

WT2.6: European Centre for Soft Computing Report

Activities performed during the visit

in Wrocław, Poland

period: 10.01.2016 - 17.01.2016

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Personal Information

Mr. Sergio Damas, member of **European Centre for Soft Computing, Spain** visited **Wrocław University of Technology, Poland** in the period from **10.01.2016 to 17.01.2016** in order to carry out research and training activities in the field of **evolutionary medical image segmentation and system dynamics for social media analysis**.

Information about Seminars

The seminar presentation was organized on **11.01.2016**

It was entitled:

Automatic evolutionary medical image segmentation using deformable models (11.01.2016)

Description of scientific activities

(Please describe value added to the ENGINE project i.e. new knowledge, new skills with respect to the objectives of the project, the assigned common area of future cooperation with the partner, plans for common research, projects, publications and how it could be used in the scope of ENGINE)

New knowledge:

Mr. Damas has presented work on “Automatic evolutionary medical image segmentation using deformable models”. It was about partitioning of an image into non overlapping regions that are homogeneous with respect to some visual feature such as intensity or texture. The task of medical image segmentation denotes detection of lesions, measurement of organ size/volume, quantitative tissue analysis and computer-integrated surgery. However, curves or surfaces defined within an image domain move under the influence of “internal forces” - related with the curve features and “external forces” - related with the surrounding image. Therefore there was proposed a concept of parametric deformable models with Active Shape Models that represents curves and surfaces explicitly in their parametric forms during deformation. Moreover it allows direct interaction with the model and leading to a compact representation for fast real-time implementation. Another technique is geometric deformable model with Level Set Method that is able to handle topological changes naturally, based on the theory of curve evolution; it represents curves and surfaces implicitly as a level set of a higher-dimensional scalar function. The presentation was devoted to advanced aspects of mentioned techniques.

New skills:

Thanks to Mr. Damas's visit Engine Center's team had a chance to familiarize with specialized skills on evolutionary medical image segmentation using deformable models and system dynamics application to network analysis. During the visit Mr. Damas was also participating in the NetSciX'2016 conference with presentation of his poster on system dynamics.

Common area of future cooperation:

It has been agreed that further collaboration within the project will be concentrated on:

- 2D RTG to 3D model projection of knee bone implants
- diffusion processes in complex networks
- classification in networks
- social network analysis and social media analysis

Plans for common research:

There were discussed further research activities on the topic "Key Variable detection in System Dynamics Framework based on Multiplex" during the visit.

It is sometimes difficult to identify key variables in dense or large problems modelled by system dynamics. These key variables are those able to generate significant changes in the whole system. This descriptive information of the system is vital for modellers since they can apply strategic actions over those variables (in a direct or indirect way) and focus their what-if scenarios. The identification of these key variables is also useful for understanding the dynamics of the model and for validation purposes. We can define a key variable in a system dynamics model as a variable that is able to generate significant changes in the whole system. Then, the goal of this work is to automatically detect which variables constitute the set of key variables.

Plans for joint projects:

Not decided yet.

Plans for collaboration in publications preparation:

Agreed on paper submission to JCR journal.

Information referring to the intellectual property

(the generally binding law in this area in the visited country and procedures of patenting);

Not addressed.

Description of the cooperation between universities and industry

(how it is organized in partner's organization, the sources of funding, the opinions about drawbacks and strengths of existing solution).

Not addressed.

Other activities

None

REMARK: Apart from this information also a program of the visit and the presentation in electronic version should be given to the project office (please send all of them to Urszula.Markowska-Kaczmar@pwr.wroc.pl). Please respond to the points 1-5 for outgoing visit and points 1-3 for incoming visit. Point 6 is for extra activities that are not put in points 1-5.

