AutoNaut Unmanned Surface Vessel (USVs) for Arctic and Antarctic seas

AutoNaut

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INTRODUCTION

The project will produce an AutoNaut unmanned surface vessel (USV) capable of operating in the Arctic and Antarctic regions to be able to autonomously gather and transmit data from the ocean surface. High latitude oceans are amongst the most hostile areas of the planet and deeper understanding of these regions is of increasing importance. Both commercially, because of their resources, and scientifically due to the critical role they play in climate change. For instance, krill fisheries and CO^2 flux will be key research aims enabled by the development of this novel platform.

AUTONAUT USV

The AutoNaut is a wave propelled Unmanned Surface Vessel (USV) creating a step forward in autonomous data gathering. She has zero emissions, and can roam the oceans for very long periods, transmitting data via satellite to shore. With no requirement for offshore personnel, the AutoNaut significantly reduces costs and safety risks at sea. An extensive range of sensors and equipment can be installed.

ENERGY HARVESTING

The AutoNaut's forward motion is driven by the motion of the waves acting upon the foils and hull. This frees up energy derived from other means – currently photo-voltaic (PV) solar panels, and stored in batteries – for on-board electrical power for platform control, sensors, and data transmission. This project will require the further development of solutions for energy harvesting in the dark and cold, with a key aim being to move beyond reliance on PV panels. This may involve energy systems deriving power from motion and/or using new kinds of fuel cell. Improvements in power-energy efficiency will also be made through a new power management system.

COPING WITH ICE

Ice presents a range of issues to be overcome. The project will involve the application of new material such as nano or hydrophobic coatings to prevent icing of masts and topsides. It will also evaluate materials capable of working reliably in extremes of cold. This is relevant to hull construction for abrasion by ice, and crushing, and to fatigue in working parts such as stainless steel springs and SLA printed nylon parts. Testing of materials will be conducted in a sea ice chamber.

The hazard of floating ice to an unmanned surface vessel will be very real. AutoNaut has a well developed collision avoidance system based on marine traffic but requires development to enable work amongst floating ice. Enhanced situational awareness specifically for ice, such as thermal imaging, in concert with machine learning, will be developed for autonomous decisions on ice avoidance.

PROJECT OUTCOME

The USV sensor platform produced by this project will enable science to better understand the extreme environments of high latitude oceans. Once ruggedised and equipped to harvest energy in the dark, the platform will be able to play a part in the monitoring of climate change and environmental protection of these environments, such as marine protected areas (MPAs).