

WISCONSIN ROBOTICS

SUMMER NEWSLETTER 2017



KEYSIGHT
TECHNOLOGIES

The Competition

Wisconsin Robotics is made possible through generous donations from our sponsors. These contributions, both financial and in-kind, allow the team to develop advanced robotics systems for international competitions and to remain involved in community outreach to inspire K-12 students to pursue STEM. We are grateful for the continued support of our sponsors, University, and extended community. To this end, we have compiled a newsletter detailing our performance at the University Rover Challenge, our next steps, and activity since our last update.

Wisconsin Robotics competed at the University Rover Challenge in Hanksville, Utah, from June 1st-3rd. Over the course of the competition, Ascent, our rover, competed in four tasks: Equipment Servicing, Autonomous Traversal, Science Cache, and Extreme Retrieval and Delivery. At the onset of the previous academic year, eighty-two teams applied to have a chance to compete at the University Rover Challenge. Of those eighty-two, thirty-six teams were accepted, and of those thirty-six, Wisconsin Robotics' Ascent secured a 12th place finish.

Equipment Servicing

The Equipment Servicing task involved towing a wagon containing a fuel can to a piece of equipment that the rover then had to perform a number of dexterous operations upon. Ascent was successful in pulling the wagon a short distance; unfortunately, a recurring system failure led to the operators continually losing control of the rover. The team was forced to make the decision to end the task prematurely and move on to the Autonomous task, which began shortly after the conclusion of Equipment Servicing.

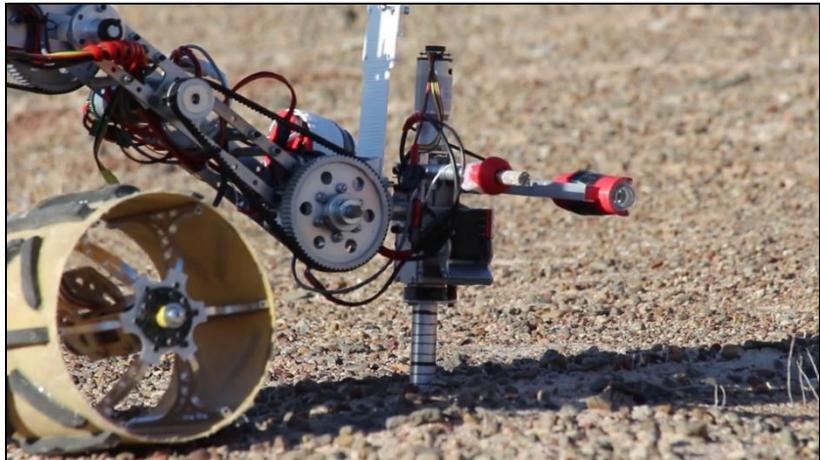


Autonomous Traversal

After a brief rundown of the rover to check all systems, Ascent began the Autonomous Traversal task. For this task, teams were provided GPS waypoints which were marked with a tennis ball. Rovers were required to autonomously navigate these waypoints in a specific order, having to recognize when they were within three meters of the tennis ball in order to move on to the next waypoint. Ascent completed the first three gates with astonishing speed, navigating directly to the given GPS coordinates, scanning and quickly finding and approaching the tennis ball, signaling back to base each time. During the attempt at the fourth gate, the entire right-side wheels lost power, and the team decided to end the task there rather than attempt to move forward at a point penalty.

Science Cache

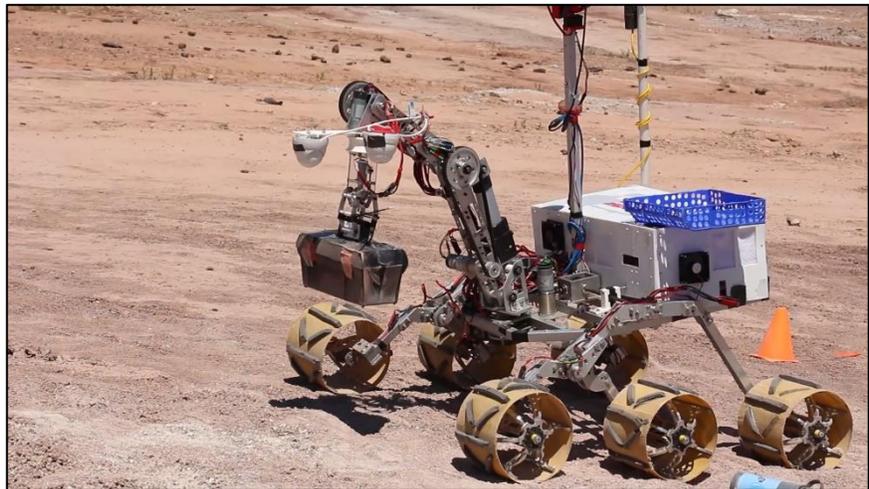
In the Science Cache, the rover was tasked with retrieving a soil sample, as well as taking pictures of the selected sample site. Using a custom-designed science tool, the rover was able to take sensor measurements, as well as drill into the soil at the site chosen by the team and securely deposit it in the onboard push-to-seal container. Additionally, a panorama, high resolution image, and an 800x zoom image of the soil were



obtained. After the task, the retrieved sample was given to the judges. At a later time, the team was allowed to perform a number of independently selected tests to ascertain the likelihood of microbial life in the acquired soil sample as well as an additional soil sample provided by the judges. After these tests, the team presented its findings to a panel of judges. From a possible total of 100 points, Wisconsin Robotics scored a 95, which is 21 points higher than the average score for this task.

Extreme Retrieval and Delivery

Ascent was tasked with traversing difficult terrain whilst retrieving and delivering various objects to separate locations. The operators were able to find the first set of items with relative ease—a 5kg toolbox and a water bottle. The toolbox was delivered to a location not far from the pick up area. The water bottle was to be delivered to an astronaut a further



distance away. In the process of moving towards the astronaut, the team attempted to traverse a drop in excess of 1 meter--a required obstacle. In the process, the rover flipped over, fortunately maintaining grip on the water bottle. After an intervention, Ascent continued on, successfully delivering the water bottle. Throughout the task, visual clarity from the camera feeds, due to camera quality and vibration, made it increasingly difficult to fully understand the terrain around the rover, as well as important visual indicators. This led to major difficulties in finding specific locations. Notably, a simple rock garden and a box in which the team had to deposit a specially colored rock were items that the team was not able to complete.

Ultimately, the team has advanced and learned an incredible amount from our 2015-2016 rover, and after participating in URC 2017 with a rover that was fully capable of validly attempting each task, looks to move forward with our next rover, yet to be named.

New Team Structure

In line with this, the team has approved a number of team structure changes. Instead of engineering discipline focused teams, Wisconsin Robotics will be moving to system based teams. Using the various systems required by URC, Wisconsin Robotics will be moving forward with the following project teams:

- Arm & Manipulation
- Drive System
- Chassis
- Science
- Autonomy & Simulation
- Software Controls
- Outreach Robots

The team has already held meetings discussing the high-level design of their next rover and has begun the transition into the initial planning and design phase. With the Fall semester just getting underway Wisconsin Robotics is in the process of recruiting new members and working on ways to quickly and effectively get them working on team projects.

Outreach

Engineering Expo

Since our last newsletter, the team has participated in a number of outreach events. This past April, Wisconsin Robotics debuted Ascent as a fully operational rover at Engineering Expo, a two day event held on campus for students, student organizations, and companies to show off their projects. Engineering Expo typically brings in around 10,000 visitors and is geared toward middle to high school students. Here, team members demonstrated Ascent's capabilities by driving throughout the building and manipulating common objects. In addition to Ascent, the team also presented other team projects such as user friendly, drivable mini-bots, object-recognition software, and the team's 3D printer.



Engineering Tomorrow's Careers

In June, after the competition, the team also hosted a portion of Engineering Tomorrow's Careers, a camp dedicated to young women in high school who are interested in engineering and STEM fields. A presentation detailing what the team does, how the team performed at competition, and ways in which students can get involved in robotics were discussed, after which a tour of Wisconsin Robotics' workspace was conducted. The team showed Ascent in a short demo, picking objects up and moving them to a point a short distance away. Eighty-four students attended throughout the two-hour event.

Up and Coming

Upcoming this fall, Wisconsin Robotics will be taking part in the Milwaukee Maker Faire and the Wisconsin Science Festival here in Madison, demonstrating both Ascent and the team's outreach robots, and talking about our current projects including our upcoming rover design.

With much thanks to our sponsors, Wisconsin Robotics has been able to make substantial growth and improvements over the past year while taking on difficult projects, inspiring interest in STEM fields, and developing important skills along the way. Building sophisticated rovers is no trivial task and without the help of our sponsors, Wisconsin Robotics would certainly not be where it is today. We are excited for what the upcoming school year and competition have in store for us and are extremely grateful for all of your continued support which helps make this possible.

A Special Thank You to our Sponsors!

