UTOFIA
Underwater Time Of Flight Image Acquisition

Newsletter #5
December 2017

Compact, powerful, real-time – UTOFIA ready for testing

The most advanced version of UTOFIA – system two – has now been shipped to partners for testing.

This system includes all the features planned during the UTOFIA project – live 3D acquisition and backscatter-free images in a system that is both compact and versatile. The system includes both camera and illumination in a compact package making the system ideal for agile platforms.

◀ System two with control electronics, cable and PC

Key specifications

Parameter	Value
Camera diameter	155 mm
Camera length	370 mm (cylinder only) Approx. 470 mm including connectors and front eye bolts
Max cable length	70 meters
Weight	9 kg
Volume	7 liters
Power supply	230 V. 250-300 W.
Frame rate	10-20 Hz (adjustable)
Resolution	900x500

The UTOFIA Sea Trail Tour

In the upcoming months, the UTOFIA system will be doing a tour of Europe to face its final and most rigorous series of field trials.

From its home in Oslo, its first port of call is Marseilles harbour for initial tests at sea and marine litter surveys. From there it will travel to Copenhagen to survey the seabed and seagrass meadows in the Øresund strait (the Sound) and proving its worth in monitoring Norwegian lobsters. It then travels to the Basque country to conduct benthic biodiversity surveys, after which it is back to Denmark to sample fish aggregations. Its final test is in Catalonia, where it will be used to observe and measure fish in a sea cage. During these sea trails, the UFOFIA system will be deployed by a whole range of vehicles including towed bodies, ROV's and a benthic sledge. Watch out for our next newsletter where we report on what we expect to be an exciting round of results.

Further Field Trials with UTOFIA System 1

Field tests with the UTOFIA system 1 have been performed in June 2017 in Denmark.

The camera was deployed in harbour, offshore aquaculture cages, coastal environmental and fish tanks. A range of conditions for water turbidity was tested and different deployment systems were used: pole, ROV and benthic sledge (*Figure 1*).

The camera showed good performances in terms of use flexibility for the different setups and provided high quality distance-depth measurements of underwater objects (*Figure 2*).

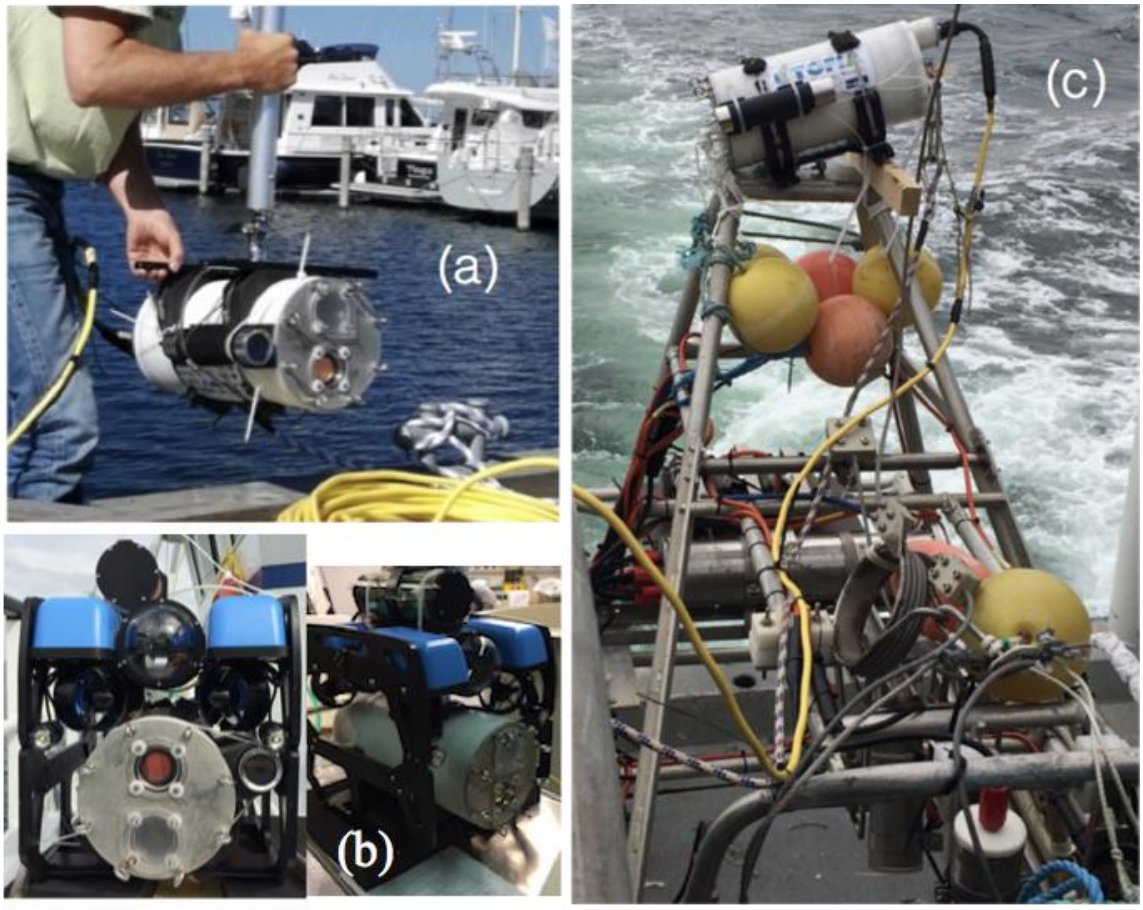

Figure 1. *UTOFIA camera system 1 on different deployment devices.*
(a) Pole system; (b) BlueROV2 from Blue Robotics; (c) Benthic sledge used in Nephrops surveys.

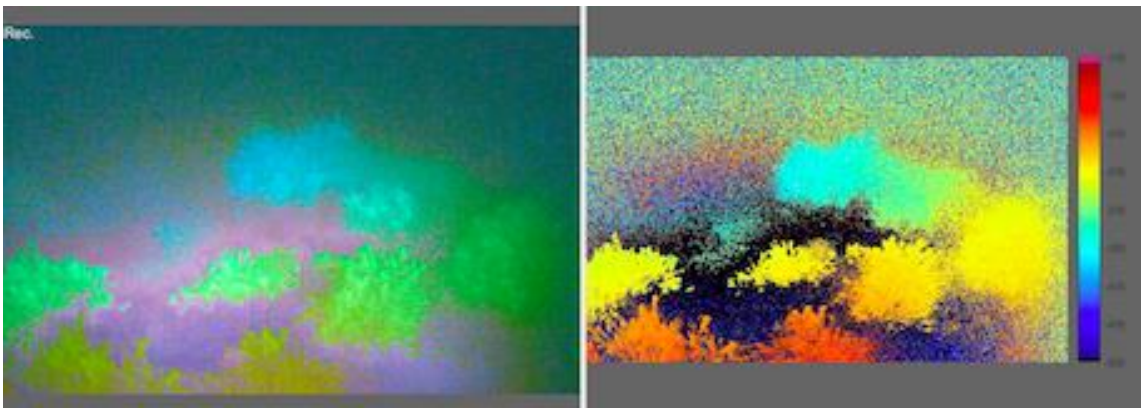

Figure 2. *UTOFIA system 1 images for coastal substrate in Assens (Denmark) collected at 30 m depth.*
Left side shows the overlay functionality where the depth distance is over imposed on the camera image, while on the right side only the depth-distance is displayed with the associated colorbar.

The pole was used in harbour inspection and aquaculture cage. It provides good flexibility in operating the camera and allowed to have more control on local environmental conditions such as water turbidity. Indeed using both the ROV and the benthic sledge local turbidity conditions could easily vary due to resuspension of bottom sediment during operations with these platforms. The thrusters mounted on the ROV can create conditions for resuspension when operated close to a muddy and sandy bottom, while benthic sledge can easily drag sediment along during operations.

As the UTOFIA system allows operations within a certain turbidity range, sudden changes in these conditions can limit operations with the camera. However in our experience, even when the UTOFIA system is operated in its high turbidity range, the depth reconstruction appears to provide reliable results making still possible to detect objects when underwater visibility is particularly low.

Operations with the ROV also suffered from some difficulties in finding the right mounting point. Indeed as we have been mainly operating with a small inspection class ROV (Figure 1b) the proper attachment of the payload and a careful regulation of the ballast is needed. However the design of the UTOFIA system 1 device resulted in a mismatch between the centre of gravity and the centre of mass, hence creating difficulties in the proper regulation. The UTOFIA system 2 will have a new design and this issue will be adjusted to allow extended operations for a large range of ROV platforms.

During our sea trials we have collected a total of 500 Gb of data including high quality video footages of fish schools, man-made infrastructures and seabed. Those data will be valuable to refine the characteristic of our system and improve its performances for a range of underwater operations.

UTOFIA 3rd general assembly

The third and final general assembly of the UTOFIA project was held 20-22 July at the partner institute AZTI in Sukarrieta, Spain.

The first two days were dedicated to the project status, administrative matters and especially demonstration of the advancement and specifics of the UTOFIA System 2. Results from field trials of System 1 were also shown and discussed.

After the official meeting, the new UTOFIA system 2 was tested in the nearby Bermeo city harbour and sea. The aim was to calibrate and verify UTOFIA System 2 performance and the improvements on the software specifications.

First trials were undertaken from a crane in the harbour. The UTOFIA system 1 and system 2 were deployed in the harbour and different focus rates were tested and compared. It was clear that UTOFIA System 2 had much improved resolution and software specifications.

Further tests were carried out at sea with UTOFIA System 2 launched from a vessel, to test more realistic operative conditions. The sea conditions were adverse for using the UTOFIA camera from a wire but some tests were carried out in sheltered waters where rocky sea bottom could be observed where the system could detect lost fishing gear. The trials were used to train the partner users such as the AZTI staff, for future testing of the System 2.