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UC Merced Lab Tour with Robert Backman

Posted by [Janna Rodriguez](#) on Monday, November 21, 2011 · [Leave a Comment](#)

It's easy to get lost in the digital worlds in films like Star Wars and Harry Potter with landscapes and creatures so real you forget what you're seeing is largely computer animated. The tool behind much of that magic is a 3D animation application called Autodesk Maya.

Robert Backman, a second-year PhD student from the Computer Graphics Lab at UC Merced has been working with Maya creating video games and robots for as long as he can remember. Before Backman came to Merced he worked creating 3D models of futuristic vehicles and environments for video games.

"I wanted to make them real," says Backman, who says that was his drive for obtaining a Bachelors degree in Mechanical Engineering from UC Merced.

One morning while reading the newspaper, Backman says he saw a story about UC Merced's budding graphics lab under professors Marcelo Kallmann.



UC Merced graduate researcher Robert Backman talks to DLM

reporter Janna Rodriguez about his project that is using mathematics and 3D modeling software to try and teach robots how to maneuver in complex environments.

Backman remembers being shocked that there was a computer graphics lab on campus and says he knew it would be a good fit. He wasted no time and the same day he knocked on Prof. Kallmann's office, he was given the opportunity to work on a huge undergraduate project that he has continued to work on as a graduate student.

Backman's work involves figuring out different learning algorithms that will help robots maintain balance, manipulate objects and work around obstacles. The simplest of actions, walking on uneven terrain, for example, can be extremely difficult to program into a robot. The robot must be aware of its surroundings and learn to respond to unanticipated changes in real time. Currently, robots are far from the intelligence of Star Wars' R2D2, but there has been amazing progress. Robots can operate intelligently but only in very austere environments; they do things very slowly because they must remain in static balance.

"We need to create technology to put robots in complex environments," says Backman.

Backman works with physics based characters, a technique that uses a ragdoll model of a human to generate human like motion. Backman explains that analyzing movements using physics; has applications for robotics. He also says understanding human dynamics is the next step for video games, where characters are often more human-like than many of our surgically-altered Hollywood stars. Backman says that motions in video games are typically pre-scripted, which limits the number of things that can happen in a game. Someone comes to a studio and they record the motions and they are captured exactly, but it doesn't allow users to physically interact with the character.

For instance, in football video games when two characters collide together, they can react in a physically accurate, but passive manner. His hope is to create algorithms that will allow the ragdoll character to respond intelligently in a complex scenario. From a practical standpoint; there are so many potential situations a robot can be in, so how do you prepare for them all. To account for this there are many controllers that take over depending on the situation. For instance there is a controller that will synthesize a human-like reaction when stumbling from a surface or in colliding with a solid object.

He concedes that we are still far away from taking humanoid robots out the labs and into our homes. The main problem is the complexity of the tasks and the few variables that you can actually manipulate.

Backman certainly has his plate full. In addition to solving this problem, he's taking on other projects as well, including a physical therapy tool using the Xbox Kinect software. He also has a wife and two children, and says he wishes there was more time in the day. But he's not complaining.

"I am doing research on a subject that I would do for free in my spare time," he says