OceanRINGS
Smart Technologies for Subsea Operations

System Concept & Applications

Charles Parsons Initiative
Energy & Sustainable Environment
Supporting Technologies for Ocean Energy Systems

Mobile & Marine Robotics Research Centre
Team:
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J. Coleman, PhD Student
L. Miller, PhD Student

Background Picture: 1,000m depth rated smart ROV LATIS, developed at UL
Look Into Feature

Desired Features of Future ROVs:

- **Improved User Interface**: More intuitive 2D & 3D displays – better situation awareness, touch screen controls
- **Higher Level of Automation**: Auto-compensation of ocean currents and umbilical drag effects
- **Advanced Control Modes**: Enable ROV pilots with average skills to achieve exceptional results
- **High-Accuracy DP in Deep Water**: Fast move to desired location, pilot can concentrate on task
- **Built-in Thruster Fault Tolerance**: Optimal control allocation for any thruster configuration
- **Improved ROV - Ship Bridge Link**: Easier synchronisation of ROV & Ship motions
- **Universal Architecture**: Standard connectors, Ethernet as comm protocol, off-the-shelf components

Ultimate Objective:

- Saving ship time,
- Making ROV operations easier & safer.
Virtual Underwater Lab for Ocean Systems Modelling and Simulation

System Concept

Virtual Environment
- Virtual structures
- Virtual ROVs
- Virtual support vessels

Simulation Tools
- Modelling Tools
- Visualisation Tools

Real-World Environment
- Real structures
- Real ROVs
- Real support vessels

OceanRINGS
- Disturbances
  - Virtual waves
  - Virtual ocean currents

System Core

Full compatibility between Real-World and Virtual components!
Unique Prototype Platform with Multiple Modes of Operations

- Surface-Tow Mode
- Surface-Thrusted Mode
- ROV Operation Mode
- ROV Submerged Tow in Strong Currents
- “On the Fly” Reconfiguration
Smart ROV \textit{LATIS}

- **2D Real-Time Display**
- **3D Real-Time Display**
  - Transparent ocean view aiding operations

**Input Devices**
- Joystick
- PDA
- Touch screen

**Pilot Interface**
- Heading
- Roll
- Pitch
- Speed
- Depth

University of Limerick  Mobile & Marine Robotics
## Field Test Trials

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3D RT Augmented Reality Display
Low Level of Automation: Pilot Skills Essential for Mission Success

Richard Vandervoort
Chief of ROV Operation & Underwater Robotics, Marine Institute, Newfoundland, Canada

“The only real automatic controls present on modern work-class ROVs, used in offshore oil and gas exploration, are auto heading, auto depth, and auto altitude. It really depends on pilot skills to do good piloting.”
Empress of Britain
Surface Operations
Subsea Operations
Two ROVs (LATIS & Pro3/Pro4)

Control Centre (Dry Lab) → ROV LATIS → VideoRay Interface Bottle → Pro3 & Pro4 (Wet Lab)
"Recently, I had the opportunity to be part of the sea trials of a prototype vehicle, the ROV LATIS, onboard the research vessel Celtic Voyager. It is a truly remarkable piece of technology, and I am convinced it represents the next generation of underwater robotics. The ability of the vehicle to navigate, its user friendly piloting controls, dynamic and static positioning capabilities and built-in malfunction corrective functions far surpasses anything that presently exists on the market and as such would greatly increase both the speed and accuracy of subsea operations. It is my estimation that a significant savings in the time required to perform underwater tasks, along with the commensurate savings in operational costs, would be achieved should this technology become available for wide scale commercial and industrial use."

Richard VanderVoort
ROV Expert, Chief of ROV Operations
Marine Institute
Memorial University, Newfoundland, Canada

"ROV LATIS is exceptional, cutting edge technology, and most likely the future of ROV piloting."

Donovan Tulk
ROV Pilot (Student)
Memorial University, Newfoundland, Canada
International Collaboration in ROV Development
Implementation

Features:
- Universal Architecture
- Communication Protocol: Ethernet
- Off-The-Shelf Components
- Normalised Control Spaces
- Standard Connectors
- Remote Control
- Built-in Autotuning & Fault-Tolerance

ROV Upgrade Kit:
- Dry Components (Control Cabin)
- Wet Components (ROV)

Aiding Sensors:
- GPS
- Depth
- DVL
- USBL
- LBL
- CTD
- SVP