EXCELLABUST

EXCELLING LABUST IN MARINE ROBOTICS

Staff exchange 3

Report

Feb – Mar 2017

Anja Babić @ Institute for Research of Intelligent Systems for Automation (ISSIA) in Genova

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During February and March of 2017, Anja Babić was a guest researcher at the Institute for research of intelligent systems for automation (ISSIA), which is a part of the National Research Council of Italy (CNR). CNR is a public organization founded in 1923, made up of seven departments and 106 institutes. ISSIA is distributed in three cities in Italy: namely Genova, Bari and Palermo. All three of the locations have a focus on specific research areas in robotics as well as automation in general.

The Department of Field and Interaction Robotics, located in Genova, is composed of 8 researchers, 5 assistant researchers, 1 technologist, and 4 technicians. They have over 20 years of experience in robotics, both in terms of theoretical and applied research. Their research interests include: system modelling and identification, navigation, cooperative guidance, visual odometry, IT, and telecommunications.

Anja Babić presented her research plan upon arrival and gave a talk titled “Long-term autonomy in a heterogeneous marine multi-robot society”. Her research goal was developing and simulating long-term autonomy concepts for the multi-layer underwater robot society created as part of the Horizon 2020 FET project subCULTron, primarily concerning the overactuated surface platform robots called aPads. During her stay in Genova, her work was supervised by Dr. Marco Bibuli and Massimo Caccia. Dr. Danilo Maccio introduced her to the differential evolution method, as well as offering help and discussion with regards to optimization methods, benchmarking, and algorithm implementation.

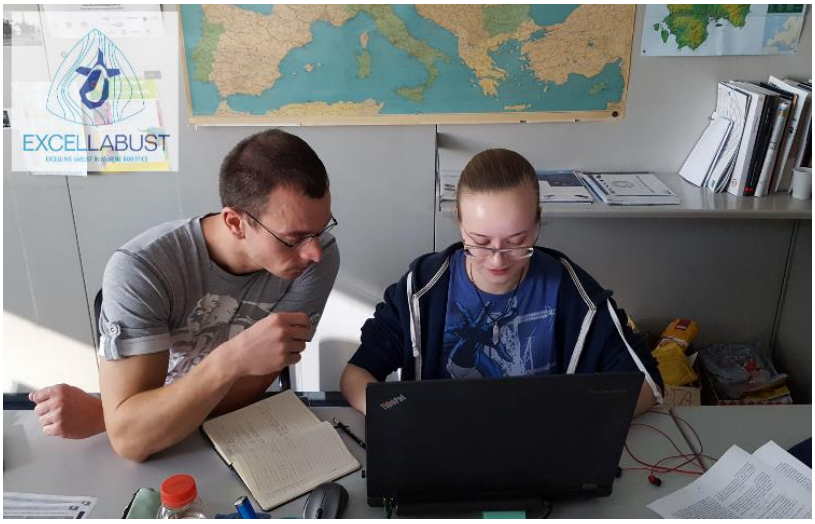

Figure 1. Working on algorithm simulation with Dr. Marco Bibuli

The result of this two-month research is a simulation testbed with a representation of the robotic system well-suited for implementation and testing of a variety of task allocation and scheduling methods and algorithms. The differential evolution method was used in the implementation of an optimisation heuristic for energy management problems in the system (all NP-complete and related to the travelling salesman and vehicle routing problems). Additional work has been done on developing fault-tolerant behaviours.

Major results accomplished during and shortly after staff exchange are:

- Development and simulation of an algorithm for task distribution and scheduling for multiple robotic agents based on differential evolution
- Development of a simulation testbed for the purposes of energy management and exchange within the H2020 project subCULTron artificial robotic ecosystem
- Analysed results will be presented as a joint conference paper