

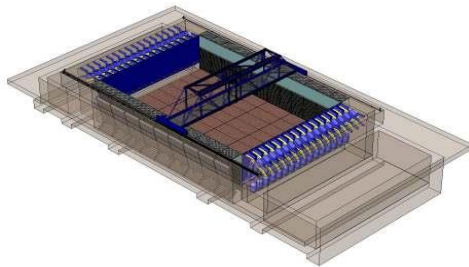


Khalifa University Marine Robotics Lab

Khalifa University Robotics Institute

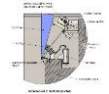
The research in the field of underwater robots is triggered by highly demanding applications such as exploration, inspection, maintenance and repairing in submerged areas in which interventions are essential but extremely complex, expensive or dangerous for humans. The Khalifa University Marine Robotics Lab is devoted to the development of advanced robotics systems in order to respond to the exploration, inspection and maintenance needs of marine engineering platforms as well as marine natural ecosystems.

WORLD-CLASS TESTING FACILITY



Main Components

Wave generator



Stream generator



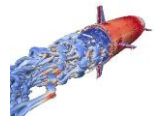
Gantry system



Cameras for tracking

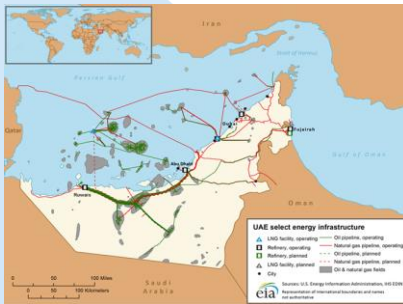


CFD Simulator



Proposed Projects

AUTOMATED UNDERWATER MANUFACTURING AND INSPECTION



This project aspires to automate manufacturing and inspection of marine infrastructures such as offshore oil/gas platforms, nuclear power plants, sea-floor pipelines and power/information cables, ship and submarine repair stations and ports, ultrafast Hyperloop railways, through "resilient infrastructure for economic growth" (Abu Dhabi 2030 Plan). Structure-walking automata will be used for aquatic manufacture by machining, joining, consolidation, curing, as well as underwater assembly and integration with underwater propulsion and inspection.

Socio-Economic Outcomes

- Materials industry global market of nearly \$1.5 trillion/year, rising by 19% annually and with a profitability of 27% (Abu Dhabi 2030 Plan, p. 116-119).
- Oil, gas and Nuclear Industry.
- Energy and the environment.

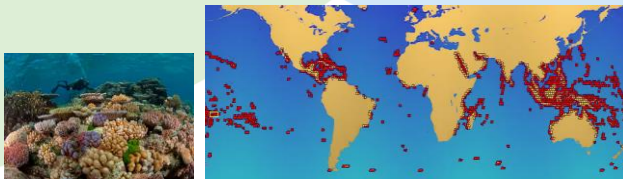
Scientific-Technical Outcomes

- Underwater Manufacturing
- Underwater sensors and signal transmission.
- Underwater SLAM and path planning.
- Automated Macroscale Assembly



Unmanned Underwater Navigation and Manipulation for Coral Reef Reimplantation

Today corals worldwide are facing serious threats from climate change, human related activities and pollution while they play a crucial role in maintaining the marine biodiversity. In general terms the richer the local biodiversity of animal and plant communities the better the range and quality of ecological services provided such as: food products, raw materials, medicines, life support functions i.e. clean breathable air and clean water, spiritual well-being, cultural heritage value and recreation opportunities. For these reasons, it's in everyone's interest to protect biodiversity. With this project, using underwater robotics technology, we aim to preserve and reinforce the coral reef ecological environment of the coast of the Abu Dhabi Emirate, providing a great beneficial to the whole marine ecosystem of the region.



Scientific-Technical Outcomes

- Arabic Coral Reef documentation of the ecosystem properties.
- Underwater sensors and signal transmission.
- Underwater SLAM and path planning.
- Underwater SWARM robotics and collective task planning.

Socio-Economic Outcomes

- The global economic value of coral reefs has been estimated to be between US\$ 29.8 billion and 375 billion per year.
- Enhance of : food products, raw materials, medicines, life support functions such as clean breathable air and clean water.
- Spiritual well-being, cultural heritage value and recreation opportunities.

Soft Unmanned Underwater Vehicle for the Exploration and Conservation of the Mangrove Forest

Mangroves are extremely important for the marine biodiversity, only as they act as the best antidote for coastline erosion, but they represent a unique ecosystem that provide suitable habitat and safe breeding grounds for many fish species, such as snapper, grunt fish, bream, shrimps and crabs, in a word biodiversity. In general terms the richer the local biodiversity of animal and plant communities the better the range and quality of ecological services provided such as: food products, raw materials, medicines, life support functions i.e. clean breathable air and clean water, spiritual well-being, cultural heritage value and recreation opportunities. For these reasons, it's in everyone's interest to preserve and explore the mangrove forest ecological environment of Abu Dhabi, providing a great beneficial to the whole marine ecosystem of the region.



Scientific-Technical Outcomes

- Arabic Mangrove documentation of the ecosystem properties.
- Mechanics of jet propelling and soft underwater locomotion.
- Engineering science of soft robotics.
- Robophysics of continuum programmable materials.

Socio-Economic Outcomes

- Coastal protection
- Storage of carbon in mangroves through accumulation in living biomass and through burial in sediment deposits
- Enhance of : food products, raw materials, medicines, life support functions such as clean breathable air and clean water.
- Spiritual well-being, cultural heritage value and recreation opportunities