UALR Prof, students helping keep NASA's rovers from getting stuck

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(PhysOrg.com) -- A paper co-authored by Dr. Cang Ye, associate professor in UALR's Department of Applied Science, and two UALR students won "Best Paper" at the 2010 Institute of Electrical and Electronics Engineering International Conference on Mechantronics and Automation Aug. 4 to 7, in Xi'An, China, helping keep NASA's Rovers on the moon or Mars from getting stuck.

Chris Robinson of Cedarville, who graduated from UALR in the spring with a bachelor's degree in applied science, applied science Ph.D. student GuruPrasad M. Hegde, a native of India, and Ye co-authored with Dr. Ashley Stroupe, a robotics engineer at the Jet Propulsion Laboratory and Rover driver for NASA's Mars exploration, and Edward Tunstel, a senior robotics engineer at NASA's Jet Propulsion Laboratory. Tunstel is also the Space Robotics & Autonomous Control Lead of Johns Hopkins University Applied Physics Laboratory.

The paper was titled, "Computer Vision Based Wheel Sinkage Detection for Robotic Lunar Exploration Task," deals with a difficult problem in NASA's robotic planetary exploration.

"When a robot rover moves on planetary surface, it usually interacts with soft terrain," Ye said. "For example, the Mars rovers move on soft sandy terrain most of the time in their scientific tasks. The soft soil may cause wheel slip and traction loss. Excess traction loss may cause a rover immobile and make mission impossible."

How deep and fast a wheel sinks can provide information to assess the loss of traction and determine when and how to apply corrective action. For example, the robot needs to slow down to restore traction if the sinkage is big, or it needs to move back if sinkage is getting larger along the way.

“We used a machine vision camera to monitor each wheel’s interaction with terrain,” Ye said. “We devised a computer vision method that may reliably detect the wheel-soil boundary and determine the sinkage.”

NASA has had problems with lunar robots because moon dust can stick on wheel surfaces, making it less distinctive from the soil and making it difficult for a robot to predict a potential trap of lunar soil.

“Existing methods fail in this particular case while our method consistently succeeds in sinkage detection under low-illumination, non-uniform lighting conditions, as well as scenario with shadow,” Ye said.

The paper won the Toshio Fukuda Best Paper Award in Mechatronics.

Provided by University of Arkansas at Little Rock