



**1) LIDAR Truck/Panoramic Augmented Reality for Persistent Information in Counterinsurgency Environments (PARPICE) – Mathias Kölsch**

Abstract – Panoramic Augmented Reality for Persistent Information in Counterinsurgency Environments (PARPICE) A system for providing comprehensive situational awareness for vehicle crews.

The focus of this research and prototype system development is to integrate spatially related data into a synthetic view of the outside environment for use by vehicle commanders, via a visually augmented, spherical video, indirect vision system.

Former IED locations, street names, building and inhabitant information as well as intelligence data will be fused with the video displays of the indirect vision systems of next-generation combat and patrol vehicles such as BAE's Bradley. This permits terrain-associated knowledge to persist in-place on the battlefield.

**2) Using Robotics and Enhanced 3D Visualization to Modernize the Expeditionary Warfare Demonstrator (EWD) – MAJ Chris Fitzpatrick**

Abstract – The Expeditionary Warfare Demonstrator located aboard NAB Little Creek, VA was constructed in 1953. It has been used to demonstrate doctrine, tactics, and procedures for all phases of amphibious operations. With only one major upgrade in the last 56 years, the EWD is losing its viability as a training tool for today's technically savvy Sailors and Marines. This thesis investigates the usage of robotics and wireless communication to replace the current EWD ship models controlled by a pulley system. It also expands the current display capability to worldwide coverage using X3D Earth.

Sponsored by SPAWAR and PMTRASYS

**3) Integrating Intelligence Activities and Building Teams with the Infantry Immersive Trainer – MAJ Craig Schwetje**

Abstract – Across the Marine Corps, infantry squad leaders lack an accessible simulation center for training their squads for a firefight. These virtual combat experiences would prepare fire teams and squads to accomplish the mission by integrating individual and fire team tasks at the squad level. The simulation center must be cost effective and robust enough to create a virtual environment that replicates the asymmetrical battlefield we face today. This thesis was set out to examine whether incorporating the well structured intelligence briefs and debriefs within a Squad Planning Operations Center (SPOC) supported by suitable technologies improved the training that was conducted within an infantry immersive training environment.

**4) BASE-IT: Human Posture Recognition of US Marines – Mathias Kölsch**

Abstract –Real-time human body posture recognition is of increasing importance to training and operations of the US Marine Corps. (Continued on Next Page)



#### **4) Continued (BASE-IT: Human Posture Recognition of US Marines – Mathias Kölsch)**

Abstract (Continued) – This article details the algorithms and implementation of a library that we built to this purpose. It requires prior person detection and then calculates overall stance, torso orientation in four increments and head location and orientation based on individual frames. A syntactic post-processing module takes temporal information into account and smoothes the results over time while correcting improbable configurations. We show accuracy and timing measurements for the library and its utilization in a range instrumentation application.

#### **5) Training Transfer Study of Virtual Battlespace 2 – MAJ Ben Brown**

Abstract – This research endeavors to evaluate the training effectiveness of a particular proprietary Marine Corps first person view tactical trainer called Virtual Battlespace 2. Specifically, the project examines squad level tactical maneuver of a combat convoy in a semi-permissive environment. Performance at the convoy movement course at 29 Palms, CA serves as the metric for the study. Research also seeks to determine the extent to which the training of the simulation controller impacts the effectiveness of the simulation.

Sponsor – ONR

#### **6) A Locomotion Interface to Virtual Environments based on Natural Walking - Xiaoping Yun**

Abstract – This project develops a locomotion interface to virtual environments that allows users to navigate a virtual environment by naturally walking in any open space such as in a lab, hallway, or parking lot. The interface uses foot-mounted inertial sensors to track gait cycles and thus generate inputs to virtual environments. It provide a highly immersive training experience by correlating locomotion in the virtual environment and the real world. It is portable and can be deployed anywhere without the need of infrastructure support.

Sponsor – NMSO

#### **7) Peace Support Operations Model (PSOM) and Battlespace Terrain Reasoning and Awareness (BTRA) Battle Engine (BBE) – Curt Blais**

Abstract – Peace Support Operations Model (PSOM) is a computer-assisted game for planning and exercising missions in a multi-player environment. The game is concerned the level of popular support for each faction in a scenario based on the actions of those factions. The MOVES Institute is examining model design and outcomes as part of an effort to define a methodology for validating Irregular Warfare models. The Institute is also investigating the use of PSOM as an instructional aid for command staffs prior to deployment. (Demo and Discussion 4:30-4:55pm and 5:30-5:55pm)

Abstract – Battlespace Terrain Reasoning and Awareness (BTRA) Battle Engine (BBE) is a planning tool for defining and evaluating friendly and enemy courses of action. The MOVES Institute is being tasked to examine the analytical validity of the model's data representations and computed battle outcomes, including execution of genetic algorithms to explore the space of friendly and enemy courses of action to compare against human-generated courses of action. (Demo and Discussion 5:00-5:25pm and 6:00-6:30pm)



**8) Human Social Culture Behavior Modeling – Chris Darken**

Abstract – Human Social Culture Behavior (HSCB) modeling is a new frontier for DoD M&S. Its importance for supporting non-kinetic operations through analysis and training would be difficult to overstate, as would the challenges of creating the needed models. We will informally discuss current work in this area that is already in progress at NPS and a new initiative that is in start-up mode. Please come and share your interests and observations!

**9) Realistic Reflections for Marine Environments in Augmented Reality Training Systems (AR-VAST) – LT Jason Nelson/ Kölsch**

Abstract – Realistic Reflections for Marine Environments in Augmented Reality Training Systems.

Problem: Pasting virtual objects into real maritime/ocean environments looks unnatural.

Solution: Create reflection and shadows of virtual object onto the real ocean surface.

Difficulties: Water geometry and reflective properties are unknown, and change over time with ocean state (wind, waves).

Applications: Current application is in Augmented Reality Virtual At Sea Trainer (AR-VAST). Ideal for training applications where added realism to scene can add to training effectiveness.

**10) Chromakey – Augmented Virtual Environment (CHRAVE) – Joe Sullivan**

Abstract – The Chromakey Augmented Virtual Environment converts any vehicle into a training platform. This appended training system uses chromakey technology to replace the operator's out the window view with computer generated imagery. This system provides deployable, affordable and immersive training with minimal footprint (normally the existing vehicle) and learning curve for the operator. Training transfer studies with novice (Cat I) helicopter pilots at HS-10 and HMM(T)-164 have demonstrated the efficacy of the training system and provided key insight into acquisition of critical helicopter pilot knowledge, skills and abilities.

Sponsor – ONR

**11) Eye Scan Analysis for Terrain Navigation Training – Joe Sullivan**

Abstract – Improving instruction in simulation by providing insight into trainee's cognitive state. While much of simulation design hinges on representational fidelity, much less attention has been paid to *how* the simulation is used. How do we make use of capabilities and features available exclusively in Virtual Environments?

The aim of this project is to use a comparison of expert and novice's scan patterns to cue instructors for selection and timing of feedback. Can we use scan pattern to determine if a trainee is selecting and effectively applying an appropriate navigation strategy? Does this improve the effectiveness of the simulation?



**12) Virtual Sand Table – Amela Sadagic**

Abstract – We will demonstrate a novel display platform called Virtual Sand Table, a unique combination of a traditional media (three-dimensional physical artifacts) and a contemporary form of data presentation (digital simulation). The domain in which we will demonstrate the work of this platform is the urban warfare operations, however the same platform and the same concepts can be deployed in a variety of other domains. The primary objective of Virtual Sand Table is to enable a military team discussion during their mission rehearsal, and present both the environment and terrain data, as well as dynamic data sets that illustrate unit's movement on the terrain. A Magic Marker capability has also been added to allow for sketching unit's planned movement and to mark the potential danger zones identified in the environment. The visual Sand Table has been developed as a part of BASE-IT project by our colleagues from University of North Carolina at Chapel Hill. The rendering of 3D environment and a simulation of the pre-recorded dynamic data sets are planned to be done by the MOVES Delta3D team.

Sponsor – Office of Naval Research (ONR)

**13) Delta 3D: Advanced Rendering in Delta3D, Maritime Operations, Inverse Kinematics Animation, Port Builder – Perry McDowell, et al.**

**Advanced Rendering in Delta3D:** Abstract – This demonstrates advanced rendering performed by Renaissance Sciences Corporation (RSC) in the Delta3D game engine. RSC and MOVES worked together to integrate advanced physically based rendering of atmospheric conditions and the multiple visualization systems (including NVG and FLIR) of RSC's Synthetic Environment Radiometry Engine (SERE) and Interservice Common Sensor Model (ICSM) into a Delta3D environment.

Sponsor – NAVAIR (PMA-205)

**Maritime Operations:** Abstract – This is the prototype of a training application designed to both train and socialize personnel from non-located agencies, such as the Coast Guard and local police systems. The game is networked, which each player acting as either operations center duty officer or boat commander while searching for a boat which is suspected of bringing a weapon of mass destruction into the U.S.

Sponsor – SRI/NAVAIR

**Inverse Kinematics Animation:** Abstract – Traditional inverse kinematics systems are riddled with issues that make their use in real-time simulations prohibitive. Foremost, the computational costs associated with these methods are too high to make their widespread use practical. Furthermore, their usage typically results in the synthesis of animations that fail to impart the sense of weight and timing that would be present in either motion captured or artist created forward kinematic animation. This is a byproduct of using a mathematical technique to solve an artistic problem. A new method we have developed succeeds in overcoming these shortcomings. By using a database of predefined animation poses, a new animation can be derived to achieve the desired pose. At its simplest, the technique can be used to manually control a character's gaze for simulating environmental awareness as well as directing a character's gun to point in the desired direction for aiming or shooting. It does all of this and more without burdening the CPU and can be easily enhanced using hardware skinning for optimal performance.



**Port Builder:** Abstract – As part of a training application for the Federal Law Enforcement Training Center’s Maritime Division in Charleston, we are adding the capability to build port areas using the Delta3D world building tool, STAGE. This has led to several improvements in STAGE, including:

- Moving to a plug-in based architecture, allowing anyone to add functionality to STAGE with significantly less difficulty.
- Fence builder – the capability to build linear objects, such as fences, walls, pipelines, etc. in the world simply by pointing and clicking
- Building builder – the capability to modify buildings to the correct dimensions while maintaining a realistic level of appearance.
- Multiple objects defined in a single object for inclusion in multiple worlds.

Sponsor: Federal Law Enforcement Training Center

**14) Achieving Simulator Interoperability Using a Multiplayer Online Game Architecture – LCDR Tariq Rashid**

Abstract – Lately, finding military applications for Massive Multiplayer Online Games (MMOGs) has received much attention. Typically, the commercial MMOG environment is dominated by role-playing games (RPG). This is a function of the economics of MMOGs. There is nothing inherent in MMOG architecture that requires them to be RPGs. The inherent characteristics of MMOGs are scalability, persistence, and common environment state. It seems reasonable to conclude that such properties could be useful for any purpose.

We use the open-source game server Project Darkstar to implement a persistent, scalable environment. At the current stage of development we have implemented a simple message passing scheme wherein the messages are DIS Entity State Protocol Data Units (espsdu). Various commercial and military simulators have been used as clients to connect to this server.

**15) Modeling & Simulation for Customs and Border Patrol Analysis – Arnold Buss**

Abstract – Customs & Border Protection’s mission is to secure U.S. borders. One emerging threat to this mission is tunnels. US Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) Monterey (TRAC-Monterey) is partnering with the Naval Postgraduate School to help analyze proposed systems for the detection of new and existing tunnels. In this portion of an interdisciplinary effort, Modeling & Simulation (M&S) will be used to analyze the performance of different proposed sensor systems and their configuration. Recent work on the JDAFS (Joint Dynamic Allocation of Fires and Sensors) model will be leveraged; using input from vendors, field experiments, databases, and subject matter experts, the different sensors and defensive systems will be modeling in JDAFS. Using a simulation model, different scenarios will be analyzed and the proposed systems compared. The simulation model will be validated against known outcomes, historical data, and input from subject matter experts. Additionally, to the greatest extent possible, the simulation will be validated against known analytic models.

Sponsor - TRAC Monterey



### 16) Savage Lab: A Series of Demonstrations...

- A demo showing interoperability between the X3D Edit DIS Sender via OpenDIS, Delta 3D via OpenDIS, an iPhone and XPlane via the Darkstar server (never been done before)
- A Web-Distributed Physically Based Modeling demo
- An Efficient XML Interchange demo
- XML Security for Coalition Operations demo
- An Expeditionary Warfare Demonstrator using Sunspot Robots and the Army Model Exchange
- A demo of the Maritime Information Exchange Model Editor