

# FREE<sub>sub</sub>NET Management Report

## Task 3.4: Algorithms and Sensor Integration for Vehicle and Target Positioning

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# Simultaneous Depth Tracking and Attitude Control

- Paper: Teixeira et al. [1]
- Addresses simultaneous depth tracking and precise attitude control
- Proven controller design to regulate pitch, yaw and depth tracking errors to zero
- Deals with bounded disturbances like sea waves and sensor noise

# Single Beacon Underwater Navigation

- Paper: Saúde et al. [2]
- Addresses single beacon underwater navigation
- Position estimation in presence of unknown ocean currents
- Combines dead-reckoning data with multiple range measurements



# Multiple Model Adaptive Estimation

- Paper: Hassani et al. [3]
- Addresses multiple model adaptive estimation for discrete-time, linear time-invariant MIMO plants
- Incorporates parameter uncertainty and unmodelled dynamics
- Relies on a finite number of local observers, each designed using a selected model from the original set of (possibly infinite) plant models

# Multiple-Model Adaptive Estimator Design

- Paper: Hassani et al. [4]
- Addresses multiple model adaptive estimator design for linear processes subject to parameter uncertainty
- Discusses model-set selection issues
- Proposes a performance-based model-set design strategy

# Deterministic Adaptive State and Parameter Estimation

- Paper: Hassani et al. [5]
- Addresses a deterministic approach to adaptive state and parameter estimation using a multiple model structure
- Uses a finite dimensional model with parameter uncertainty for model description
- A Dynamic Weighting Signal Generator is used to perform on-line adaptation of individual observer weights

# Acoustic Tagging of Lobsters

- Paper: Schmiing et al. [6]
- Addresses moulting, growth and retention of externally attached acoustic tags in lobsters
- Shows that externally attached transmitters are adequate for medium-term movement studies of lobsters, but not for longer-term annual studies due to the rate of molting

# Habitat Use Patterns and Implications on Marine Reserve Design

- Paper: Afonso et al. [7]
- Addresses movements and habitat use patterns of a commercially important mackerel species
- Uses active acoustic tracking, passive acoustic monitoring and standard tag-release
- Discusses protection measures for spawning sites and argues that spatial management measures need to be accompanied by conventional fishing control measures



# Habitat Use Patterns and Implications on Marine Reserve Design

- Paper: Afonso et al. [8]
- Addresses movement patterns, habitat use and dispersal in the red porgy
- Aims to support the design of marine reserves for protecting local populations while enhancing fisheries
- Shows relations of home ranges to fish sizes
- Argues that subpopulation protection of red porgy needs bigger reserves to provide protection while promoting emigration (spillover)

## Additionally Planned Publications

IST 2+ from Vahid Hassani on adaptive control  
2+ to be expected from other DSOR personnel

Cybernetix (no information on prospective publications)

Ifremer (no information on prospective publications)

IMAR 3 from Mara Schmiing ( “Predicting commercial fish abundances in the Azores”, “Fecundity and diversity of commercially-important coastal fishes” and “Estimation of fish population home ranges using acoustic telemetry and modelling techniques” )

# Identities and Termination Dates of Contributors

IST Andreas J. Häusler, July 31<sup>st</sup>, 2010

Cybernetix Szymon Krupinski, August 1<sup>st</sup> 2010

Ifremer Rudolf Haraksim, November 1<sup>st</sup> 2009

Matteo Munaro, October 31<sup>st</sup> 2010

IMAR Mara Schmiing, August 31<sup>st</sup> 2010

# Interactions Between ESRs or Partners

- None to date
- None forecast

# Links to Any Material Produced to Date

- This management report only deals with most recent task 3.4 publications for 2009
- Those publications are available on the *FREE<sub>sub</sub>NET* repository in directory `<CVSROOT>/fsn/finalreport/wp3/4`



## Task 3.4 Publications in 2009, Part I



### Francisco C. Teixeira, A. Pedro Aguiar, and António M. Pascoal

*Nonlinear adaptive depth tracking and attitude control of an underwater towed vehicle.*

Proceedings of the 8<sup>th</sup> Conference on Manoeuvring and Control of Marine Craft (MCMC 2009).

Guarujá (SP), Brazil, Sept. 2009.



### João Saúde and A. Pedro Aguiar

*Single Beacon Acoustic Navigation for an AUV in the presence of unknown ocean currents.*

Proceedings of the 8<sup>th</sup> Conference on Manoeuvring and Control of Marine Craft (MCMC 2009).

Guarujá (SP), Brazil, Sept. 2009.

## Task 3.4 Publications in 2009, Part II



**Vahid Hassani, A. Pedro Aguiar, Michael Athans, and António M. Pascoal**

*Multiple Model Adaptive Estimation and Model Identification using a Minimum Energy Criterion.*

Proc. of ACC'09 - American Control Conference.

St. Louis, Missouri, June 2009.



**Vahid Hassani, A. Pedro Aguiar, António M. Pascoal, and Michael Athans**

*A Performance Based Model-Set Design Strategy for Multiple Model Adaptive Estimation.*

Proc. of ECC'09 - European Control Conference.

Budapest, Hungary, Aug. 2009.

## Task 3.4 Publications in 2009, Part III



**Vahid Hassani, A. Pedro Aguiar, António M. Pascoal,  
and Michael Athans**

*Further Results on Plant Parameter Identification using  
Continuous-Time Multiple-Model Adaptive Estimators.*

Proc. of CDC'09 - 48th IEEE Conference on Decision and Control.  
Shanghai, China, Dec. 2009.



**M. Schmiing and P. Afonso**

*Acoustic tag-retention in the Mediterranean slipper lobster  
Scyllarides latus in the Azores Archipelago.*

Life and Marine Sciences.

Volume 26, Pages 37–43. 2009.



## Task 3.4 Publications in 2009, Part IV



### **P. Afonso and J. Fontes and K.N. Holland and R.S. Santos**

*Multi-scale patterns of habitat use in a highly mobile reef fish, the white trevally *Pseudocaranx dentex*, and their implications for marine reserve design.*

Marine Ecology Progress Series.

Volume 381, Pages 273–286. 2009.



### **P. Afonso and J. Fontes and R. Guedes and F. Tempera and K.N. Holland and R.S. Santos**

*A multi-scale study of red porgy movements and habitat use, and its application to the design of marine reserve networks.*

“Tagging and Tracking of Marine Animals with Electronic Devices”.

Reviews: Methods and Technologies in Fish Biology and Fisheries.

Volume 9, Pages 423–443. 2009.

# Further Information & Ongoing Research

## Open Discussion

- The presented information can be found in the *FREE<sub>sub</sub>NET* Management Report for Task 3.4
- Interaction between partners needs to be intensified (no secondments up to now)
- Number of quality publications is high and promises a very good final task report in November 2010