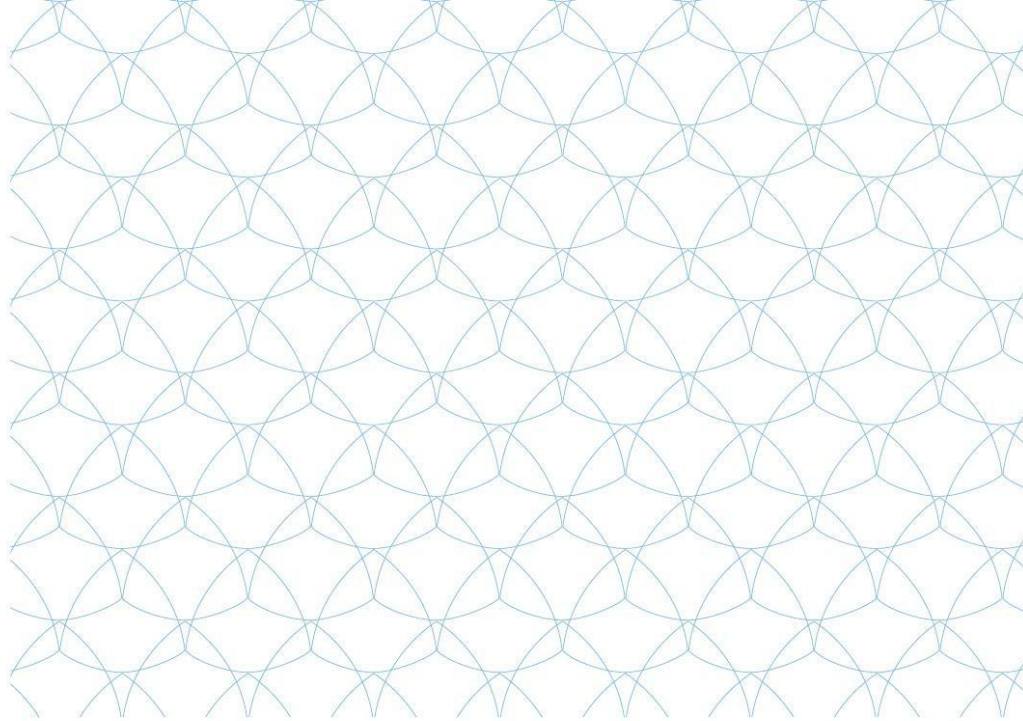




**EXCELLABUST**  
EXCELLING LABUST IN MARINE ROBOTICS

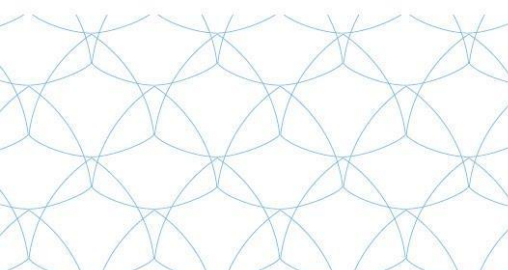


# Staff exchange 5

## *Report*

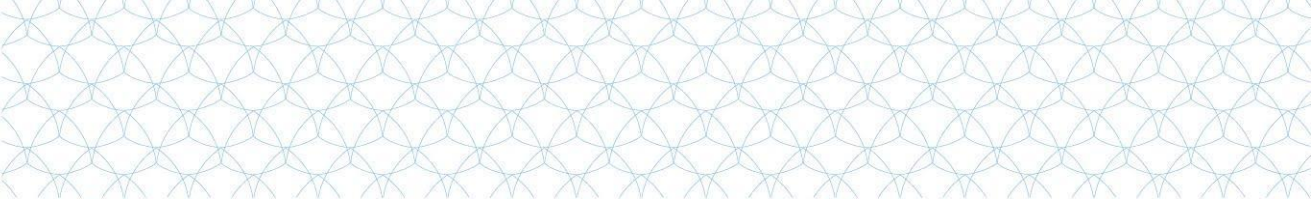
July – Aug 2018

Đula Nađ @University of Limerick



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Đula Nađ was a guest researcher during July and August 2018 at University of Limerick, Department of Electronic and Computer Engineering, Centre for Robotics and Intelligent Systems. The UL team is well established in the fields of human-machine interaction (HMI) and underwater vehicle control.

During his stay, Đula Nađ has been involved in human-machine interface research. Together with his UL supervisor, Edin Omerdić, PhD, he investigated the use of virtual reality tools for visualization and operation of remotely operated underwater vehicles (ROVs). Based on this research the HTC Vive virtual reality system was integrated with the existing LabView simulator and user interface.

The first part of the exchange focused on learning the Unity game engine and associated toolboxes for inclusion of the HTC Vive VR headset for creation of the immersive system visualization. In parallel the main communication scheme between LabView and Unity game engine was designed. In the designed event-driven communication, LabView and the Unity application are communicating via UDP messages. Each user interface event, in either Unity or LabView, generates a message transmission to maintain system synchronization. As an example, assume that a controller is turned on in Unity. The action generates a message which is transmitted through UDP to LabView. This message is processed in LabView and a user-interface event enabling the controller is enqueued and executed. The message format is ASCII and resembles the ubiquitous NMEA message standard format. This allows human readable analysis of message transmissions. The same messaging scheme can be applied to numerous other interactors, e.g. ROS nodes, multi-model interfaces, etc.

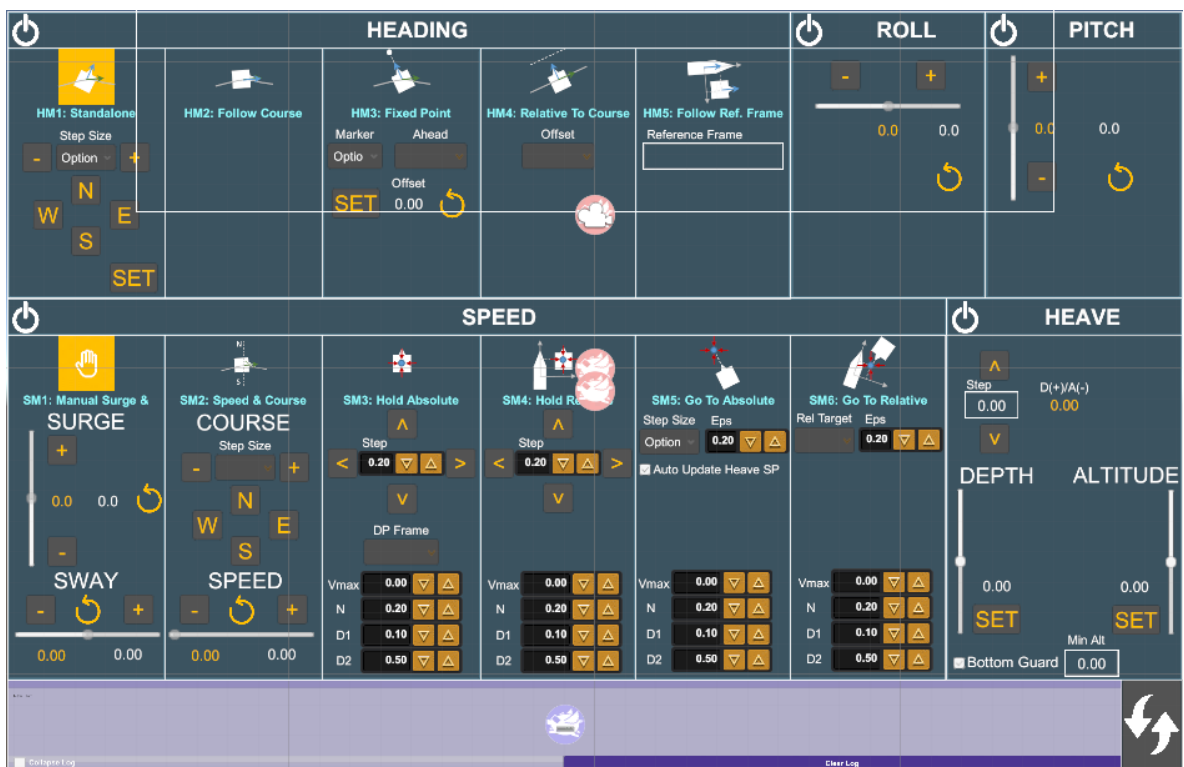
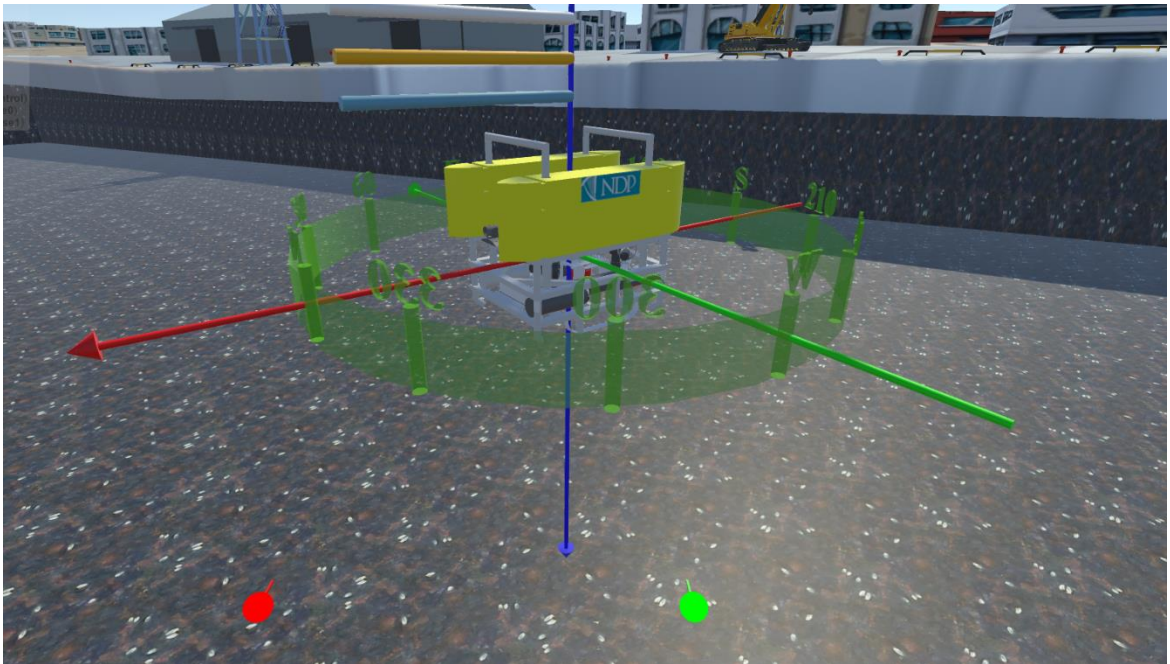


Figure 1. The Unity developed user interface for testing all communication protocol functionality

Once the communication protocol was defined and basic familiarity with the Unity game engine acquired, a LabView UI protocol in Unity was created, see Figure 1, that allows easy testing and validation of the communication protocol. Once the communication protocol was validated, the next steps included importing meshes for the environment, vehicles and augmentation elements (i.e. compass). Figure 2 shows the ROV mesh augmented with visual indicators for orientation and movement speeds. As proof-of-concept environment, the Limerick docks, seen in background on Figure 2, were generated in Unity to provide a realistic environment for future user testing.



*Figure 2. The ROV as seen in the virtual reality*

The main outcomes of the visit were:

1. Unity game engine operation and development skills were acquired.
2. Operation and integration of HTC Vive in Unity were accomplished.
3. Skill in designing simulators and multi-modal user interfaces were acquired.

These new skills will be used for development of a new system for investigating diver-robot interactions and for a system providing end-user education and training.