New Tools for Easing System Integration, Deployment, Monitoring and Maintenance of Ocean Energy Devices

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This paper describes a set of novel aiding tools and technologies for system integration, deployment, monitoring and maintenance of ocean energy devices. The main component of the system is smart remotely operated vehicle ROV_{LATIS} – a novel, multi-mode of operation marine robotics vehicle, developed at Mobile & Marine Robotics Research Centre (MMRRC), UL for operational flexibility in high-resolution near seabed survey from shallow inshore waters out to the continental shelf edge. The assistive visualisation and control tools, proposed in this paper, allow operators to have better situation awareness and enhanced vehicle control in presence of disturbances. Flexible design of these tools enables their use as separate modules, as well as their integration into unique system. Ocean energy technologies play an important part in meeting target that third of Irish electricity is generated from renewable sources by 2020. Proposed assistive tools could help developers of ocean energy devices in meeting this target during different stages of design, deployment and operation.

At present, the typical displays presented to ROV operators during deployment and maintenance operations with ocean energy devices include low visibility real-time images from onboard cameras and optional 2D situation top view display(s). During such operations, the ROV is subject to disturbances, such as strong currents and waves. The assistive visualisation and control tools, proposed in this paper, provide operators with better situation awareness and enhanced vehicle control in the presence of disturbances, allowing them to concentrate on the task and to complete the work in a satisfactory manner and in a shorter time. The direct benefits of this approach are reduced maintenance and deployment costs due to savings in expensive support vessel time.

The proposed assistive tools are integrated into a system called the Virtual Underwater Lab for Ocean Systems Modelling and Simulation. The main components of the system are: the System Core; the Real-World Environment; and the Simulation Environment. Input-output compatibility between the real-world and virtual components enables easy switching between environments, creating opportunity for a variety of applications. Many integration problems can be detected, isolated and resolved in advance. Different mission scenarios can be designed and verified through the mixed use of virtual and real-world components, yielding significant costs savings and improving the reliability of the overall system.