MSIAC M&S Newsletter

February 27, 2008


*Welcome to the February/March 2008 Edition of the Modeling and Simulation Information Analysis Center (MSIAC) M&S Newsletter. In this issue you will find a variety of M&S articles and events from communities enabled by M&S within the Department of Defense and beyond. We hope you enjoy the February/March Edition and look forward to your comments.*

*The MSIAC notes that the wordings in the excerpts do not always correspond to official DoD usage, but that the full articles available through the links provide valuable insight into the applications of M&S technologies throughout the community.*

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*The following article describes the M&S Steering Committee's Strategic Vision for DoD modeling and simulation.*

***THE WAY AHEAD FOR DoD M&S***

The Department of Defense (DoD) has undertaken a major restructuring of its Modeling and Simulation (M&S) management approach and is now employing a "board of directors" process to managing its M&S activities. The board, known as the M&S Steering Committee, consists of the leads for the four Services, the Joint Staff, and six newly established Communities enabled by M&S composed around distinctive M&S issue areas: acquisition, analysis, experimentation, planning, testing, and training. Initial activities include improved visibility and collaboration across communities and a reduction in unnecessary duplication. Another focus is improving the Department's interactions between it and other government agencies, international partners, industry, and academia.

To support this newly developed management structure, the Department is implementing its "Strategic Vision for DoD Modeling and Simulation." This vision is to "empower DoD with modeling and simulation capabilities that effectively and efficiently support the full spectrum of the Department's activities and operations."

The goals of the M&S strategic vision are to provide:

- Shared accessible standards, architectures, networks and environments,
- Tools and authoritative data that are available to credibly support the full range of DoD interests,
- Enterprise-wide policies that promote the use of common capabilities and minimize unnecessary duplication
- Management processes that promote sharing, reuse, and cost effective development of M&S tools and data,
- A well-trained workforce

To achieve the vision and implement the specific goals set forth by the M&S Steering Committee, a FY2010 "Enterprise-wide" Common and Crosscutting Business Plan is being developed in coordination with the DoD Components and published under the authority of the OSD, AT&L. This business plan will serve as the basis for identifying DoD common and crosscutting M&S needs, as well as potential redundancies. It will also include an assessment of current M&S capabilities and gaps, a status report on current M&S efforts, and a roadmap that delineates the management, investment, and technical strategies required to achieve the DoD M&S Strategic Vision.

With greater DoD community and Service coordination enabled by strategic planning and based on the decisive vision, the Department is moving forward through enhanced collaboration on its M&S initiatives and projects to leverage its significant investment in M&S.

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*The following excerpt from an article about a combat medics simulation originally appeared in the National Defense Magazine, February 2008 issue.*

***"M*A*S*H" MEETS "STAR TREK" IN SIMULATION FOR COMBAT MEDICS***

*WALTER REED ARMY MEDICAL CENTER, Md. —*

Inspired by a concept found in the “Star Trek” television show, scientists and videogame designers have joined forces to build an immersive simulation that will replicate realistic battlefield and field hospital scenarios to train combat medics and surgical teams.

The goal is to combine 3-D images, Hollywood-style effects, props and live actors, and a range of computer-controlled medical mannequins into an integrated “holodeck-like” experience, said Alan Liu, director for virtual medical environments at the National Capital Area Medical Simulation Center.

The simulator — called the wide area virtual environment, or WAVE — will consist of two pods about 20 feet in diameter that are connected by a 15-foot long corridor. Nine-foot tall and 12-foot wide movie screens will surround the resulting 1,000-square foot space and will display stereoscopic images that trainees wearing polarized glasses will see. During exercises, participants will have to hunt for live “victims” among the humvees, boxes, debris and other props scattered on the backlit floor.

A speaker system will deliver directional sound effects, such as flying bullets, screams and explosions, while smoke-generators and other special effects will create the appropriate levels of chaos for the scenarios.

“You will be completely immersed inside a video game,” said Liu.

A team of up to 18 people can train together in the simulation during a sustained period. The idea is to use one pod to simulate a single phase of a scenario, such as the aftermath of an explosion, and then have the team evacuate casualties along the corridor to the other pod, where the next scenario, such as a helicopter transport, would be ready to play.

Once all the actors have left the first pod, it would be reconfigured for a third scenario, so that by the time the individuals in the helicopter “land” and move back through the same corridor, they would enter a completely different scene, this time that of a field hospital. Click here for the complete article from National Defense Magazine.

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*The following excerpt of an article about computer models providing intelligence to the Army originally appeared in ScienceDaily.*

***COMPUTER MODELS TO PROVIDE BETTER INTELLIGENCE FOR ARMY***

*ScienceDaily (Feb. 14, 2008)* — Adversaries the U.S. currently faces in Iraq rely on surprise and apparent randomness to compensate for their lack of organization, technology and firepower. If one could find some method to their madness, however, the asymmetric threat could be made significantly less serious, according to scientists at The University of Alabama in Huntsville.

These UAHuntsville scientists hope to help provide a better intelligence posture on these asymmetric threats by developing computer models that identify trends in the behaviors of the adversaries.

UAHuntsville teamed with a Virginia-based company, Mymic LLC, to receive an Air Force contract for the six-month study.

“One way to combat these attacks is to identify trends in the attackers’ methods, then use those trends to predict their future actions,” said UAHuntsville researcher Wes Colley said. “Some trends from these attacks show important day-to-day correlations. If we can draw inferences from those correlations, then we may be able to save lives by heightening awareness of possible events or changing the allocation of our security assets to provide more protection.”

A four-step process was used in this research, according to Colley. Researchers reviewed the behavior signatures of terrorists on 12,000 attacks between 2003 and mid-2007 to calculate relative probabilities of future attacks on various target types.

The four steps were: create a database of past attacks; identify trends in the attacks; determine the

correlation between attacks and use analysis to calculate the probabilities of future attacks and their location.

The goal was not to try to predict exactly when and what type of attack was going to happen next, but rather, which target types were more likely to be attacked next, according to Colley. “Our research won’t predict that an attack targeting civilians at a public market will take place tomorrow at 9:30 a.m.”

Instead, he said military commanders could make choices from various options to reduce risk. “A commander with limited intelligence and security assets can concentrate resources at those locations that have higher probabilities of attack.”

This study considered two aspects of each attack: the target of the attack, and the time of the attack. Using careful statistical techniques, the team identified correlations between attacks on various target types as a function of time. For instance, if there were an attack on a government target, that somewhat increased the chance of an attack on a police target over the next several days. Click here for complete article from ScienceDaily.

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*The following excerpt from an article about simulating terrorists originally appeared in the Training & Simulation Journal Online, December 2007 issue.*

***RED FORCES GET SMART***
***Advanced AI adds unpredictability to simulated terrorists***

In the early-evening bustle of a simulated Mideast city — amid a cacophony of distractions from congested streets, the crowded casbah and competing prayer calls from muezzin — computer-generated terrorists embark on multiple missions against occupying security forces.

Within 30 minutes, the first bits of actionable intelligence reach the sector commander, whose forces have maintained relatively high levels of alert over a period of days. Details, however, are scarce and incomplete.

One operation involves a lone shooter planning to attack deployed troops at one of the half-dozen checkpoints surrounding the city. In another, a six-man squad is en route to a pickup point, where a short-range rocket awaits transport and launch beyond city limits.

Conflicting reports about one, perhaps two, suicide bombers on the move are quickly discredited as decoy-generated disinformation. And so, the decision comes down to arrest or kill the terrorists in play.

The race against time begins.

In this high-fidelity counterterrorism training scenario, blue force defenders employ all available assets in their hunt for urban enemies. Unmanned aerial vehicles and helicopters are called in to scour alleyways and busy streets, while well-armed patrols and undercover operatives maneuver their way along all possible avenues of attack.

It’s the quality and capabilities of foes — red forces — that distinguish this daunting, computer-generated exercise from other distributed simulations. Very quickly, defenders discover they’re not only locked in a race against time, but in a battle of wits against uniquely empowered, fully autonomous targets whose individual as well as collective thoughts, actions and even emotions defy prediction.

Created by Israel’s Elbit Systems around artificial intelligence designed by Bar Ilan University’s computer science department and the Multidisciplinary Brain Research Center, synthetic red forces — known as Smart Entities — think and behave like human beings. In addition to their human-like cognitive capacity, these virtual fighters possess the operational knowledge and clandestine survival skills of real terrorists, whose experiences and feelings have been recorded in thousands of hours of interrogations and debriefings by Israel’s security services. Click here for complete article from TSJ Online.

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*The following article about NASA's Vertical Motion Simulator originally appeared on the NASA Simlabs website.*

***CREW EXPLORATION VEHICLE HANDLING QUALITIES EXPERIMENT AT AMES' VERTICAL MOTION SIMULATION***

SimLabs continues to examine critical issues related to space vehicle handling qualities in support of NASA's Exploration Systems Mission Directorate (ESMD). Handling qualities describe the ease and precision with which a pilot can execute a flying task and are affected by numerous issues, including vehicle response, guidance cues, and inceptors.

In this study, researchers focused on the Crew Exploration Vehicle (CEV), with specific emphasis on the relationship of the control system response to control power. Additionally, the effects of camera delay during docking were examined.

A Vertical Motion Simulator (VMS) cab has been customized to resemble the cockpit of a generic space capsule, representative of the CEV. In-house graphics specialists created a visual database of the International Space Station that depicts the new docking mechanism to be utilized by the CEV, known as the "Low Impact Docking System," or "LIDS."

Test subjects—including current and former astronauts and NASA test pilots—flew several docking scenarios wherein the vehicle's translational control system was varied (continuous jets, pulse jets, proportional, or discrete) and combined with either zero, low, or high cross-axis coupling. Such coupling means that the commanded thrust vector could produce unintended motion effects.

It is anticipated that the CEV will have a display in the cockpit which shows the centerline camera view during docking. Super-imposed guidance aids should make the docking task easier. However, excessive delay of the camera feed could be detrimental to the operation. Researchers experimented with delays of up to several seconds.

At the end of each simulation run, pilots provided Cooper-Harper ratings and Task Load Index ratings. Researchers are evaluating the data and will use their findings to provide design guidelines to NASA's Exploration Science Mission Directorate, ultimately benefiting the space vehicle program for several generations to come. Click here for the original article from the website of NASA Simlabs.

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*The following excerpt is from an article about mathematical models that originally appeared in the National Defense Magazine, December 2007 issue with an additional quote by Dr. George Stone on the complexity of M&S. "In order to venture into a simulation endeavor, the age-old wisdom applies that one should have a problem to fix first, and then use the right tool, of which simulation is just one tool in the toolkit. Not everyone is able to be an expert in Modeling and Simulation. In fact, the more one learns about M&S, the more one realizes how much there is to know in this field."*

***MATHEMATICAL MODELS: THE LATEST WEAPONS AGAINST URBAN INSURGENCIES***

War planners for decades have used computer simulations to prepare for future battles.
The Iraq experience, however, convinced commanders that they need new and improved ways to cope with the complex social environments and insurgent behaviors that were poorly understood before U.S. forces invaded Iraq.

"The Defense Department is asking for models of social agendas, of social behaviors," said Rob Goff, manager of defense operations at Alion Science and Technology Corp. The company develops simulations and models for military war games.

"A lot of work is going on in that area," said Goff.

Simulations that require accurate representations of

foreign cultures are tough to do, he said. The challenge is even harder when the models have to predict the interaction between different cultures in harsh conditions, Goff noted.

Military leaders, for example, may want to know what happens when two cultures are thrown into a poverty stricken city — how they would relate to each other based on religion, economics, ethnicity and other factors.

"The hard part is defining the social behaviors among cultures," Goff said. To make simulations believable, they have to truly reflect the characteristics and nuances of specific ethnic and religious groups.

A recent example of the difficulties of modeling social behaviors is a pandemic simulation that Alion created for the Office of Naval Research. "We didn't think it would be that hard, but it is turning out to be quite a chore" because of the complexities of human behavior," Goff said. "Lots of things go into modeling the effects of a pandemic episode other than people catching the bird flu.

"When you try to lay all that out, and make it come true in a simulation, the multiplying effects are just so hard to predict … We know people may die. But what will happen to the water supply, the food supply, the availability of hospital beds? It's a tremendously tough database to build."

Simulations that can help military commanders anticipate how foreign cultures react to specific actions are in high demand, said George Stone, an Alion scientist. "The Defense Department is setting aside funding for these technologies," he said. "A lot of the work is pretty new and everyone is just trying to understand it." Click here for the complete article from the National Defense Magazine.

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*This following article about a new training center opening in North Carolina originally appeared in the Air Force Times News.*

***STRIKE EAGLE TRAINING CENTER OPENS IN N.C.***

A new F-15E mission training center opened Dec. 21 at Seymour Johnson Air Force Base, N.C., a Boeing spokeswoman said Wednesday.

The facility, which Boeing built and will operate for the Air Force, provides aircrews with high-fidelity training without the costs of using operational aircraft for training, according to the release.

Air Force officials have said they are cutting the number of training hours pilots can fly by 7.5 percent this year and will rely more heavily on simulators for training.

The new Seymour Johnson facility includes two high-fidelity, dual-cockpit, 360-degree F-15E simulators, according to a Boeing press release dated Tuesday.

The new F-15E simulators — equipped with a head-tracked, area-of-interest display visual system — can be operated individually or linked to provide two- or four-ship training scenarios, according to the press release.

Boeing will open another F-15E mission training center in the near future at RAF Lakenheath in Britain, according to the release, and Mountain Home Air Force Base, Idaho, and Seymour Johnson each will receive a second center this year. Click here for original article from Air Force Times.

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*The following excerpt from an article about a new model of earth's core originally appeared in ScienceDaily.*

***RUBIK'S CUBE IN CENTER OF EARTH? COMPUTER SIMULATIONS SUPPORT NEW MODEL OF EARTH'S CORE***

*ScienceDaily (Feb. 11, 2008)* — Swedish researchers have presented evidence to support their new theory about the structure of the earth's core. The findings may be of significance for our understanding of the cooling down of the earth, and

of the stability of the earth's magnetic field.

It has long been known that the inner core of the earth, a sphere consisting of a solid mass with a radius of about 1,200 km, is mainly made up of iron.

However, seismic observations have shown that elastic waves pass more rapidly through this core in directions that are parallel to the earth's axis of rotation than in directions parallel to the equator-a phenomenon that has not been previously explained. At the high temperatures that prevail in the core of the earth, these waves should pass at the same speed regardless of their direction.

In the present study, scientists from Uppsala University and KTH present an explanation for this puzzling characteristic. The new publication in Science is part of a series of articles published by the same research team in Nature and Science.

Initially, in 2003, they published strong theoretical proof that the earth's core assumes the so—called body—centered cubic crystal structure at high temperatures-a structure that despite its high degree of symmetry evinces a surprisingly high level of elastic anisotropy, that is, its elastic properties are contingent on direction. This theory about the crystal structure directly contradicted the then prevailing view, but since then the theory has found both experimental and theoretical support.

In this new study the researchers present simulations of how seismic waves are reproduced in iron under the conditions that prevail in the core of the earth, showing a difference of about 12 percent depending on their direction—which suffices as an explanation for the puzzling observations. First the trajectories of movement were calculated for several million atoms in strong interaction with each other. On this basis, the scientists were then able to determine that the progress of the sound waves was actually accurately described in the computer—generated model for iron under the conditions prevailing in the core of the earth. Click here for complete article from ScienceDaily.

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*The following is an article about the SpringSim Conference which will take place in April 2008.*

***SPRING SIM BREAKS NEW GROUND***

*First Canadian Spring Simulation Multiconference, featuring tools for visualization and simulation, runs from April 14 - 17, 2008 in Ottawa, Canada.*

The annual Spring Simulation Multiconference (SpringSim 2008) is to be held in Ottawa, Canada for the first time in its long history. SpringSim is one of the oldest events in the field, including the 40th edition of the Annual Simulation Symposium. In recent years it was held in locations such as Norfolk, VA and the Von Braun Center in Huntsville, AL. The conference is organized by The Society for Modeling and Simulation International and co-sponsored by the ACM/SIGSIM (and IEEE).

This International event is comprised of different symposia, and organizers come from a variety of professional organizations around the world, such as: US ARMY - RDECOM - ARDEC, Westinghouse Savannah River Company, SAGETEA Group, The Society for Modeling and Simulation International, ACM/SIGSIM, NASA Ames Research Center, RTI International, USDOE Ames Laboratory and Duval Hill Incorporated.

The conference has continuously advanced and shared knowledge on diverse methodologies such as Agent Directed Simulation, Service-oriented Computing and Simulation, Animations/Virtual Reality, Web-based Modeling and Simulation, Distributed Systems and Databases, Clusters and Grids, Simulation-based Performance Analysis, Simulation Languages, Tools, and Environments. Likewise, the application of simulation in advanced fields is one of the main topics of the conference, including VLSI Circuits, Multiprocessor Architectures, Simulation of Parallel Processing Systems, Networks (including Sensor Networks, Wireless and Mobile Networking), Traffic Modeling, Routing and Mobility, Energy-aware Schemes for Wireless Networks, Cognitive sciences, Biomedical applications, and Military/Defence applications. At this year's conference, this established track record of topics will be built upon further – by both exhibitors

and presenters – in an exciting new venue and featuring new interactive formats for networking and information exchange.

On the presenter side, Spring Sim 2008 demonstrates the advancement on its traditional topics with symposia along with a lineup of exhibitors/exhibits.

Each symposium will be completed with an exciting lineup of Plenary Speakers in the individual field of each symposia. This year's conference Key Note will be given by Prof. Chris M. Herdman, Director of Carleton University Centre on Visualization and Simulation (VSim). His presentation will be on Simulation and Cognitive Engineering: The Use of Synthetic Environments to Design and Evaluate Human-In-The-Loop Systems. In his talk, he will introduce VSim's multidisciplinary approach, which integrates research in the human sciences with engineering. He will precent advances on Vsim's Advanced Cognitive Engineering (ACE) Lab, where synthetic environments of different fidelity are engineered to support the design and evaluation of human-in-the-loop systems. This includes an HLA-enabled helicopter (CF-146 Griffon), a general aviation simulator (Cessna 172 type) and Unmanned Air Vehicle (UAV) simulators, as well as an automobile simulator. In this talk he will outline a Cognitive Systems framework that we use to guide the research in the ACE lab and he will draw upon specific examples from our aerospace and automotive research to illustrate how simulation plays a critical role in advancing human-in-the-loop systems.

Conference applications are relevant to a diverse range of socially beneficial fields such as education, civil planning, medical, security and business. This year organizers are expecting 300+ attendees, 207 different presentations from different fields of academia, and representatives from government, military and industry. Click here for website details.

***MSIAC M&S NEWSLETTER***

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