Derek M./MAJ Air Force Canada

Graduated: Dec. '08

-Leong, Hoe Wai/Mr. CIV Singapore
-*Ong, Kim Soo/Mr. CIV Singapore
-*Wong, Teck Hwee/Mr. CIV Singapore

*Graduated with distinction, and were also recipients of the George L. Phillips Award for outstanding academic performance, thesis quality and leadership abilities.



Pictured (from left to right): Former MOVES Graduates, Capt. Umit Ayvaz, Turkish Army, Lt. Michael Farias, USN, LCDR Alan "Niles" Schiaffino, USN, and Maj. Charles "Neil" Fitzpatrick, USMC.

*Recognized for Outstanding Thesis

Congratulations to our remarkable and distinguished alumni!

Sound Off: An Important Message from our Sponsor

Featuring: Director of NMSO, John Moore

NMSO website for more info: <https://nmso.navy.mil/>

The MOVES Institute has the privilege of receiving funding and project requests from several outstanding organizations. One such sponsor is the Navy Modeling & Simulation Office (NMSO) based out of Washington D.C. According to the NMSO statement of purpose, their role is to provide centralized coordination of Navy M&S as well as coordinate M&S efforts across functional community areas. NMSO serves as the Governance Board's "action arm" by implementing policy guidance. NMSO's Director, John Moore provided us with some insight into why his organi-

zation has been a strong supporter of MOVES for the last 13 years. NMSO has a rich and strategically coordinated history with the MOVES Institute. So much so that Mr. Moore feels that each MOVES effort has "a direct role in progressing Communities down their M&S roadmaps." One key example offered by Mr. Moore would be the BASE-IT project, in which the MOVES team "is using artificial intelligence and computer surveillance to enable computers to recognize real world Marines and their actions in field training exercises. Because of physical and resource constraints, we can not have a set of trainer's eyes

everywhere, 100% of the time, in field exercises. This new capability is going to make the evaluation of the training more accurate by providing more complete coverage of the actions; which in turn enables the trainers to provide more valuable feedback to the Marines." Mr. Moore's "most passionate favorite" example of the influence MOVES has in improving the military's operational effectiveness "is the pursuit of a true net-centric environment. Across the DoD, M&S is one of the strongest leaders in achieving true interoperability and knowledge management. MOVES continues to play crucial roles in developing both the vision and technical solutions to get (Continued on Pg. 4)

Announcing...

MOVES Annual Research Summit 2009

Save the date!

The Annual MOVES Research Summit will be held

July 21st-23rd 2009

Highlights Include:

- Keynote Speaker: TBA
- Presentations & Breakout Sessions
- Research Demonstration Night



NPS celebrates its Centennial Anniversary
1909-2009

Check out the Alumni website for Information on upcoming events:

<http://www.nps.edu/100>



WHERE TACTICAL MEETS TECHNICAL

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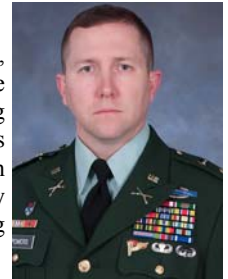
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We're on the Web! Visit us at:
<http://www.movesinstitute.org>

MAJ Johnny Powers FA 57
(Simulations)

(Powers, Continued from Pg. 2)

individual Soldiers on battle command systems and processes. And perhaps most interesting to the MOVES community, Johnny is responsible for providing funding oversight/management for the Army Gaming Program, ensuring that those agencies tasked with the actual combat development and material development of standard gaming solutions for training are provided the funds necessary to field those capabilities. In his own words, Johnny explains how his NPS education has affected his work, "The MOVES program provided me with the technical foundation of simulations. This education when combined with my previous experience as an Infantry Officer assists me in providing informed recommendations to my boss. We now intend to explore the development of a modeling/simulation tool to explore the impacts of short and long term budgeting decisions."



(Moore, Continued from Pg. 3)

there. So far, M&S already has an approved discovery metadata specification and a working index search capability (our own Web 3.0). We have also started the initial research necessary to develop both uniform processes for data exchange across disparate domains and frameworks for using modular applications. Once we finish those, interoperability will be essentially automatic. These are truly exciting efforts that would still be vaporware without the superb ability of MOVES to find the right answers." According to Mr. Moore, one of the most effective manners in which MOVES can support the military communities is to place our graduates back into their Services or into the DoD, so the graduates make M&S more efficient for their commands. "For Navy, getting MOVES graduates into coded billets is currently our biggest challenge and our major focus area for 2009." As far as how things have changed since NMSO began supporting MOVES, Mr. Moore has seen an improvement in focus. He believes this change has "caused MOVES to reach out to its customers to determine their prioritized requirements and integrate those with the necessary education requirements to produce officers who can be proud of what they have achieved academically and commands who will be just as proud of the benefits they received from those who have this education."

Mr. Moore's vision for the future of M&S for the Communities is that the M&S software would "decompose into smaller, interchangeable application modules. The goals of this change would be: easier to modify M&S making it possible to really answer the questions that need to be answered; increased M&S interoperable due to the built-in interoperability of the modules that compose them; simpler, faster, less expensive VV&A of the modified simulation modules; greater M&S reuse due to the standardization of the interfaces between modules, etc. For the Communities, MOVES, NPS and educational experts, the difficult task is to determine how to educate those that need to be educated in what they need to know, without destroying their careers or our educational system." Since MOVES thrives on difficult problems, we appreciate John Moore as a sponsor. CDR Sullivan says it best, "John never wastes our valuable research time and effort on anything less than 'grand' challenges!" The MOVES Institute is especially grateful for the financial support, wisdom and encouragement we receive from our sponsors. Without the generosity of these organizations, we would have a lot of M&S experts with their hands tied. If you or your organization would like to invest in the MOVES Institute, contact MOVES Director CDR Joe Sullivan, sullivan@nps.edu.



BASE-IT Story Continued from Pg. 1

The performance data provided to the unit at the end of their training ranges from how many times (and how many people) were involved in combat patrolling, how many 'cordon and search' operations were executed, to the rate of dispersion of any unit across the terrain. This also includes identification of moments when the unit was 'bunching up' or a Marine was 'flagging' a fellow Marine with his weapon system. The unit can either request smart searches of their training session ("Find and list all 'flagging' incidents"), or watch the recordings from any viewpoint that may need review. One could even pause the replay and request the system to generate a "what-if" type scenario and display a variation of what has been recorded on the ranges. The technologies designed and developed in this project are applicable to a number of training situations both in the USMC and Navy. Last December, the teams completed and presented research results of their first funding year, and are actively working with PM TRASYSS and TECOM as transition customers to ensure the best results of this work get acquired and integrated in the future system on USMC training ranges. The NPS MOVES team of researchers consists of MOVES and CS researches led by Dr. Amela Sadagic as a PI for the entire project. Team members include Dr. Chris Darken, Dr. Neil Rowe, Dr. Mathias Kolsch, Dr. Juan Wachs, Deborah Goshorn and Delta3D team.

Dr. Amela Sadagic pictured at the Twenty-nine Palms base in Southern California while observing and collecting data for live fire combined arms training of USMC units.

For more information about the BASE-IT project, please visit:
<http://www.movesinstitute.org/base-it/>