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BYU's Y-Clops has eye on a prize

12 students create high-tech robot to vie for \$10,000

By **Jeremy Twitchell**

Deseret Morning News

PROVO — A group of BYU students has turned one man's junk into a technological treasure — a challenging concept that resulted in a high-tech creation that is now poised to enter a national competition that offers a \$10,000 prize.

The project began last fall when 12 engineering students found an old electric wheelchair on a trip to the local Deseret Industries, then turned it into the foundation of an intelligent, self-propelling and self-directing robot, affectionately dubbed "Y-Clops" in honor of the single camera it uses for navigation.

Using an improvised obstacle course of construction barrels and white plastic tape, the team spent this week testing their creation's abilities on a large chunk of grass in the middle of a busy campus thoroughfare as they prepared for next week's Intelligent Ground Vehicle Competition at Selfridge Air National Guard Base in Harrison Township, Mich.

"I'm pretty excited about our chances," said team member Spencer Fowers, a senior from Hooper. "I feel kind of like we're a football team, because we've been looking at tape footage from past competitions to see what other teams have. No one else has driven as fast as we have through an obstacle course like this. . . . As long as we make it through the competition, we'll make it through the fastest."

Y-Clops uses a color camera to identify the colors orange and white, then studiously avoids those colors as it navigates the course.

DJ Lee, the faculty adviser for the student team, said students had to overcome several challenges, from making the machine mechanically able to navigate hills and sharp turns to building a circuit board to communicate between the camera and the guidance program, which was also written by students.

Y-Clops also uses a machine learning algorithm, making it capable of learning and remembering. The teaching process has since turned the designers into proud parental figures as they help it "grow up."

"It will kind of remember what it sees in the past and try to mimic the same



Jeffrey D. Allred, Deseret Morning News

BYU engineering student Nicholas Jepsen runs Y-Clops through its paces on campus Friday.

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action it took last time," Lee said. "If it makes a wrong decision, we review it, and we help correct it and train the algorithm again. So the more it runs, the better it gets . . . it's kind of like a human."

The team's baby still has some minor bugs to work out, Lee said, though he expressed high hopes after Friday's near-flawless demonstration. Y-Clops made just one mistake, broadsiding a construction barrel on its third lap,

during several laps on the obstacle course, which was frequently rearranged.

Lee said the dedication of his students has been most impressive. They worked on the project for two semesters, one for course credit and another as volunteers and in recent weeks have been working on it as much as 40 hours per week in some cases, he said.

"It's the kind of commitment that makes you feel good about it," Lee said. "Even if you don't do well, just seeing what they've learned and how much they enjoy it, is probably the most rewarding thing I can expect. But of course, we want to win."

The BYU team will face stiff competition in the 39-school field. While estimates for the cost of Y-Clops run between \$3,000 and \$5,000, many of the machines from other schools have budgets of more than \$25,000, Lee estimates.

The exact cost of Y-Clops is difficult to determine, students say, because of the way materials were collected. The base came from a thrift store, the camera was donated and students painstakingly made the drive wheels and sleek fiberglass casing themselves. The tracks were "borrowed" from the snowmobile of one student's father-in-law, leaving the GPS system and three-axis compass as the only real out-of-pocket expenses.



Jeffrey D. Allred, Deseret Morning News

Using a single camera for navigation, the self-propelling, self-directing Y-Clops makes its way through an obstacle course at BYU Friday.

Y-Clops' creators now hope to prove that big budgets are no match for hard work and ingenuity.

"Our chances are good," said Chris Young, a senior from Oklahoma. "I'm really amazed. We don't have as sophisticated sensors as some of the other robots, but it's amazing the results we get."

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