

# Model-Driven Engineering and Model Transformation: for Fun and Profit

Richard F. Paige  
University of York, United Kingdom

Model-Driven Engineering (MDE) [1] is an engineering discipline that uses descriptions of phenomena of interest as first-class engineering artefacts. These artefacts – *models* – are expressed in a variety of general-purpose and domain-specific languages, and are manipulated by automated tools for analysis, validation, transformation, evolution and other purposes. MDE attempts to balance requirements for rigorous and precise description with those for automated tool support for key engineering tasks. As such, the descriptions produced when applying MDE do not always lend themselves directly to mathematical reasoning; however, descriptions are easily constructed and manipulated by powerful automated tools for model management. At the heart of MDE is *model transformation* [2], the process of transforming models across and between languages. Model transformations of different kinds underpin many of the engineering tasks (and automated tools) for MDE. Diverse model transformations have been identified, and a number of powerful tools for their construction and execution have been developed and put in to practice.

In this lecture, we will introduce the fundamental concepts of MDE, including how its style and form of description differs from that of more mathematical approaches. We will explore some of the different kinds of model transformations, exemplified by a practical and widely used MDE toolset, Epsilon<sup>1</sup>. We will consider mapping transformations (or *model-to-model transformations*) [3], operational transformations, model-to-text transformations, update-in-place transformations and migration transformations. We will also consider mechanisms for verifying and validating such transformations, ranging from automated testing to concrete task-specific forms of analysis such as failure analysis. We will consider the mechanisms underpinning transformation languages and tools that enable broader dependability issues, such as certification against safety critical systems engineering standards, to be addressed. Finally, we will see a number of examples applying MDE and model transformations, that are either fun or profitable (or both).

## References

- [1] D. C. Schmidt. *Guest Editors Introduction: Model-driven Engineering*. IEEE Computer, Vol. 39(2), pp. 25-31; 2006.
- [2] K. Czarnecki, S. Helsen. *Feature-based Survey of Model Transformation Approaches*. IBM Systems Journal, Vol. 45(3), pp. 621-646; 2006.
- [3] D. S. Kolovos, R. F. Paige, F. A.C. Polack. *The Epsilon Transformation Language*. In Proc. 1st International Conference on Model Transformation, ICMT; 2008.

---

<sup>1</sup><http://www.eclipse.org/epsilon/>