

Miniature Robots Play Nano-Soccer

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Exploding from the other end of the field, a silver robot glinted under the light of the cameras and burst toward the lone defender standing between it and the goal.

That's when the "Whirling Dervish," as its creators call it, lived up to its name, spinning furiously in a show of razzle-dazzle. But suddenly, the robot stopped dead in its tracks, hopelessly mired as if it were stuck on superglue.

A metal arm appeared to rescue the wayward robot, but it was no crane — it was an acupuncture needle. And the field it plucked the robot from was hardly the size of a grain of rice.

What do you expect when the robot is six times smaller than an amoeba and weighs no more than a few hundred nanograms?

Robots of all sizes have descended on the campus of Georgia Tech for the RoboCup, an international contest that pits robotic creations against one another in a range of technical challenges.

But perhaps the most intriguing event was Saturday's Nano Cup, a competition hailed by organizers as the world's first nanoscale soccer game.

Held by the National Institute of Standards and Technology, its organizers hope to show the potential for building tiny devices that can be used in manufacturing, biotechnology and other industries. They also hope to develop manufacturing standards for the untapped field.

"If you take an ant and leave it on its own, it can't do much. But many ants can do incredible things," said Michael Gaitan, the leader of the agency's microrobots project. "We think the same way with microrobots. We'll have to see where it takes us. For now, it's soccer."

Five teams from the U.S., Canada and Switzerland answered the call, building microscopic robots that competed Saturday in two events: A two-millimeter dash and a challenging slalom, where the robot must reach a goal that is blocked by stationary defenders that look like running men but are about the diameter of two hairs.

The events take place in a glass-enclosed cube in the corner of a cramped classroom. Two high-powered microscopes project the action to the big screen, and scientists and students fall silent whenever a competition takes place.

The odds-on favorite for the day was ETH Zurich, an impressive Swiss team that developed a sophisticated propulsion system for the robot that's driven by small magnets.

The creation was completely automated, allowing the players to point and click a place on screen and then watch the device move accordingly.

The team has great hopes for the invention, which they developed over the past six months, and has already applied for patents. The team one day hopes to be able to send their robots into a human's bloodstream to treat cancer, cell defects or for other medical uses.

"You can leave the soccer field, build these robots and send them into the blood flow," said Dominic Frutiger, a Ph.D. student at the Swiss Federal Institute of Technology.

But scientific competitions are as much about failed experiments as they are about those that actually succeed.

The creators of the Whirling Dervish, a team of two from Canada's Simon Fraser University, took that lesson home. They took a gamble by building their device with a plastic base rather than a metal one, and the result made the two-millimeter dash look more like a chess match than a sprint.

With a video game controller in hand, team member Dan Sameoto desperately mashed buttons trying to find the right frequency combination to get his microscopic robot moving.

Each twitch on the big screen elicited a gasp from the crowd and encouragement from his teammate, See-Ho Tsang. "C'mon," Tsang cried to the robot. "You can't be tired now!"

Each trial, though, ended with the acupuncture needle floating on screen to rescue the wayward device.

After the event, the two partners huddled around the computer to discuss what went wrong. Next year, they decided, they're going with a heavier device they say won't get stuck as easily.

"The lesson was learned," Tsang said.

Sameoto shrugged as he put Whirling Dervish aside.

"We go through a lot of them," he said. "They're designed to be disposable so we don't get too attached."

On the Net:

www.robocup.org/