

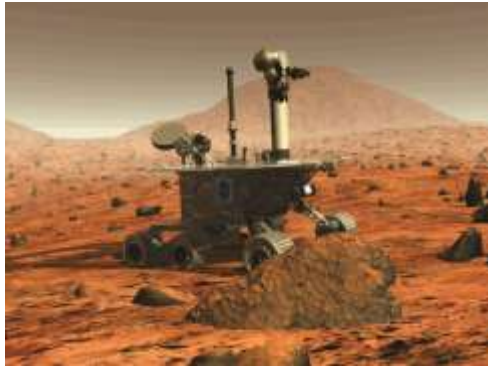
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Persistent Operation of Mobile Robots

In Nonlinear and Autonomous Systems Lab, we are developing theoretical, computational, and experimental tools for long-term operation of network of autonomous vehicles in complex environments. The application is for a air, ground, and sea robots.





Challenge

- Collective power management for long-term multi-robot operation.
- Effectively respond to energy needs in the presence of dynamic conditions and environmental uncertainty.

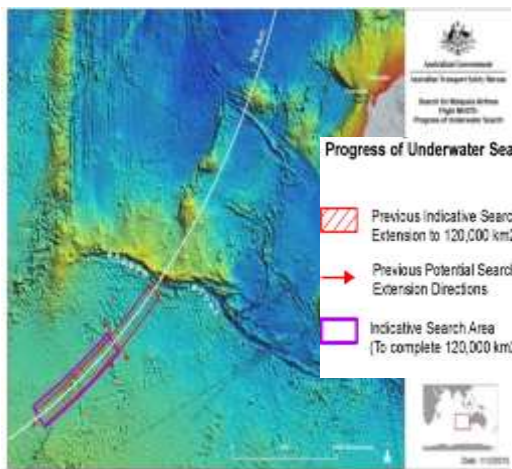


Solution

The key is lowering deployment and operating costs, while also increasing efficiency, endurance and persistence.

Our approach includes:

- task and energy routing scheduling,
- efficient path planning and coordination,
- low-infrastructure platforms.



COST OF THE SEARCH		
HMS SUCCESS 14 days at sea USD 7.15 MIL	US PLANES & SHIPS as of Wednesday USD 3.34 MIL	VIETNAMESE search in South China Sea USD 8.07 MIL
HMAS TOWOOMBA 7 days at sea USD 2.51 MIL	US BLACK BOX LOCATOR /UNDERWATER DRONE USD 3.62 MIL	PAYOUT TO FAMILIES USD 1.16 MIL

US = United States of America Source: The Sydney Morning Herald

Robot sub to search seabed for MH370

An unmanned submarine is expected to be deployed in the coming days to search for wreckage on the sea floor, after acoustic signals consistent with an aircraft black box narrowed down the likely search area

BLUEFIN-21 Length: 4.93m Weight: 750kg Speed: 4.5 knots Autonomy: 25 hours

Sonar buoys dropped in 600 square km area to help triangulate source of signals detected by Australian navy ship since April 5

Bluefin-21 can search 100km per day

Bluefin-21: Side-scanning sonar and multi-beam echo sounder can examine underwater objects in minute detail

Sources: U.S. Navy, Bluefin Robotics, Australian Maritime Safety Authority © GRAPHIC NEWS

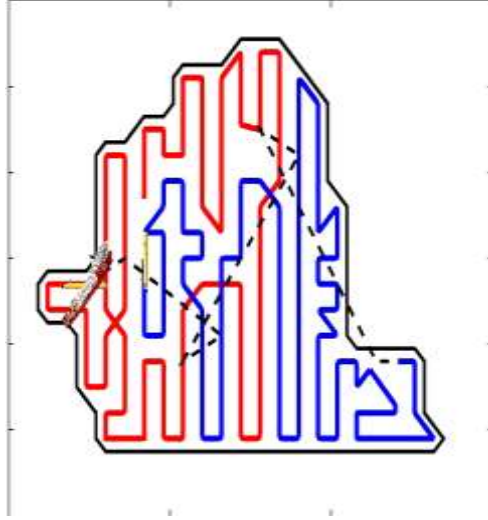
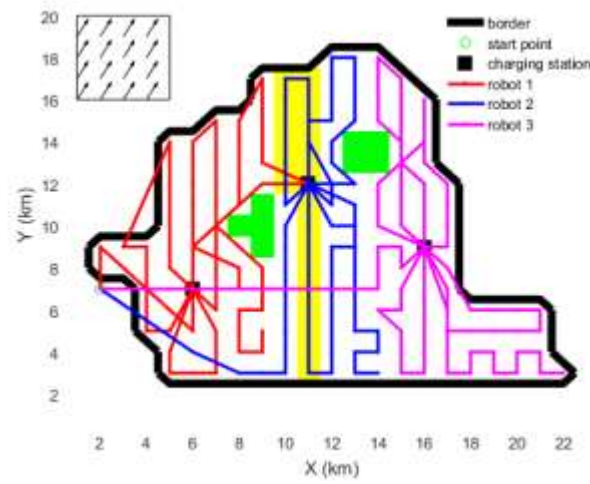
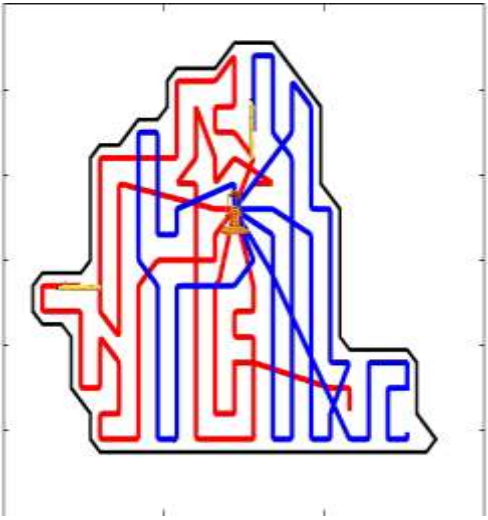
Task and Energy Routing Scheduling

Mission planning architecture for persistent operation to

- place and uses static charging stations
- Or
- find the rendezvous positions of mobile chargers

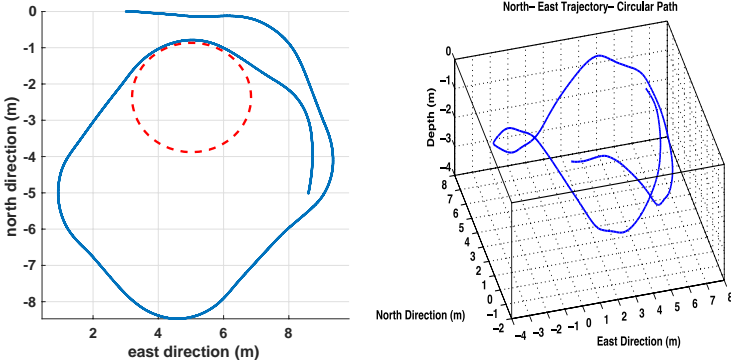


With primary objective: minimize the energy spent

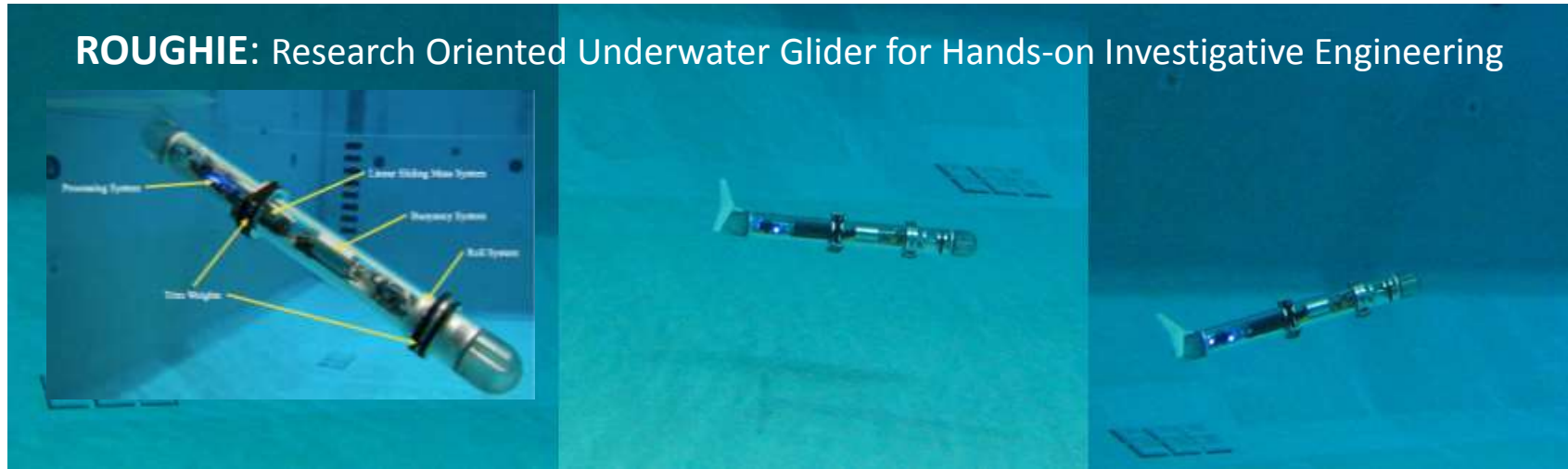


Low-Infrastructure Platforms

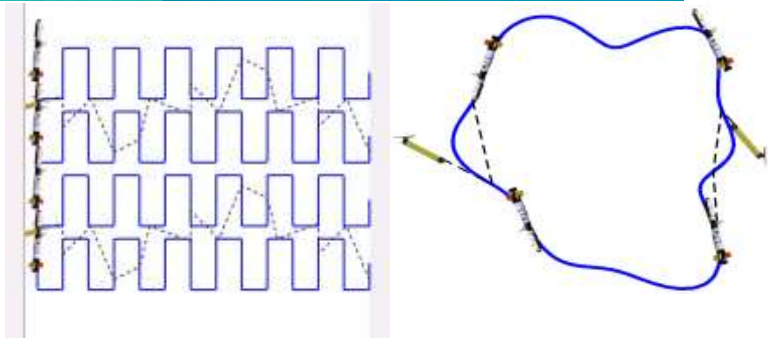
- Reducing the cost of deployable AUUVs while increasing maneuverability and capability of operation



ROUGHIE: Research Oriented Underwater Glider for Hands-on Investigative Engineering



- Developing experimental test-bed including a mobile charger capable of autonomous docking and wireless energy transfer for marine settings.



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