Fish4Knowledge
Large scale coral reef fish monitoring using undersea computer vision methods

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1. Collecting Video Data
   • Collecting videos
   • Detecting fish
   • Recognizing fish species
   • Recognizing fish behaviors
   • Evaluating video analysis accuracy

2. Exploring Video Data
   • Exploring fish counts
   • Investigating species composition
   • Checking potential biases
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Multiple video streams: 9 Cameras, >20,000 hours of videos (Dec. 2012)

- Terabyte-scale data platform
- High-performance servers for data access
DETECTING FISH

☑ Detection of fish in each frame
☑ Description of fish contour, color, texture... (>30 features)
☑ Tracking of single fish over several frames
☑ Handling partial and total occlusions
☑ Over 400 million fish detections

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RECOGNIZING FISH SPECIES

- Detection of body parts *(head, tail...)*
- Construction of a fish model for each species
- 15 species detected *(96% of total number of fish)*
RECOGNIZING FISH BEHAVIORS

- Detection of behaviors by analyzing trajectories
- Relation to background objects (feeding, hiding...)
- Relation to other fish (pairing, grouping, solitary...)

Fish Trajectories
Description of scene’s background
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EVALUATING VIDEO ANALYSIS ACCURACY

- 4407 fish
- 5585 fish

- Comparison with manual detections by experts
- Fish detection game to encourage crowd sourcing

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EVALUATING VIDEO ANALYSIS ACCURACY

Certainty Scores indicate the quality of each detection
These can be used to filter out low-quality fish
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ABUNDANCE OF DASCYLLUS RETICULATUS
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Videos

Camera38 (2216 videos)

2011-01-17 17:00 (164 fish)
2011-01-18 07:00 (375 fish)
2011-01-18 09:00 (471 fish)
2011-01-18 10:00 (314 fish)
2011-01-18 11:00 (348 fish)

Show more
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SPECIES COMPOSITION DEPENDS ON LOCATION
Amphiprion clarkii, Camera 38

Plectroglyphidodon dickii, Camera 39
SPECIES COMPOSITION DEPENDS ON LOCATION
THE FISH4KNOWLEDGE PROJECT

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Plectroglyphidodon dickii, Camera 38
Amphiprion clarkii, Camera 38

Plectroglyphidodon dickii, Camera 39
Amphiprion clarkii, Camera 39
THE FISH4KNOWLEDGE PROJECT

http://fish4knowledge.eu/people.htm

- University of Edinburgh (United Kingdom)
- Università di Catania (Italy)
- Centrum Wiskunde & Informatica (Netherlands)
- National Applied Research Laboratories (Taiwan)