

Object detection in sonar images with deep learning

Introduction to Fleet Cleaner

Fleet Cleaner develops and deploys robots for ship hull cleanings. We are an innovative technical company based in Delft. With our unique robot we offer the most complete solution for ship hull cleanings on the market, available in all Dutch seaports. The Fleet Cleaner robot removes fouling from a ship's hull, thereby increasing fuel efficiency dramatically and reducing fuel costs. The cleaning is performed during loading and unloading in port; resulting in no down-time for the vessel. The fouling that is removed from the vessel is captured and filtered by our state-of-the-art filtering system aboard our support vessel. This is the reason that Fleet Cleaner is one of only a few companies licensed to perform hull cleanings in Dutch ports.



Figure 1 The Fleet Cleaner robot cleaning a ship

Research objectives

Since the robot usually operates in turbid waters, camera vision is of irregular and poor quality. Therefore, for navigational purposes the robot relies heavily on a forward looking sonar (FLS). This device gathers information on objects and fouled areas on the ship's hull and presents it to the human operator in the form of a sonar image (see Fig 2). In a previous study, algorithms were developed for the detection of objects to assist the robot operator and to eventually make the robot autonomous. These objects, like the waterline, the bilge, bow thrusters and sea chests are detected by using handcrafted rules and algorithms. However, it is well-known that detecting object by directly from the data with deep learning algorithms, can result in a better performance. Fleet Cleaner is already using this technology on its underwater camera's but we would like to extend this towards our sonar. Therefore we are looking for interns who are interested in one or more of the following topics:

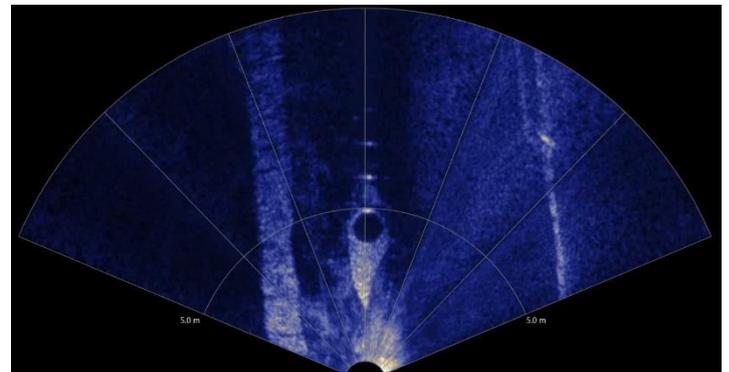


Figure 2 Example of a sonar image with an object and fouling

- Optimizing deep learning algorithms for use on sonar images.
- Detecting objects while using a limited amount of training data.
- Automatically detecting passable and non-passable regions in the image.
- Presenting the results of the algorithm to the operator in an intuitive way.

We are looking for a talented and enthusiastic MSc, BSc or Applied Science (HBO) student, preferably with a background in robotics, computer vision or related engineering fields. We offer the following:

- 3-12 months thesis assignment or internship at Fleet Cleaner (in Delft)
- Actual implementation and testing of your work in a real-world application
- Working in an innovative company
- Working together in a young, enthusiastic and multidisciplinary team
- An appropriate internship allowance