

The Undriven

A Publication of the Autonomous Vehicle Team of Virginia Tech

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Vehicles Compete in the Ultimate Test

A Day at The Virginia Tech Rodeo

By Tara Tuckwiller

A golf cart puttering around the Virginia Tech Drillfield at 3 mph will seldom attract much attention. But more than 60 students, faculty and Blacksburg residents gathered Saturday, April 11, to watch just that.

Only this golf cart had no rider. It was one of Tech's autonomous vehicles, using its computerized eyes to navigate a complicated obstacle course full of lines, hay bales and buckets, with rough grass to trip it up

and a glaring sun to confuse it.

But CALVIN, who started life as a lowly golf cart, wasn't even the star of the Tech Autonomous Vehicle Team's Rodeo — teammate Christine completed the obstacle course two minutes faster to win the event.

"We thought the glare from the sun would be a big problem, but we did a lot of work with the computer vision system beforehand," said Mike Burgiss, a senior in mechanical

engineering.

Burgiss, who organized the Rodeo, said Tech has a shot at bringing home the gold from this summer's international competition in Michigan if this weekend's performance is any indication. CALVIN and Christine both placed at last year's competition when Christine was still BOB (Beast of Burden). The team has since re-vamped the vehicle. And Burgiss said they're both running better than ever.

"Christine and Calvin each made two full runs around the course," he said. "They went 1 mph the first time but almost 3 mph the second time; either is fast enough to win this summer."

Burgiss said no vehicle has ever completed the international course to his knowledge, but he expects that to

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Freshmen Join Autonomous Vehicle Team; Find Leadership Opportunities

By Tara Tuckwiller

You join the Autonomous Vehicle Team as a Virginia Tech freshman because you've heard about it in class or from a friend. You think it sounds interesting — you've always been interested in mechanics, or maybe it was electronics or computers. You've heard the team needs plenty of people in all these areas, and where else as a freshman can you get academic credit for building big robots? You don't know anything about computer vision code or programming microprocessors, but you're eager to learn the technical things and willing to help with the grunt work.

According to Dr. Charles Reinholtz, W.S. White Chair and assistant department head of Mechanical Engineering at Virginia Tech, you're the kind of person who's likely to become a leader on the Autonomous Vehicle Team — and, more than likely, in your chosen profession after you graduate.

"I think it's a great all-around opportunity," said Reinholtz, one of the team's advisers. He rattles off a list of benefits freshmen can glean from

working on the team — a chance to learn from and network with leading upperclassmen in engineering, as well as faculty; early exposure to technical concepts; and learning to work on a team.

"It has a myriad of benefits," he concludes. "The whole package is worthwhile."

Freshmen on the team couldn't agree more. Patrick Coleman, a freshman in electrical engineering from Falls Church, Va., joined the

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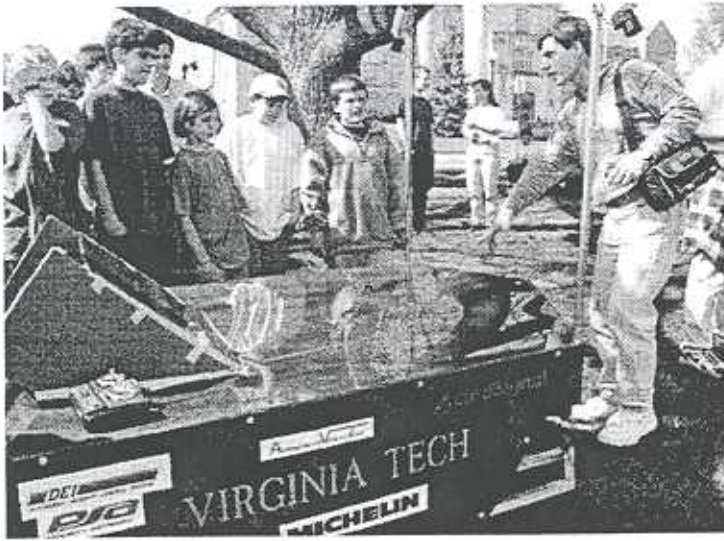
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Rodeo Highlights



Virginia Tech's three autonomous vehicles competed for the school title in the second annual Rodeo, a practice run before June's international competition. TOP: Dr. Charles Reinholtz, one of the Autonomous Vehicle Team's advisers, helps local middle- and elementary-school students get acquainted with CALVIN. RIGHT: Team members used the Rodeo to test and gather data about IVAN, the only vehicle the team built from the ground up this year. BOTTOM: Christine, a reincarnation of last year's BOB, defeated CALVIN by two minutes to win this year's Rodeo.



Photos by Amy Drewry

Freshmen...

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team in January after hearing about it from a professor who knew of Coleman's interest in sensor technology.

"Where else are you going to learn how to program a microprocessor?" Coleman said. "This was an opportunity for me to do that."

Microprocessor programming is one of the skills Coleman has begun to pick up after just one semester on the team, along with some knowledge of circuits and controls. Even the odd jobs he has performed around the lab have yielded practical skills.

"I'm becoming a much better solderer than I was when I joined the project," he laughs. "There are certain things you can only pick up by doing them. There's just not enough class time here to pick up all the practical skills."

Freshman Kevin Ball, a Blacksburg native majoring in mechanical engineering, agrees that the team has been a fountain of both technical and practical knowledge.

"I've learned an incredible amount that I probably would have eventually learned, but now I've learned it before the rest of my classmates," said Ball, who has worked about 20 hours a week on the project since he joined the team in January.

Neither Ball nor Coleman underestimates the value of the teamwork experience they have gained during the past months.

"Most people don't get a chance to work on an engineering team until they co-op or even until they graduate and get a job," Coleman said. "By then it's almost too late — they're already behind the power curve."

Reinholtz said technical and practical knowledge and the ability to work on a team are definitely two skills employers won't ignore when they look at the team's outstanding members. And there's another benefit to working on the team — a benefit that may not

have occurred to the freshmen yet, Reinholtz said.

"It's a pleasure to recommend someone like that for a job or scholarship," he said of the team's outstanding freshmen, adding that he might not have gotten to know them if they hadn't joined the team. "Often, it's personal contacts that are important."

Coleman and Ball said working with faculty and upperclassmen is a big part of why they like the project.

"I've really enjoyed working with them," Ball said. "It seems like upperclassmen are a lot more intent on

what they're doing than freshmen would be on their design project, and the faculty have been good about helping me get involved."

Helping freshmen find their niche on the team has been no dull task for the faculty advisers.

"Getting to know these people is a positive for the faculty, too," Reinholtz said.

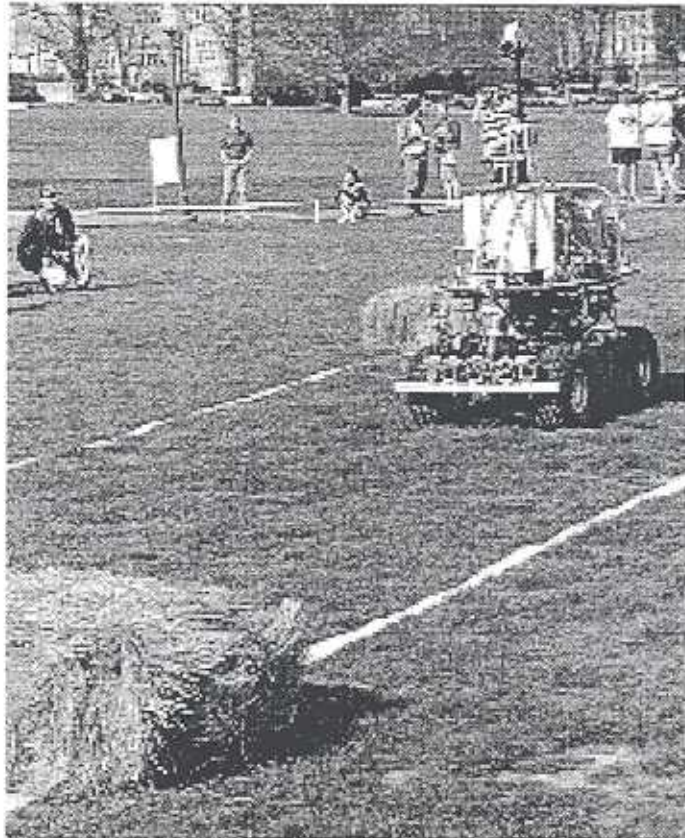


Photo By Amy Drewry

Autonomous vehicle Christine keeps between the lines as she prepares to evade a haybale, one of several obstacles the Virginia Tech team integrated into its Rodeo course.

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Rodeo...

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change this year.

"I predict that somebody will finish the course this year" in addition to Virginia Tech, he said.

Burgiss said the Rodeo track wasn't as long or difficult as last year's international track in Orlando, Fla., but it simulated the competition track in most ways. In addition to the white lines that mark the course, the vehicles had to steer around hay bales wrapped in red plastic and white 5-gallon buckets.

"The buckets make it more confusing because they're white, like the lines, but they've been added to competition this year" so they were added to the Rodeo track, Burgiss said.

The team used the Rodeo to test drive its third vehicle, IVAN (Intelligent Vehicle with Autonomous Navigation) and collect data to complete IVAN's control system. Burgiss said IVAN, whom the team built from the ground up this year, was operating without all the sensors the other vehicles have and therefore failed to make it all the

way around the track.

Christine and CALVIN benefited from practicing at the Rodeo, too. For example, Burgiss said Christine swerved through the first 10 feet of course because her steering was over-correcting — a problem that is easily corrected, but one that could have cost Christine the competition this summer.

"It was good practice to be on the starting line, to load and unload the vehicles from the van," Burgiss said. "It was good to go through it one time so everyone knows what's going on." The team used the Rodeo as a dress rehearsal to fine-tune the vehicles before adding the finishing touches, such as fiberglass shells for Christine and IVAN and safety features such as remote control.

The team also used the Rodeo to pay a debt to Blacksburg Middle

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<http://fbox.vt.edu:10021/org/ANRobotics/robotics.html>



Schoo, which gave the team full access to its shop last summer. Dr. Charles Reinholtz, one of the team's advisers, said teacher Steve Tselides helped the team secure the use of the Middle School's lawn as a practice area.

"We had all our stuff out there for a month and a half, so we owed them," Reinholtz said. "We invited them to come see the cars, and they took us up on that Friday."

Tselides brought seven students who are making "sumo wrestling robots" — robots whose goal is to knock opponents out of a circle, Reinholtz explained. The team invited other area students as well, and they drove IVAN in remote-control mode as team members explained how the cars work and answered questions.

