

## Documents

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**The SAFE-PORT project: An approach to port surveillance and protection**  
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### Abstract

SAFE-PORT is a recently started project addressing the complex issue of determining the best configurations of resources for harbour and port surveillance and protection. More specifically, the main goal is to find, for any given scenario, an adequate set of configuration solutions - i.e., number and type of sensors and equipments, their locations and operating modes, the corresponding personnel and other support resources - that maximize protection over a specific area. The project includes research and development of sensors models, novel algorithms for optimization and decision support, and a computer-based decision support system (DSS) to assist decision makers in that task. It includes also the development of a simulation environment for modelling relevant aspects of the scenario (including sensors used for surveillance, platforms, threats and the environment), capable to incorporate data from field-trials, used to test and validate solutions proposed by the DSS. Test cases will consider the use of intelligent agents to model the behaviour of threats and of NATO forces in a realistic way, following experts' definitions and parameters.

### Author Keywords

Decision support systems; Harbour and port protection; Maritime surveillance; Simulation

### Index Keywords

Configuration solution, Decision makers, Decision supports, Harbour and port protection, Maritime surveillance, NATO forces, Novel algorithm, Operating modes, Research and development, Sensors models, Simulation, Simulation environment, Specific areas, Test case; Algorithms, Artificial intelligence, Decision making, Decision support systems, Decision theory, Intelligent agents, Monitoring, Sensors; Ports and harbors

### References

- *The Defence Against Terrorism Programme of Work Handbook*, NATO
- Caiti, A., Munafó, A., Vettari, G.  
**HISS: Harbour intrusion simulator system**  
(2009) *Procs. IEEE Oceans'09 Europe*, Bremen, Germany
- Hermand, J.-P., Legac, J.-C.  
**MREA BP'07 sea trials plan**  
(2007) *RNLN-ULB-NURC Technical Document*, April
- Healey, A.J., Marco, D.B., McGhee, R.B.  
**Autonomous underwater vehicle control coordination using a tri-level hybrid software architecture**  
(1996) *Procs. of IEEE Conference on Robotics and Automation*, pp. 2149-2159. Minneapolis, Minnesota, April

- Healey, A.J., Lienard, D.  
**Multivariable sliding mode control for autonomous diving and steering of unmanned underwater vehicles**  
 (1993) *IEEE Journal of Oceanic Engineering*, 18, pp. 327-339.  
 July
- Fossen, T.I.  
 (1994) *Guidance and Control of Ocean Vehicles*,  
 Wiley
- Silva, J., Borges De Sousa, J.  
**Models for simulation and control of underwater vehicles**  
 (2008) *New Approaches in Automation and Robotics*, pp. 197-207.  
 Editor: Harald Aschemann, Publisher: I-Tech Education and Publishing, ISBN: 978-3-902613-26-4 Vienna, Austria, May
- Varaiya, P.  
**Hierarchical control of semi-autonomous teams under uncertainty**  
 (2004) *Mica Final Report V.5*,  
 Available
- Borges De, J., Sousa, J., Da Silva, E.  
**Optimal path coordination problems**  
 (2008) *Procs. of the CDC 08 Conference*,  
 Cancun, Dec.
- Borges De Sousa, J., Gonçalves, G.  
**Mixed initiative control of unmanned air and ocean going vehicles: Models, tools and experimentation**  
 (2007) *Platform Innovations and System Integration for Unmanned Air, Land and Sea Vehicles (AVT-SCI Joint Symposium)*, pp. 91-914.  
 Meeting Proceedings RTO-MP-AVT-146, Paper 9. Neuilly-sur-Seine, France: RTO
- Tinka, A., Diemer, S., Madureira, L., Marques, E., Borges De Sousa, J., Martins, R., Pinto, J., Bayen, A.  
**Viability-based computation of spatially constrained minimum time trajectories for an autonomous underwater vehicle: Implementation and experiments**  
 (2009) *Procs. American Control Conference*,
- Sujit, P.B., Borges De Sousa, J., Lobo Pereira, F.  
**UAVs and AUVs coordination for ocean exploration**  
 (2009) *Procs. IEEE Oceans Conference*,  
 Bremen
- Sujit, P.B., Borges De Sousa, J., Lobo Pereira, F.  
**Multiple UAV teams for multiple tasks**  
 (2009) *Procs. IEEE Symp. on Computational Intelligence for Security and Defence Applications*,  
 Ottawa, Canada, July
- Pereira, E., Borges De Sousa, J.  
**Dynamic reallocation in teams of unmanned air vehicles**  
 (2009) *Procs. AIAA Infotech Aerospace Conference*,  
 Seattle, USA, April
- Sujit, P.B., Borges De Sousa, J., Lobo Pereira, F.  
**Coalition formation with communication ranges and moving targets**  
 (2010) *Procs. American Control Conference*,  
 Baltimore, USA, June
- Schaffer, J.D.  
**Multiple objective optimization with vector evaluated genetic algorithms**  
 (1985) *Genetic Algorithms and their Applications: Procs. First International Conference on Genetic Algorithms*,
- Dias, J., Captivo, M.E., Clímaco, J.  
**A memetic algorithm for multiobjective dynamic location problems**  
 (2008) *Journal of Global Optimization, Special Issue on Advances in MCDM Theory and Applications*, 42 (2), pp. 221-253.

- Björkman, M., Holmström, K.  
**Global optimization of costly nonconvex functions using radial basis functions**  
(2000) *Optimization and Engineering*, 1, pp. 373-397.
- Holmström, K.  
**An adaptive radial basis algorithm (ARBF) for expensive black-box global optimization**  
(2008) *Optimization and Engineering*, 41 (3), pp. 447-464.
- Jakobsson, S., Patriksson, M., Rudholm, J., Wojciechowski, A.  
**A method for simulation based optimization using radial basis functions**  
(2009) *Optimization and Engineering*,  
published online: DOI 10.1007/s11081-009-9087-1, June
- Bellingham, J.G., Zhang, Y.  
**Observing processes that vary in time and space with heterogeneous mobile networks**  
(2005) *Procs. Int. Workshop Underwater Robotics for Sustainable Management of Marine Ecosystems and Environmental Monitoring*, pp. 9-16.  
Genoa, Italy
- Leonard, N.E., Paley, D.A., Lekien, F., Sepulchre, R., Fratantoni, D.M., Davis, R.E.  
**Collective motion, sensor networks, and ocean sampling**  
(2007) *Proceedings of the IEEE*, 95 (1), pp. 48-74.
- Arsie, A., Frazzoli, E.  
**Efficient routing of multiple vehicles with no communication**  
(2007) *Procs. American Control Conference*,  
New York, NY, July
- Enright, J.J., Savla, K., Frazzoli, E.  
**Coverage control for teams of nonholonomic agents**  
(2008) *IEEE Conf. on Decision and Control*, pp. 4250-4256.
- Gothäll, H., Westin, R.  
**Evaluation of four global optimisation techniques as applied to anechoic coating design and inverse problem uncertainty estimation**  
(2005) *Technical Report FOI-R-1593-SE, FOI-swedish Defence Research Agency*,  
March
- Weise, T.  
*Global Optimization Algorithms: Theory and Application*,  
2nd ed. Published online
- Savla, K., Bullo, F., Frazzoli, E.  
**The coverage problem for loitering Dubins vehicles**  
(2007) *Proceedings of the IEEE Conference on Decision and Control*, pp. 1398-1403.  
DOI 10.1109/CDC.2007.4435017, 4435017, Proceedings of the 46th IEEE Conference on Decision and Control 2007, CDC
- Paley, D., Zhang, F., Leonard, N.E.  
**Cooperative control for ocean sampling: The glider coordinated control system**  
(2008) *IEEE Trans. Control Systems Technology*, 16 (4), pp. 735-744.
- Zhang, F., Fratantoni, D.M., Paley, D.A., Lund, J.M., Leonard, N.E.  
**Control of coordinated patterns for ocean sampling**  
(2007) *International Journal of Control*, 80 (7), pp. 1186-1199.  
DOI 10.1080/00207170701222947, PII 781271991
- Caiti, A., Morellato, V., Munafo, A.  
**GIS-based performance prediction and evaluation of civilian harbour protection systems**  
(2007) *Procs. IEEE/OES Oceans'07 Conference*,

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