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UW lab works to create smarter robots

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In this April 30, 2014 photo, University of Wyoming assistant professor of computer science Jeff Clune, right, points out various components of a test model robot to undergraduate student Tyler Hughes, left, and Laramie High School student Jingyu Li, at the Artificial

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BY NADIA HILL
LARAMIE BOOMERANG

LARAMIE, Wyo. -- Computer-simulated blocks gallop across a screen.

Multi-colored, they started as blobs that barely wiggled, but over time and through multiple generations, each one took shape into something similar to a horse or giraffe.

"To me, they look alive, not robotic," said Jeff Clune, University of Wyoming computer science assistant professor. "They're quirky but still functional. They have that 'je ne sais quoi' of nature, with no human input."

Clune started up UW's evolving artificial intelligence lab in January 2013 and since then, four students have published research in peer-reviewed scientific journals. Several of his students have won national awards from Associated for Computing Machinery to NASA space grants.

He currently has five Ph.D. students, two master's students, two undergraduate students and one Laramie High School student.

Clune and his 10 students spend their days using evolution to create smarter robots.

Artificial intelligence in robots is a software limitation, and most robots can't walk across a floor without tripping, Clune said.

"When I read news like firefighters dying, I think we should be sending in robots to do that," Clune said. "We're trying to harness the power of evolution. It's an extremely creative and powerful design force. Can we use that process to evolve robots? We can harness it, and when we do, evolution comes up with something smarter than humans can design."

The basic concept is Darwinian evolution and survival of the fittest, he said.

Evolving the robots starts with a set of genomes or traits, which are then randomly mutated to achieve a next generation of organisms or objects. The process is repeated until the desired outcome is achieved, from robots that can save human lives or simply pick up a set of keys, Clune said.

The software responsible for developing the robot is given a desired end result or goal, the programmer hits "go" and wakes up the next morning to see how evolution worked its magic, Clune said.

As a visiting scientist at Cornell University, Clune successfully attempted the same process on a robot. He said other techniques were used to try to program the robot, but evolution was the only process to successfully make it walk.

"Nature already produced these designs," Clune said. "We want to engineer robots that rival nature and are as agile and smart. If you tried writing code to do it, you probably couldn't.

"Evolution has figured out how to build self-assembling molecules."

Along with designing, building and evolving robots, Clune created endlessforms.com, a website where users can apply the same evolutionary techniques to common objects such as lamps or jewelry. By selecting a starting point, users then choose which attributes they want in their designs. Once the object looks as desired, it can be printed on a three-dimensional printer using any material.

Technology could become so advanced that everyone will have a three-dimensional printer in their

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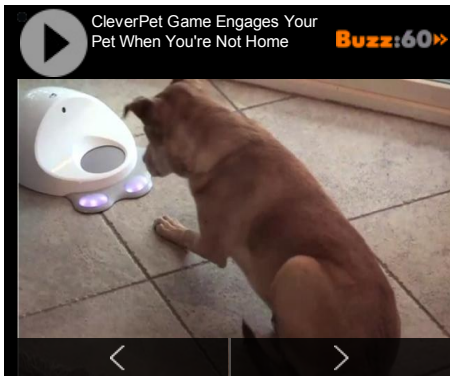

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home and the challenge will become learning how to design an object, Clune said.

Access to such technology — and the evolution of artificial intelligence — raises ethical concerns such as developing robots smarter and more powerful than humans, he said. One of Clune's lecture days is devoted to the topic. He said every technological advancement has its positives and negatives, but history has shown the positives outweigh the negatives.

"It's not going to happen by accident," Clune said. "Right now, it can't walk and chew gum at the same time. Give it 10, 20, 50 years and we'll have to seriously think about whether we're creating technology that could usurp control from us."

After earning two philosophy degrees, Clune decided to pursue computer science because he was fascinated by how intelligence works. He said he marveled at what nature produced and how a sense of being emerges from a collection of cells, leading him to try to understand evolving artificial intelligence.

"You as the designer get to say what you want and it's up to evolution to produce and accomplish that goal," Clune said. "I thought the best way to understand my own brain was to build one. I'm learning a lot about how evolution did it by doing it myself."

Information from: Laramie Boomerang, http://www.laramieboomerang.com

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