3D reconstruction from sonar images using Deep Learning techniques

ENSTA Bretagne

NICOLAS BAUDIN
INTERNSHIPS IN FRANCE INITIATIVE

Name of the hosting institution in France	ENSTA Bretagne
Name of the host laboratory / research team	Lab-STICC UMR 6285
Address	ENSTA Bretagne Lab-STICC 2 rue François Verny 29806 Brest Cedex 9
Web site	www.labsticc.fr
Name of the supervisor	Isabelle QUIDU
Function	Associate Professor
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Internship offer

Topic of the internship (title)	3D reconstruction from sonar images using Deep Learning techniques			
Proposed dates of the internship*	Start	2020-10-04	End	2021-03-31

* The supervisors have indicated the dates proposed are flexible and are able to be postponed subject to COVID-19 border closures.

Scientific and academic objectives of the internship (detailed description of the internship content, work expected from the intern and expected outcomes):

The Underwater Systems business line of Thales DMS develops innovative systems for detection, classification, localization and identification of underwater threats like mines or IED. Deployment of unmanned systems into operational forces, required to address new type of mission, generates a multiplication of payloads and huge quantity of data. This data need to be analysed as quickly as possible. During typical AUV survey mission, the system generates several high resolution sonar views of the objects laid on the floor. Those views allow producing a 3D reconstruction of the object. The goal of this internship is to develop some preprocessing module using Deep Learning approach in order to reduce operator manipulation :

- Firstly, a registration module dedicated to high accuracy Multiview alignment.
- Then a segmentation module that realizes an extract of the acoustic shadow shape of the sonar views.

The candidate will be integrated in the Digital eXperience laboratory composed of software developer & data scientists. Main steps will be :

- Appropriation of data format and existing 3D reconstruction algorithm
- Generate contact database using existing annotation tools
- Design & train the Deep Learning services for segmentation & registration
- Integrate the services in the existing demonstrator

Name of industrial partner	Thales Defence Mission Systems France- UWS
Role of the industrial partner in the internship project	Thales will provide real data sets of underwater multiviews sonar contacts and expertise in deep learning systems development. Thales will also participate to the management/coaching of the internship. Thales will provide existing software mock-up & tools that will support the internship project.
Main contact at the French industrial partner	Julien Ferrand
Email of contact at French industrial partner	Julien.ferrand@fr.thalesgroup.com

Expected profile of applicant

Level of study	Master, Bachelor with Honours
Discipline	Computer Science, machine learning, 3D development
Required qualities, knowledge and skills	Knowledge : Required: Python/tensor flow, Machine Learning, 3D with Unity development Desirable: Java development, Dockerisation, tensor Board Behavior : Curiosity, Motivation, Autonomy Keywords : Deep learning, User Experience, 3D, Artificial intelligence.

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