Robots head for the high seas

Automated sailing boats are testing the waters and could soon cross the Atlantic Ocean

Jacob Aron

PEOPLE have been sailing the world for centuries, but ask a robot to do the same and it quickly falls down.

Last year Mark Neal, a computer scientist at the University of Aberystwyth, UK, oversaw the launch of Pinta, a robotic sailing boat that set off from the west coast of Ireland in an attempt to be the first automaton to cross the Atlantic Ocean. His team lost communication with the boat just over two days later. The voyage was still an achievement: "Forty-nine hours is the longest period of unattended autonomous sailing that has happened," says Neal.

"Protei boats have a unique design that allows the hull to flex in order to best use the wind while turning"

When uncrewed aircraft can master flight so readily, it might seem strange that it is so hard for a robot to sail a boat. In fact, the challenges are very different. "Some of the longest unmanned aerial vehicle (UAV) flights are a day or two. If something stays up for 24 hours, that's a pretty outstanding achievement," says Neal. In contrast, a useful robo-boat needs to run for months using only sails and solar power (see "Why build a robot sailor?"). During that time the solar panels could get caked with salt, the craft could be damaged, and barnacles and weed could grow on the rudder.

What's more, while UAVs have to cope with weather changes, the conditions they operate in are fairly stable compared with those of the ocean, Neal says. "The boat needs to deal flexibly with an unpredictable environment," says Roland Stelzer of the Austrian Society for Innovative Computer Sciences in Vienna. Stelzer is in charge of Roboat, an automated 3.75-metre-long boat that has won the World Robotic Sailing Championship for the past three years by successfully completing tasks including a 24-hour endurance race and navigation between tightly spaced buoys.

Stelzer puts Roboat's success down to its computer "brain", which mimics two human sailing abilities. One system plots the best route by calculating the heading that takes best advantage of wind speed and direction in relation to the destination.

The other keeps the boat on the desired course. It does this by considering factors like how far the boat is heeling and whether waves have pushed it off course, and then adjusting the rudder position to make both small corrections and sudden turns.

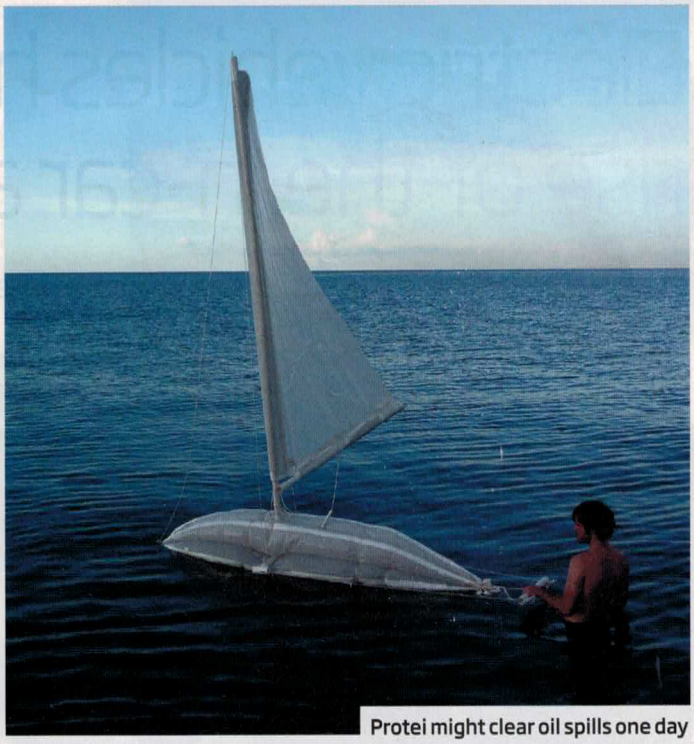
However, each competition took place within 4 kilometres of the shore. "We had to monitor the boat all the time either from shore or on a chasing boat," Stelzer says.

The Pinta is smaller and less sophisticated, in case the boat is lost at sea. Stelzer's craft might be robust enough to cross the Atlantic, but he is reluctant to try – losing such an expensive rig would be a huge setback.

Instead, the first robotic sailors to spend long periods at sea may come from the Protei project, which aims to build autonomous craft for cleaning up oil spills. Conceived by designer Cesar Harada, who also leads the project, the boats have a unique articulated design that allows the hull to flex in order to best use the wind while turning.

The hardware is open source, meaning that anyone can work on or modify the design and help solve problems. "It's a collaboration with people worldwide contributing their best knowledge and enthusiasm," says Peim Wirtz, who manages the project from the V2 centre in Rotterdam, the Netherlands. The concepts behind Protei have undergone small-scale tests, and the team will now build a full-scale prototype after raising nearly $35,000 on the crowd-funding website Kickstarter last month. "We have over 300 backers that thought the initiative was worth sponsoring," says Wirtz.

So will we see robots sail the seas any time soon? Wirtz hopes to complete the Protei prototype by September and Pinta will be making another transatlantic attempt at the same time. "If we didn't think it was possible, we wouldn't be trying," Neal says. "Someone will do it, and I'd like that to be us." ■



CESAR HARADA, HUNTER DANIEL, MARIKO TOYOJI

Protei might clear oil spills one day

Why build a robot sailor?

A boat that sails itself would be a nice bit of tech, but what are the practical benefits? A craft using only sails and solar power would be ideal for long-term missions, says Roland Stelzer of the Austrian Society for Innovative Computer Sciences.

"In the future, autonomous sailing boats will be used for tasks such as maritime monitoring, reconnaissance and surveillance, and carbon dioxide-neutral transportation of goods," he says. Robotic sailboats could also operate in swarms, allowing them to tackle large-scale problems like gathering meteorological data in remote stretches of ocean or measuring water pollution. They could even be used to rescue refugees.