MSIAC M&S Newsletter

March/April 2010

Welcome to the March/April 2010 edition of the Modeling and Simulation Information Analysis Center (MSIAC) M&S Newsletter. This issue presents 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 March/April edition and look forward to your comments.

Although the wordings in the excerpts may not always correspond to official DoD usage, the full articles available through the links provide valuable insight into the applications of M&S technologies throughout the community.

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ISSUE SPOTLIGHTS

Simulator improving driving skills

Simulator combats stress

Next generation of immersive training technologies

New model of optimizing mission control

Department of Homeland Security develops evacuation simulation

Integrating flight management systems

3D model of Mars

DoD Modeling and Simulation Staff Officer Courses (MSSOC)

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The following article on a new simulator sharpening driving skills on unpaved roads, originally appeared on the Department of Defense website.

NEW SIMULATOR SHARPENS SKILLS ON UNPAVED ROADS

WASHINGTON, March 12, 2010 - Because one-third as many soldiers are killed in vehicle accidents as in combat, researchers are developing a training simulator that creates environments mirroring the challenges service members face behind the wheel.

"Our work is focused on how wheeled vehicles behave on gravel, loose stones, mud, snow, and ice because these are surfaces where military vehicles frequently operate," Barry Coutermarsh, a research engineer with the U.S. Army Cold Regions Research and Engineering Lab in Hanover, N.H., said in a March 10 interview on the "Armed with Science: Research and Applications for the Modern Military" podcast. Coutermarsh said today's heavily armored vehicles have a higher center of gravity that makes them more susceptible to rollovers.

His colleague at the Lab, Sally Shoop, said one key to improving safety is allowing drivers to exercise maneuvering in bad situations so they build up a muscle memory that can react automatically.

"One of the really important things to do in avoiding an accident is to look at where you want to go, not at the obstacle you might hit," she said.

Professional race car drivers who help to conduct traditional Army driver training first came up with the idea that more soldiers would benefit if a portable, military-optimized driving simulator was available. The research program to develop that simulator is called SAVE, which stands for Synthetic Automotive Virtual Environments.

The first development phase involves capturing real data from specially instrumented vehicles to record every bit of contact with the ground. "It's all about where the tire meets the road for real vehicles," Shoop explained, "because that's where the forces transmit from the terrain to the vehicle." Programmers feed collected data into the simulator.

So far, test results have been promising. Shoop and Coutermarsh are seeking additional funding to expand trials.

"It would be nice to get some soldiers into the simulator and get their input," Shoop said. She added that younger soldiers who are attuned to video games seem to enjoy learning in virtual environments. "Hopefully, we can train them to drive a vehicle better and they can have fun at the same time," she said.

Beyond military applications, the researchers said the simulator could pay off in added safety for all road vehicles and that it could provide data to improve the way gravel roads are constructed. For the original article from the Department of Defense, click here.

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The following article on a simulator helping reduce combat stress, is an excerpt from an article that originally appeared in The San Diego Union-Tribune.

SIMULATOR HELPS COMBAT STRESS
Pyrotechnics, holograms inhabit 'mixed reality'

Their mission is to meet the village leader and assess his needs, but this being Afghanistan and war, Sgt. Anthony Garbo hands out the ammunition. Then his Marines disperse, past a plot of red poppies and slabs of meat hanging in the bazaar, the Muslim call to prayer keening in the distance.

The last troops who pushed through this area were eviscerated by a rocket-propelled grenade. Undaunted, the squad from the 1st Battalion, 7th Marine Regiment aims to win hearts and minds.

The maze of narrow, sand-strewn alleys and dun-colored adobe homes quickly fills with villagers who pelt the Marines with rocks. When Garbo finally meets the village elder, he places his hand over his heart and says, "We are trying to help you guys as best we can."

There is no time for tea, though.

Shots ricochet through the village. A woman shrieks and a man bellows "Allahu akbar" - "God is great." Garbo and his squad pile into the alley to hunt for the gunmen. Dozens of hidden cameras record the action.

Inside the Marine Corps' Infantry Immersion Trainer, the bullets are tipped with chalk, the explosions are Hollywood-style pyrotechnics and some insurgents and civilians are computerized holograms. But the weapons are real, and so is the combat stress, the military has found.
Two years after opening the prototype "mixed-reality" simulator - the first Defense Department facility of its kind - in a former tomato-packing warehouse at Camp Pendleton, the Marine Corps is expanding its use of infantry immersion training to help small units make better decisions under stress.

The simulated battlefield scenarios also may help inoculate troops against debilitating psychological effects of war-zone chaos, including post-traumatic stress disorder, Navy research indicates.

The 32,000-square-foot Camp Pendleton facility, which opened in late 2007 as a pseudo-Iraqi city block, was remodeled last month to look like the Afghan village of Now Zad. Homes were resurfaced to resemble the area's mud structures, and furniture was swapped for simple rugs and mattresses – just as troops from the 1st Marine Expeditionary Force that took

command in Helmand province last week might encounter.

The mixed-reality trainers incorporate physical and virtual props and players. They are more realistic than pure virtual reality, but less costly than city-sized, mock combat sets involving entire battalions and hundreds of actors like those used for Mojave Viper exercises at Twenty Nine Palms. For the complete article from The San Diego Union-Tribune, click here.

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The following article on the next generation of immersive training technologies, originally appeared in the Training and Simulation Journal (TSJ) Online.

NEARER THE HOLODECK

It is April 2009. Not far from Los Angeles International Airport, I am in the giant Hughes Aircraft hangar, which once housed the Spruce Goose and is now home to the crew and heavy-breathing computing power of James Cameron's virtual movie set. Holding a large flat-panel computer screen in front of me, I step forward into a virtual world imagined by Cameron more than a decade ago and now brought to life by Peter Jackson's Weta Digital, Glenn Derry, Vince Pace and the rest of the crew of the movie "Avatar."

As I walk through the football-field-sized space that Cameron calls "the volume," my point of view on the screen moves with me, as if I were carrying a window through which I view this fantastic world. Huge ships come in to land on the lush Pandora moon, while soldiers in mechanized exoskeletons (called AMP suits) move past without acknowledging my presence, their eyes fixed on the techno-color jungle beyond. In the distance I see Na'vi avatars walking. Is that avatar Sigourney Weaver's?

It is difficult, after my 19 years in computer gaming and interactive 3-D computer graphics, to shake the feeling that history is being made here, that great mechanisms are shifting and a new order will soon settle into place. It is widely recognized that Cameron has changed movie making forever.

But this technology is also reshaping the fundamental interactions between humans and the worlds — real and virtual — in which we exist. The motion capture systems, stereoscopic 3-D cameras and virtual world compositing techniques in this hangar will transform how human capabilities evolve in the information age.

With my right thumb, I toggle a small joystick on the "camera," and immediately my virtual view flies up and over the trees to provide me with a wide panning shot of the whole scene. This is just a taste of what it was like for Cameron to have control over this virtual world, to direct live actors and composite them into the world, viewing and controlling every shot, while also seeing it simultaneously in a separate 3-D stereoscopic view. It feels perfectly reasonable to call this level of control godlike.

When I walk back to the live set where Stephen Lang is filming his epic battle, things look a bit more familiar. There is the actor in his large exoskeleton prop, camera pointing at him and green screen behind, gaffers adjusting the lights. I have seen this before. I walk over to where Derry and his team of computer gaming programmers are monitoring and controlling the real-time 3-D environment, and that looks comfortably familiar to my experienced game developer gaze. The machines are large Dell desktops. I see they are using Autodesk motion builder and a custom game engine.

This team would be completely at home in any game design studio; just as Cameron behind the camera shooting the close-up of Lang's action sequence, even against green screen, looks like a natural Hollywood behind-the-scenes moment. But when the action starts, Cameron becomes electrified, and I realize that something historic is happening. He directs the action, monitors the

camera shot, views the stereoscopic composite image and, afterward, gives direction to the real-time 3-D team to alter the world in small ways to set up for the next shot.

To meet the challenge that U.S. Joint Forces Command Commander Gen. James M. Mattis laid before the entire defense industry at the I/ITSEC 2009 conference in Orlando in December, we will need to do the opposite. We will need to composite live humans into convincing, compelling virtual environments to improve their performance in complex situations in the real world. For the complete article from the Training and Simulation Journal (TSJ) Online, click here.

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The following article on models for unmanned aerial vehicles, originally appeared on the ScienceDaily website.

NEW MODELS FOR OPTIMIZING MISSION CONTROL OF UNMANNED AERIAL VEHICLES

Engineers at Boston University are working on a theoretical approach to improve automated mission control and decision-making for fleets of unmanned aerial vehicles (UAVs).

While unmanned systems currently rely on the automation of low-level functions, such as navigation, stabilization and trajectory, operating these systems is still quite labor-intensive for Air Force pilots given the variable flying conditions experienced by UAVs.

The BU team, led by Dr. David Castañón and Dr. Christos Cassandras, has focused their work on optimizing "mission control," which describes mid-level control approaches that go beyond simply improving stability and tracking trajectories.

"We were interested in automating functions such as partitioning of tasks among members of teams of UAVs,...monitoring the success of the individual activities, and re-planning to accommodate contingencies or failures in executing the planned tasks," explained Castañón.

Automating these functions would let UAVs adapt their actions more rapidly in response to unforeseen events and ultimately require less human supervision.

To date, the team has developed mathematical algorithms that can make nearly optimal decisions under realistic model conditions. Their approach thus far has been based on the need to account for a number of uncertainties requiring complex computations nearly impossible to implement in real-time systems.

"Our research approach has been to exploit classes of models for which fast algorithms can be developed and to extend these algorithms to generate decisions in more complex models that capture the relevant features of the UAV problems of interest," said Castañón. For the complete article from *ScienceDaily*, click here.

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The following article on the Department of Homeland Security (DHS) Program developing an evacuation simulation, originally appeared on the National Defense Magazine website.

DHS PROGRAM DEVELOPS MASS EVACUATION SIMULATION FOR STADIUMS

Sports venues are supposed to be prepared for emergencies — such as a bombing or a lone shooter — that could require a quick evacuation of more than 70,000 fans.

But venue managers “are not training their staffers as well as we would like,” says Lou Marciani, director of the National Center for Spectator Sports Safety and Security. “They’re not doing training exercises,” he says, noting that it’s costly to conduct live drills for events of this magnitude.

Marciani is one of the leading researchers in a project that seeks to fill these training deficiencies. The Department of Homeland Security's science and technology directorate partnered with the University of Southern Mississippi and several other organizations to create a computer program called SportEvac that uses human avatars to simulate the behaviors of panicking crowds in sports stadiums.

"Our goal was to try to find ways to reach security planners and give them a tool suite they can use for practicing these scenarios," says Marciani.

The program can be customized to fit the specifications of individual stadiums. It uses algorithms to predict the behaviors of large groups, and it factors in variables such as irrational, drunken fans and wheelchair-bound spectators.

Managers can determine how long an evacuation would take, how many people would crowd each exit and where signs could be placed to improve efficiency.

The underlying concepts can be applied to evacuation simulations for shopping malls, concert halls and other crowded events, Marciani says.

"This is just the beginning of the capabilities," he adds. "I hope that this modeling is carried over to other areas of critical infrastructure as a gift from the sports world."

In March, developers began testing the software by applying its models to actual stadiums. They're also looking into options for commercializing the software, which they hope to get into the hands of as many stadium managers as possible. For the complete article from the National Defense Magazine, click here.

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The following article on integrating simulation flight management systems (FMS), originally appeared on NASA's Aviation Systems Division website.

INTEGRATING A SIMULATED FLIGHT MANAGEMENT SYSTEM (FMS) INTO THE ADVANCED CONCEPT FLIGHT SIMULATOR (ACFS)

In response to researcher requests for better fidelity in the ACFS in terms of aircraft/FMS navigation capability, SimLabs initiated a multi-phase ACFS upgrade project which recently completed Phase I. A state-of-the-art simulated Flight Management System (sFMS) purchased from GE Aviation was integrated with the current ACFS aircraft model.

The primary Phase I goal was to provide FANS-1/A and Controller-Pilot Data Link Capability (CPDLC) as well as an improved flight model.

The sFMS, which has selectable aircraft performance software options, was configured to interface with a 737-800W model.

The existing ACFS aircraft model (a generic twin-engine commercial transport) was modified to approximate the performance of a 737-800W and provide required inputs to the FMS.

This "fine tuning" of the aircraft model was required to improve accuracy and to eliminate path oscillations when flying in LNAV/VNAV modes; path accuracies of better than 0.1 nautical mile were achieved in this upgrade.

The ACFS cockpit Navigation Display was also modified to use the data format provided by sFMS. This Phase I upgrade provides the basis for future NextGen research on the ACFS, which will enable the evaluation of new data link capabilities, designing and loading custom FMS procedures, evaluating and utilizing the intent databus, and validating published RNAV/RNP procedures. For the original article from NASA's Aviation Systems Division, click here.

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The following article on a 3D model of a Mars crater, originally appeared on the ScienceDaily website.

ENHANCED 3D MODEL OF A MARS CRATER SHOWS UPS AND DOWNS

A dramatic 3D Mars view based on terrain modeling from NASA's Mars Reconnaissance Orbiter data shows "highs and lows" of Mojave Crater.

The vertical dimension is exaggerated three-fold compared with horizontal dimensions in the synthesized images of a portion of the crater's wall. The resulting images look like the view from a low-altitude aircraft. They reflect one use of digital modeling derived from two observations by the orbiter's High Resolution Imaging Science Experiment camera.

This enhanced view shows material that has ponded and is backed up behind massive blocks of bedrock in the crater's terrace walls.

Hundreds of Martian impact craters have similar ponding with pitted surfaces. Scientists believe these "pitted ponds" are created when material melted by the crater-causing impacts is captured behind the wall terraces.

Mojave Crater, one of the freshest large craters on Mars, is about 60 kilometers (37 miles) in diameter. In a sense, it is like the Rosetta Stone of Martian craters, because it is so fresh. Other craters of this size generally have already been affected by erosion, sediment and other geologic process. Fresh craters like Mohave reveal information about the impact process, including ejecta, melting and deposits. For the original article from *ScienceDaily*, click here.

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DoD MODELING AND SIMULATION STAFF OFFICER COURSE (MSSOC) 2010

May 18-20, Orlando, FL
June 22-24, Newport News, VA
August 17-19, Wright-Patterson, AFB, OH

This three-day course provides a broad overview of modeling and simulation (M&S) policy and activities of the Department of Defense (DoD), with discussion of how DoD employs M&S in support of training, analysis, acquisition of new products and systems, test and evaluation (T&E), and experimentation. The course focuses on M&S terms, concepts, applications, and information resources, preparing attendees for positions that require conversancy in these topics. Students will gain familiarity with major M&S concepts, policies, organizations, programs, activities, and issues within the Department of Defense. Continuous Education Units (CEUs) are available for this course. For more information about upcoming MSSOC courses being offered, click here.

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Please visit the MSIAC Calendar for a list of upcoming M&S Events.

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MSIAC M&S NEWSLETTER

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