

Annotating optical images from ROVs or drop-frames in Vulnerable Marine Ecosystems studies

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The attention to Vulnerable Marine Ecosystems (VME) in the deep-sea has increased in the last few decades for several reasons, such as fishery and oil exploration activities. Marine Protected Area networks have to be developed and techniques to investigate the seafloor, such as acoustic survey techniques and optical remote sensing, play an important role in this. Image footage from Remotely Operated Vehicles (ROVs) or towed camera is a very good method to analyse and compare abundances and compositions of large epifaunal species in several deep-sea areas. This is particularly well adapted in the case of vulnerable habitats dominated by corals or sponges, as it is less destructive than a trawl sampling. Developing of standardized image annotations becomes an important goal. However, due to availability of historical data, technical reasons or budget limitations, teams are often confronted with the use of various imagery sources and have to develop methodologies for optimizing these data. Within the European fp7-funded project CoralFISH, IFREMER (France) has developed a program (COVER) which promotes standardization of annotation but keeps a large degree of flexibility. A methodology has been proposed to CoralFISH partners and improved in cooperation; it is based on common knowledge tables with a hierarchical structure where necessary. These tables have been defined taking existing references such as EUNIS, CMECS, Worms Register into consideration.

Cover is able to visualise and synchronise different types of videos and still images. The snapshot generator allows frame grabs to be made at regular time or distance interval. These frame grabs can be used for statistical analysis. The annotation interface has configurable components linked with the knowledge tables: keyboard shortcuts, buttons, combo lists, and sliders. It is also possible to enter comments. The user can organize items by blocks following thematic annotations like substrate type, benthic habitat/communities, taxa and anthropogenic impacts... This interface can be adapted to the needs of the area, the type and quality of images.

Some features of Cover will be introduced into the existing software Adelie (IFREMER).

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Introduction

Interest in Vulnerable Marine Ecosystems in the deep sea such as cold-water corals and sponge grounds has increased in the last few decades. The development of optical remote sensing has played an important role in this. Image footage from Remotely Operated Vehicles (ROVs) or towed cameras is a useful tool to analyse and compare abundances and compositions of large epifaunal species in deep-sea areas. However, with varying systems used in acquiring imagery, methodologies need to be developed to optimise the comparability and use of these data.

Software development

Within the European fp7-funded project CoralFISH, IFREMER (France) has developed the software COVER (Customizable Observation Video image Record). It makes standardisation possible to facilitate comparison between regional studies by different partners:

- Standard protocols can be developed using this software
- Use of common knowledge tables taking existing references (EUNIS, CMECS, Worms Register etc.) into consideration
- Standard terms and glossary used by scientists

The software is flexible

Knowledge tables

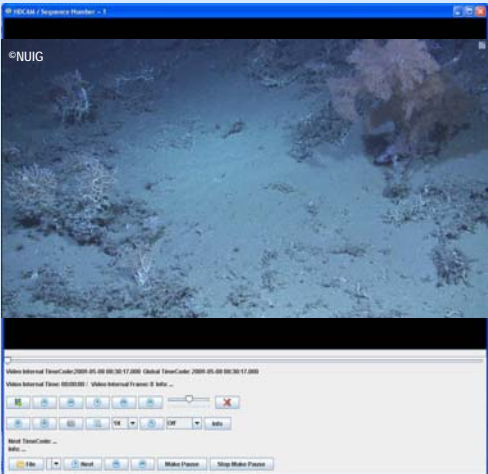
Common knowledge tables and interface developed in cooperation with CoralFISH partners. They meet criteria of the user, such as information about anthropogenic impact, bioturbation and corals, and can be as broad or detailed as the user requires. The hard geoform table is given as an example.

Date	03-05-2010
Time	16:01
m² ID	1
Observer	John Doe
Hard geofoms	1. crevices; 2. cracks; 3. joints; 4. step-like; 5. wall; 6. scarp; 7. cliff; 8. deformed; 9. faulted; 10. folded; 11. overhang
Slope inclination	1. Flat (0-5°); 2. Sloping (5-30°); 3. Steep sloping (30-45°); 4. Vertical (45-90°); 5. Overhang (>90°)

Information in grey is automatically recorded by the software; information in blue can be selected by the user

Image window:

- Basic and advanced window
- Possible to move between images
- Calibrate surface by lasers, object or known area
- Grid or random points on image → (substrate and coral) surface coverage



Video window:

- Loads videos in many formats
- Possible to play, pause, rewind and forward (also by 10 seconds)
- Connect image file → video stops automatically at timecode of next image
- Extraction of frame grabs from video

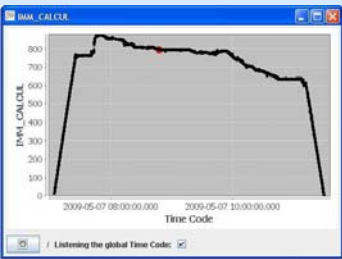
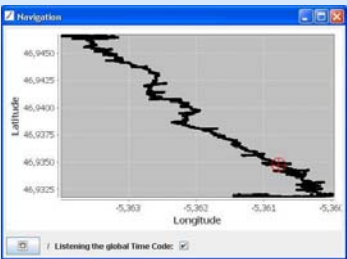
Annotation window:

- Use of lists, buttons, sliders and comments in thematic blocks
- Link with knowledge tables in .csv format and observation file
- Observation file is out-put file
- Possible to customise it for goals and wishes
→ useful in many (research) fields (geology, biology...)
→ complex structures for habitat mapping

COVER

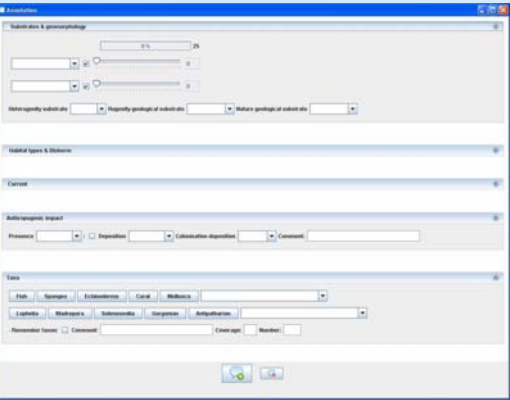
Navigation and other data

- Visualise navigation data (possible to load plot on bathymetry jpg)
- Visualise other data, such as depth
- Red point indicates ROV position of representative image/video along transect



Other functions:

- All components connected to each other with the timecode
- Snapshot generator for frame grabs on time and distance interval
- Time code converter: converts two columns displaying date and time into one



Future:

Cover functions will be integrated into Adelle software (IFREMER), a tool for synchronising different types of data (localisation, videos, still images, altitude etc.)