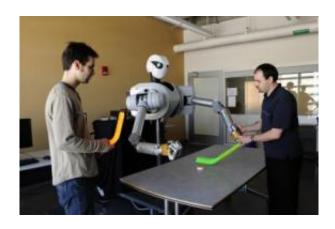# 'The robots are coming'

January 29 2009

Assistant professor Alexander Stoytchev (right) and graduate student Jivko Sinapov are working to develop software so a robot can learn to use tools. One example of such learning is maneuvering a hockey stick around a puck. Photo by Bob Elbert/Iowa State University

Alexander Stoytchev and his three graduate students recently presented one of their robot's long and shiny arms to a visitor. Here, they said, swing it around.

And so that visitor tentatively gave the robot's left arm a few twists and twirls. The metal arm was heavy, but still moved easily at its shoulder, elbow and wrist joints.

Then the graduate students hit some keyboard commands and the robot replayed those exact arm movements.

It was all incredibly quick, smooth and precise.

Stoytchev, an assistant professor of electrical and computer engineering, says it won't be long before robot technology is something we'll all see and experience.

"We'll have personal robots very soon," Stoytchev said. "We're waiting for the first killer app. Hopefully, we can contribute to that."

Star Wars

There's a little R2-D2-shaped trash can near the door to Stoytchev's lab in the new Electrical and Computer Engineering Building. Turns out the Star Wars movies were an inspiration to a young Stoytchev back home in Bulgaria.

"My interest in robotics stems from the day I saw Star Wars for the first time," the 34-year-old said. "I must have been in second or third grade at that time, but the two robots in the movie (R2-D2 and C-3PO) left a lasting impression on me."

That impression led Stoytchev to his high school's computer club and then to computer science studies as an undergraduate at American University in Bulgaria. He moved to Atlanta's Georgia Institute of Technology for graduate work in computer science. He was at Georgia Tech when he started working with robots.

His research specialty is developmental robotics, a blend of robotics, artificial intelligence, developmental psychology, developmental neuroscience and philosophy.

"It's one of the newest branches of robotics," Stoytchev said. "People have learned that it's unrealistic to program robots from scratch to do every task, so we're looking at human models. Humans are not born

knowing everything. It takes a really long time to develop skills."

Stoytchev and his students are trying to figure out how a robot can learn what children learn over the first two years of their lives. (And child development is something Stoytchev is learning firsthand; he and his wife have a 2-month-old son.)

Graduate work

Stoytchev's graduate students are working to develop software that will allow their lab robot to learn and use different sets of skills:

• Shane Griffith, who's from Cedar Rapids and is studying computer engineering and human computer interaction, wants the robot to learn on its own which everyday objects can be used as containers and which cannot.

• Jivko Sinapov, who's from Sofia, Bulgaria, and is studying computer science and human computer interaction, wants the robot to learn how to use objects as tools.

• Matt Miller, who's also from Cedar Rapids and is studying computer science, wants the robot to learn language.

Combine that developing software with existing robotics hardware, and you've got a useful, smart robot.

"The essential goal of developmental robotics is for robots to learn how to learn," Miller said. "We want them to learn how to take a situation, adjust to it and learn from it."

A robot, for example, could learn to use containers by putting a ball in a bucket and seeing what happens when that bucket is pushed across a

table. Is the ball pushed along with the bucket? Or is it left behind? The researchers believe that simple interactions like these hold the key to capturing the common-sense knowledge about the real world that comes naturally to people but is so difficult to capture in software code.

A future with robots

Stoytchev was attracted to Iowa State in 2005 by the College of Engineering's reputation and research capabilities. He also liked the interdisciplinary research programs in the department of electrical and computer engineering, the Virtual Reality Applications Center and the graduate program in human computer interaction.

And now he's directing Iowa State's Developmental Robotics Laboratory and making his own research contributions.

It's work that has him looking ahead.

"In the not-too-distant future, we will have personal robots just like we have personal computers today," he said. "The robots of the future will be generalists. They will be employed in a large variety of tasks that require a lot more smarts and autonomy than is currently possible. They will have the ability to learn how to perform new tasks on their own without human intervention."

Yes, he said, "The robots are coming. Are we ready?"

Source: Iowa State University

Citation: 'The robots are coming' (2009, January 29) retrieved 26 April 2024 from https://phys.org/news/2009-01-robots.html