

Student-Built Robot Walks Unofficial Distance Record

By CINDY HUYNH
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Under the guidance of Prof. Andy Ruina, theoretical and applied mechanics, a group of Cornell students constructed a robot that set the unofficial world record this summer for longest unaided distance traveled.

On July 6, the robot, Ranger, traveled 23 kilometers in Barton Hall, reclaiming a record that Cornell had previously held in years past.

Two years ago, the team's robot held the record for traveling 9 kilometers. But Boston Dynamic's BigDog robot later broke the record when its quadruped built for the military walked over 21 kilometers.

First built in 2006, Ranger is currently in its third iteration. Since its first construction, it has been re-built with completely new electronics and control, as "new electronics boards were designed and built; new sensors, ... new steering motors, and hardware were added," according to Nicolas Champagne-Williamson '12.

"There has been lots of design[ing], building, testing and redesign[ing], rebuilding and retesting," Ruina said.

A variety of academic disci-

plines are required to build the robot, ranging from computer science skills regarding algorithms or data-structures, and mechanical engineering skills relating to knowledge of which materials are necessary for weight and strength.

The team itself is made up of "a handful of electrical and computer engineers, half a dozen mechanical engineers, and a computer science student," Champagne-Williamson

the robot) and optimizing control for energy efficiency, we can achieve startlingly human-like gaits and smooth movements," Champagne-Williamson said.

According to Champagne-Williamson, the robot also uses smaller motor torques to maximize energy efficiency.

The developments made by the Ranger team have not only brought about new records, but also scientific advances that will help scientists better understand human gait and movement. This, in turn, will support research regarding prosthetics and therapy.

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Chandana Paul

said.

"We also regularly give talks and presentations to the rest of the team, which has greatly increased my communication skills in a group setting," he said.

In more ways than one, Ranger is a unique type of robot. It differs from other robots because the team has specifically focused on mimicking human gait — therefore optimizing energy efficiency — when it comes to Ranger's anatomy.

"It turns out that by using passive aspects of our design (like letting the legs swing by using gravity, and the forward momentum of

"My work with the Ranger Robot has helped immensely in understanding the dynamics of walking, and has helped me to transfer knowledge to help people with gait pathologies," said Chandana Paul, a Harvard post-doctoral researcher and a member of the Ranger team.

In the future, the Ranger team wants to build a fully bipedal robot by examining algorithms that will help optimize the robot's control of walking, as well as attain the energy efficiency of humans.

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