

DOCTORAL CANDIDATE: Fernando Macías
DEGREE: Philosophiae Doctor
FACULTY: Mathematics and Natural Sciences
DEPARTMENT: Informatics
AREA OF EXPERTISE: Software Engineering
SUPERVISORS: Adrian Rutle and Volker Stolz
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DISSERTATION TITLE: *Multilevel Modelling and Domain-Specific Languages*

Fernando Macías is a PhD candidate presenting his thesis soon. His most recent work is related to the areas of Multilevel Modelling, Domain-Specific Modelling Languages and Model Transformations. He also researched the application of Runtime Verification for model-based simulations, formalisation and empirical evaluation of multilevel techniques, contract-based verification of model transformations and model-based reverse engineering of legacy web applications.

The thesis he presents improves the development of Domain-Specific Modelling Languages (DSMLs), that anyone can use, as an alternative to programming languages, which require technical training and abstract thinking. DSMLs are created by software engineers using models, and they use concepts from the domain in which they are applied, so they are familiar and intuitive. This way, the clients who need software can understand how to use them and participate actively in creating the solution, instead of just providing a list of requirements which usually leads to misunderstandings, project delays and budget overruns. An example of DSML, presented in the thesis, is a visual language for programming simple robots in which anyone can put together the different tasks the robot can do, and how the robot changes from a task to the next, without needing to program a single line of code. This model-based description can be used directly for simulation using Model Transformations, run on the real robot if an interpreter for the model is provided, or compiled automatically into traditional code that the robot can run directly.

The way this work improves the creation of DSMLs is by taking and integrating ideas from the area of Multilevel Modelling, a modern way of using models which brings several improvements to the whole process of creating, using and revising DSMLs. All these ideas are grouped together in the thesis, creating a consistent and flexible framework around them. A formal description of the framework using advanced mathematics ensures that the whole idea is consistent and sound. Moreover, the framework is used in several case studies and experiments to ensure its validity, and compared with the relevant literature in the field.