

EPISODE FIFTY-SEVEN OF "ARMED WITH SCIENCE: RESEARCH APPLICATIONS FOR THE MODERN MILITARY," A DEPARTMENT OF DEFENSE WEBCAST HOST: DR. JOHN OHAB GUEST: DR. ANDREW GORDON, RESEARCH ASSOCIATE PROFESSOR, INSTITUTE FOR CREATIVE TECHNOLOGIES (ICT) AND URBANSIM PROJECT LEADER, UNIVERSITY OF SOUTHERN CALIFORNIA SUBJECT: USE OF "URBANISM" COMPUTER GAME TO SUPPORT TRAINING OF MILITARY COMMANDERS TIME: 2:00 P.M. EST DATE: WENDESDAY, MARCH 3, 2010

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(Intro music begins.)

ANNOUNCER: "Armed with Science: Research and Applications for the Modern Military" is a weekly Webcast that discusses cutting-edge science and technology and how they apply to military operations.

Each week we will interview scientists, administrators, and operators to educate and inform our listeners about the importance of science and technology to the modern military. (Intro music ends.)

DR. OHAB: Good afternoon and welcome to "Armed with Science" Webcast number 57 on Wednesday, March 3rd, 2010. I am Dr. John Ohab at the Office of the Assistant Secretary of Defense for Public Affairs.

Well, today we're headed back to the gaming and simulation world. You may have played SimCity or World of Warcraft, but you may not have heard of UrbanSim. It's a computer game that is helping to support the training of military commanders and their staffs in complex counterinsurgency and stability operations.

We're joined today by Dr. Andrew Gordon, a research associate professor at the University of Southern California Institute for Creative Technologies -- we'll refer to that as ICT throughout the program -- and he's the project leader for UrbanSim.

Dr. Gordon will give us an in-depth look at UrbanSim, including the development methodology and the research that made it all possible, including intelligent tutoring, multi-agent social simulation, and story-driven learning environments.

Dr. Gordon, it's a real pleasure to have you on the program all the way from Los Angeles.

DR. GORDON: Hi. It's great to be here. And you have a wonderful show here; it's a pleasure to be a part of it.

DR. OHAB: I really appreciate it.

In full disclosure, I actually went to grad school at UCLA. I hope that's not going to be a problem for today.

DR. GORDON: (Laughs.) I was a post-doc at UCLA myself, so I have some shared affinity over there.

DR. OHAB: Wonderful.

Listeners, we do take questions from Twitter, so you can tweet 'em if you have 'em, and I'll make sure Dr. Gordon has a chance to answer before the end of the program.

Dr. Gordon, could you get us started with a basic primer on UrbanSim? What is it?

DR. GORDON: Well, UrbanSim is a -- the research prototype was built here at ICT, the Institute for Creative Technologies here at the University of Southern California. It was under the direction of RDECOM, which is the Army's Research, Development and Engineering Command. Simply put, UrbanSim is a computer game. It's one that we built to help the U.S. Army better train commanders and their staff in what we call the art of battle command.

So when playing UrbanSim, users take on the role of a battalion commander and they're executing counterinsurgency and stability operations in an urban environment in places like Iraq and Afghanistan.

So some people like to compare it to the old computer game SimCity, as you did in the intro there, by Electronic Arts. But instead of having Godzilla and tornados attacking your city, the players are faced with things like uncooperative local officials and ethnic divisions in the communities, different tribal rivalries. And on top of this, there's this violent insurgent presence that has to be dealt with.

So it is a game, and it behaves like a traditional turn-based strategy game, like a game like Civilization or something like that.

But in each turn, the actions that you direct your subordinate units to do in the battalion, they have direct effects on the events in the city -- upon the social situation, the economic situation, that sort of thing, as well as second- and third-order effects that you have to care about.

And it's in this thinking about these second- and third-order effects that's really the objective, the training objective of UrbanSim as a training tool. We're trying to develop adaptive leaders who can pursue their mission objectives in an adaptable way, when complex situations arise.

Go ahead.

DR. OHAB: Now, how does the training progress? Is it based on individual scenarios, or is there a story line that they're adhering to?

DR. GORDON: Well, it is -- it's based on a number of scenarios.

The current system is focused on a fictional Iraqi -- northern Iraqi town that we've created that's based on sort of an amalgamation of other different cities in the area. And it's based on the experiences of former battalion commanders.

And the idea is that we've created this simulated city that has all of the complexities of the political and economic and tribal rivalries that are going on. And you -- as the battalion commander, you are directing actions of your subordinate units over a 15-turn period.

And while the underlying simulation is determining all the attitudes and actions of all the -- of the agents in this environment, there's also these underlying story threads that interject lots of complexities into the situation that you have to deal with.

DR. OHAB: And one of the themes we've visited a few times over the course of the last year actually surprises people, which is that gaming is something that actually can be used beyond the standard entertainment kinds of things, and actually can be applied to training.

How does the gaming platform itself allow you guys to address the Army's needs?

DR. GORDON: Well, UrbanSim is definitely part of the larger mission of the Institute for Creative Technologies to help the U.S. Army capitalize on the talents of the computer game industry, especially here in Southern California.

So UrbanSim is a game, but alternatively, you might think about it as a training tool that was built using computer game technologies and computer game development methods.

So the idea is to take the best components of games -- the graphics and the animations and all that stuff, the best practices of game development from the game industry, and even some of the best game developers in the local area here -- and apply all of this talent toward the training needs of the U.S. Army.

So as a result, we end up with software that does have a lot of game-like qualities. There's slick graphics and slick user interface components and all that stuff, and there's an engaging story line that immerses players into the environment.

And it shares many of the same game mechanics that are familiar in commercial games. And as well, it's a lot of fun, particularly if you're interested in counterinsurgency and stability operations. But on top of all these game features is a solid educational design.

So players of this game become intimately familiar with key doctrinal concepts like commander's intent and commander's critical information requirements, and issues specific to counterinsurgency and stability -- things like lines of effort, where these are the different components of your overall strategy in an urban environment.

So -- focusing on things like civil security and central services and the development of the host nation security forces; effective governance; and on top of these lines of effort, thinking about executing an effective information operation campaign.

And, as well, thinking about the sort of measures of effectiveness for all of these lines of effort. These are the metrics that are used to judge how well a commander is doing on those particular objectives.

So these are all concepts that are typically included in traditional Army schoolhouse training, but UrbanSim allows the students to get some hands-on practice with these concepts in a contemporary operational environment.

DR. OHAB: Now, was UrbanSim modeled after actual experiences?

DR. GORDON: Absolutely. One of the key research objectives of UrbanSim is to look at what we're calling story-driven simulation. So there's really two kinds of simulation components under the hood.

On one hand, you have this traditional -- more traditional constructive behavior model. So you have models of the attitudes of different tribes and how they react to the actions of other tribes and that sort of thing.

You have the local mayor and the police chief, and you have to model what their behaviors are going to be, based on their own goals and objectives. And you have to model the attitudes of the local population and that sort of thing.

I think the interesting -- one of the innovative things about UrbanSim is it also has this story-driven component where we're taking the real-world experiences of commanders from places like Iraq and Afghanistan and trying to find innovative ways of moving those real-life experiences directly into the simulation environment, so that the real-world experiences of soldiers are the things that are driving the underlying simulation in the UrbanSim environment.

DR. OHAB: Now, what kind of research do you actually conduct to ensure that you're simulating the diversity of large populations and also providing realistic and effective training?

DR. GORDON: Well, there is a lot of science and technology under the hood in this UrbanSim game. So all of us here at the Institute for Creative Technologies are trying to advance the university's mission

for technology innovation and research, but in UrbanSim we're focusing on really three areas of computer science research.

So the first is in these complex, multi-agent systems. This is what I was talking about just a moment ago, this idea of modeling all of the political and economic and social relationships that exist in this fictional city. And so, a lot of that kind of research into multi-agent systems.

It grew out of basic research in artificial intelligence back in the 1990s. The difference here, it has to do with the complexity of the modeling problem, because not only do you need to model things in a robust way, and it has to be interpretable and has to run in real time so that you can integrate it into a game, but also needs to be maintainable by the larger Army training community. So the second big area of research is in this idea of story-driven learning environments that I was just mentioning.

One of the real strengths of our Institute, the Institute for Creative Technologies, is to integrate the Hollywood storytelling techniques into the training applications that we build. Here in Southern California, we're sort of intimately involved in the entertainment industry here. So we try to capitalize on that as much as possible in our projects. So one of the --

For UrbanSim though, the twist here is that we're trying to focus on not only the fictional, immersive story lines that capture a student's attention, but also integrating those real-world stories, those non-fictional stories, directly into the simulation.

I think the last area of research that we're really trying to push is in intelligent tutoring technologies. The idea here is that UrbanSim was primarily built to be used in a classroom environment, the different TRADOC schools, facilitated by an instructor.

But even in this environment, you need to provide the students with enough support, enough guidance, so they're simply not wasting their time playing a computer game. They're getting enough pedagogical scaffolding, giving them lots of tools to think about what's happening in the game, reflecting on their own approach and strategy toward tackling the problem, and also reflecting on their own thought processes.

So in the game we have a virtual S2 and a virtual S3 staff officer to sort of take on those roles of guiding you and scaffolding you along as you're trying to learn, using this tool.

DR. OHAB: So let's talk a little bit about the development process for UrbanSim. Who originally identified the need for this training, and who are you collaborating with to create it and to get it out there?

DR. GORDON: Well, unlike the -- there is a standard Army procurement process. But a lot of the research we do here actually does not begin with a real, well-defined requirement.

A lot of the times the training community doesn't know how to ask for the things they really need, or even what's possible, using today's technologies.

So in a lot of ways, our job here as researchers is to help define what we call the art of the possible. It's a phrase we use -- the idea is to get people to think about -- think in creative ways about the problem that they have and that there might be really creative solutions to address those needs. So we began UrbanSim as part of a larger research effort that's part of a larger Army training objective. The idea was to explore the creation of game-based training tools that could be rapidly developed to meet all kinds of different training needs as they arose.

So the key for us, though, was having good partners. So in UrbanSim we began a very close partnership with one particular set of instructors within the Army schoolhouses. This is the instructors at the School for Command Preparation; this is out of Fort Leavenworth, Kansas.

Now, these are the folks that are -- in their classrooms, they're training lieutenant colonels at the School for Command Preparation, so they have a very unique training challenge there.

The question is what sort of technologies can be used to support the instruction of these very senior lieutenant colonels? These students are already pretty seasoned, with many, many years in the Army. They don't particularly need a lot of handholding or lectures or that sort of thing.

Instead, what they need is practice. They need practice in the art of battle command -- practice commanding a battalion of soldiers and dealing with complex environments.

So we based the UrbanSim experience very closely on the scenarios that they'd been developing at the School for Command Preparation out of Fort Leavenworth. And we closely worked with them to make sure that it was -- that that fit was in their course of instruction.

So more than as a customer, we really saw them as a partner in the development of the software. And what that enabled us is to do this kind of iterative design where each revision of our software could be tested by them, and put in front of students in real classroom environments so we could get immediate feedback on what worked and what didn't, and what we needed to fix.

So in the end, we have something that captures a lot of the essence of how they think about battle command at the School for Command Preparation, and certainly a lot of that comes through in the game play of the software.

But by sticking closely to doctrine, we found that this tool has applicability in lots of other Army training contexts and settings.

DR. OHAB: And how is it actually being used today? Are you guys getting any feedback?

DR. GORDON: Well, yes. UrbanSim continues to be used today at the School for Command Preparation. So a significant number of the new battalion commanders that are coming out now have gone through this UrbanSim experience. That's pretty rewarding, particularly for someone like me who generally sticks more closely to basic-research kind of problems.

But in addition, we've done a lot of traveling lately to run a number a different pilot studies to see where else UrbanSim as a software might be applicable within other TRADOC settings.

So also at Fort Leavenworth, there you have the Command and General Staff College. This is where the U.S. Army majors go for their intermediate level course. What we've seen is that UrbanSim fits very well.

And the course that they run there is the XO S3 elective course. This is where majors learn about how to effectively execute the roles of an XO or an S3 officer in a battalion staff.

So just this for the lieutenant colonels at the School for Command Preparation, these majors who are playing UrbanSim, they take on the role of this battalion commander in this fictional city.

They get the experience of developing the commander's intent at the battalion level, of developing the critical information requirements, of designing the lines of effort and measures of effectiveness.

But then they get the chance to experience how do these products and plans, how do they play out in the UrbanSim game?

What we typically do is we like to arrange a class of students so that there are two students on each computer. So here you have a team of two majors that are making decisions about how to execute this stability and counterinsurgency operations for the whole battalion. It gives them a chance to -- you know what they say, to walk a mile in the commander's shoes and to think about that kind of big picture.

Along these same lines we've had a lot of interest in using UrbanSim in different captains' career courses at various Army installations. So these are the courses for Army captains as they transition from being like a platoon leader to leading a company of soldiers.

So we just wrapped up a number of pilot studies to see how well UrbanSim fits in that environment.

Specifically, we're trying to figure out where within the existing course of instruction does UrbanSim fit? Does it augment something that they're currently doing, some block of instruction, or is

it -- does it allow them to replace something they're currently doing, with this game-based training experience?

The idea is to help them save -- either save time or do the same kind of training they're doing now, but more effectively. I think one thing I do want to mention though is also the -- that we're trying to push -- or to see, at least -- if UrbanSim is effective outside of the classroom environment -- so outside of the TRADOC schools entirely -- and see if -- what would happen if you put UrbanSim in the hands directly of operational units.

The idea here is to give the commanders some tools that they can use to develop their staff, so use it as a staff training exercise. This way they can learn about how their staff approaches problems, judge their own abilities and give them guidance on how things are done.

So we've run a number of experiments with operational units now, battalions, along these lines. And so far the results are very encouraging. Pretty much everywhere we've gone we've had a lot of success.

What we're finding is that people are -- even though we designed it originally for that School for Command Preparation, that when you build a solid tool that meets particular training objectives, then all of these instructors and commanders, they find a way to effectively use this tool to meet their needs.

DR. OHAB: Now, if someone was inclined, are there opportunities to incorporate UrbanSim into their training?

DR. GORDON: Yes, absolutely. So it is available. It's definitely a research prototype, so it was developed with research dollars from the U.S. Army. So this is something that the U.S. Army already owns and it was made available.

So folks who would like to get their hands on it should contact our program managers, which is the U.S. Army Research, Development and Engineering Command, Simulation Technology Training Center -- kind of a mouthful. Has this acronym, RDECOM-STTC.

So these are the folks down in beautiful Orlando, Florida, who look after the Institute for Creative Technologies here in Southern California.

So officially, UrbanSim is still a research prototype, so our sponsors are pretty careful about how they send it out and distribute it around the larger Army. But basically, I've never seen them pass up an opportunity to train soldiers when there's a real training need.

These guys are also really helpful in helping us figure out the bigger question with regards to transition of software like this out of the lab and into the greater Army. Because basically, at some point, this research project is going to be done, and we're all going to pat ourselves on the back and -- (chuckles) -- for a job well done, wrap up

and move on to something else. But the question here is we've got to figure out how to take a research application like this, one that directly meets specific Army training needs, and find some way to keep it alive outside of our lab.

If we don't do that successfully with UrbanSim, I think we've failed as a project. Not only with the project have failed, but -- you have a lot of geeky researchers like myself sort of scratching our heads, wondering why the heck we're working so hard on these applied research projects.

The Department of Defense as a whole wants to see their research dollars spent in ways that have a real impact on the military, but moving research technologies out of a lab like the Institute for Creative Technologies and moving it into the hands of the Army, it's almost a research challenge all in itself.

So this is particularly a problem here at the Institute for Creative Technologies, because we're on the "bleeding edge" of technology innovation, and at the same time we're directly applying these technologies to real Army training needs.

So when you build something that no one has ever seen before, then no one knows exactly what to do with it or how it fits into the current system.

But it's really a problem we're solving. I think one of the competitive advantages of the U.S. military is the strength of its research community. I think you believe that as well.

DR. OHAB: Certainly.

DR. GORDON: And so what we really need to do is figure out, or have our key leaders figure out how to use this advantage, how to use the research community to its advantage.

But for UrbanSim, I'm very optimistic that this project will have a long life outside of our lab, based solely on the enormous enthusiasm I've seen from instructors and students who've used this tool.

DR. OHAB: Now, as a computer scientist, are there any future research directions that you see coming out of UrbanSim?

DR. GORDON: Absolutely. I think UrbanSim -- it's definitely an applied research project -- (chuckles). (Audio break) -- (probably as applied as it gets ?) for a computer scientist like me. But still, there's lots of future directions that we could go, just even based on the current system, UrbanSim as it is.

A lot of the ideas that I think about for future work, I never would have thought of before I'd actually gone out and seen how instructors use a product like UrbanSim in their classrooms. So a lot of things like usability issues, like -- not only the nomology of the game and that sort of thing, but even, like, the maintenance of hardware and

software installations and all these kind of things that are just barriers to getting these tools in the hands of instructors.

Now, plus issues, research issues having to do with long-term assessments of effectiveness. What -- we certainly could run these kind of short-term studies to determine, yes, are these officers learning, have a better model of counterinsurgency and stability operations, are thinking more about second- or third-order effects?

But what we need to think about is how to -- do those learning games, do they have long-term stickiness? Are they going to be around and useful a year or two down the road when they're faced with these situations in real life? And other kind of issues like that.

I think there's really a lot of follow-on research that is more about the use and usability of UrbanSim within these kind of environments.

DR. OHAB: Just one final question before we wrap up today's show.

Dr. Gordon, you are a computer scientist and also a research associate professor at USC. Can you tell us a little bit about your background and training before you got to this position?

DR. GORDON: Absolutely. Yes, I'm a professionally trained professor -- (laughs) -- I guess is the best way of putting it. I got my Ph.D. at Northwestern University, doing work in artificial intelligence at a unique institute called the Institute for the Learning Sciences which, in a lot of ways, is very similar to the Institute for Creative Technologies where I am now.

I bounced around from different research labs after I graduated from Northwestern. I mentioned that I was at -- I did my first post-doc at UCLA. Actually, in the psychology department, of all places.

But then I had a great opportunity to do a second post-doc at the IBM T. J. Watson Research Center out in New York; got a chance to see both sides of the spectrum, from real basic research to real applied research.

So 10 years ago or so, when I came out to ICT, which is a part of the University of Southern California, it turned out to be a really great transition for me, because I still got a chance to pursue basic research in computer science, issues having to do with artificial intelligence and natural language processing and cognitive modeling and that sort of thing, and do that research in a context where you could actually see how those basic research technologies could have an impact in the applied context, in places like Army training and virtual reality training and that sort of thing. So all this kind of preparation in artificial intelligence and technology-based learning environments, I think, have got me into a good spot in my career.

DR. OHAB: Our guest today is Dr. Andrew Gordon, research associate professor at the University of Southern California, Institute for Creative Technologies.

Thanks so much for taking the time to be here today. Best of luck with UrbanSim and all of your research.

DR. GORDON: All right. Thank you, John.

DR. OHAB: Well, listeners, March is Women's History Month, and we're going to be spending the month bringing you a variety of blogposts and podcasts from women involved in science and technology at the Defense Department.

Next Wednesday, March 10th, we kick things off with Dr. Sally Shoop, scientist at the U.S. Army Cold Regions Research and Engineering Lab. Dr. Shoop will discuss an Army program known as Synthetic Automotive Virtual Environments, or SAVE, which is investigating improved safety systems, developing autonomous vehicles, and the construction of safer roads.

Thanks again for listening today. I am Dr. John Ohab, and you have been scienced.

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