25133: 3D state estimation and prediction for surface vessels using sensor fusion

Promotor 1:	prof. dr. ir. Hiep Luong		
Begeleider 1:	Charles Hamesse	Begeleider 2:	ir. Tien-Thanh Nguyen [Royal Military Academy]
Aantal studenten:	1	Richting(en):	Master of Science in Computer Science Engineering , Master of Science in de industriële wetenschappen: informatica, Master of Science in de informatica
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Contactpersoon: Charles Hamesse

Probleemstelling:

Autonomous Surface Vessels (ASV) are becoming important assets for military operations, not only on the battlefield, but also in logistics and in supportive roles. This also means that more and more of these vehicles are being deployed in the field, each with their own characteristics and specifications. With the involvement of sensors like cameras or laser scanner on the ASV, it critical to know the 3D pose of the ASV. In some applications, the ASV has to corporate with other autonomous agents (UAV landing), it requires to predict the 3D state of the ASV from a certain time horizon.

This thesis will be done in collaboration with the Royal Military Academy.

Doelstelling:

The main goal of this thesis is to provide an accurate and real-time 3D state estimator and predictor for the surface vessels using deep learning and sensor fusion techniques applied on available data streams from on-board sensors such as IMU and cameras (mono/stereo). The proposed estimator and predictor will be analyzed and tested in buoyancy and boat physics simulation on Unreal Engine and implemented on real hardware of an ASV. It will also be used in an application required to communicate with an UAV during an autonomous landing of UAV on to ASV. Access will also be provided to ground truth data collected during the measurement campaign including spectra leaving radiance, positions and light condition.

Figure 1: the ASV used in related projects.

References:

- Hitz et al., "Relaxing the Planar Assumption: 3D State Estimation for an Autonomous Surface Vessel", SAGE The International Journal of Robotics Research, 2015
- Figuero et al, "Inertial Measurement Unit to determine moored vessels movements", Proceedings of the 6th International Conference on the Application of Physical Modeling in Coastal and Port Engineering and Science, 2016
- Project MarSur: http://mecatron.rma.ac.be/index.php/projects/marsur/
- Project MarLand: http://mecatron.rma.ac.be/index.php/projects/marland/

Locatie: