On GCLA, Gisela, and MedView

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Abstract

Using declarative programming a programmer should be able to concentrate on *what* a program should do without worrying to much about *how* it is done. To be able to advance declarative programming methodologies, real-world examples are needed that push the limits of the proposed programming techniques. In this thesis we focus on some aspects of declarative programming, mostly from an applied angle. Specifically, various issues in the area of *definitional programming*, which has its roots in the theory of partial inductive definitions, are investigated.

The thesis consists of four separate but related parts. In the first part it is shown how functional logic programming can be achieved in the definitional programming language GCLA. Although all examples are given in GCLA the general ideas could just as well be applied to build a specialized functional logic programming language based on definitional ideas.

The second part presents the Gisela framework for definitional programming. Gisela is intended to provide a general extensible framework for definitional programming based on a new definitional computation model. The framework is also intended to facilitate building state-of-the art GUI-based applications with embedded definitional reasoning components. The computation model and various programming techniques are described.

The third part gives an overview of the MedView project. MedView is a joint project with participants from computer science and clinical medicine. The project is centered around the question: how can computing technology be used to handle clinical information in everyday work such that clinicians more systematically can learn from their gathered clinical data? All knowledge representation in MedView is based on a definitional model.

The fourth part concerns how Gisela can be used to facilitate knowledge representation and application development in the MedView project. Expressed differently, how MedView is used as a real-world example for declarative programming techniques. It is shown how the MedView knowledge base can be represented using Gisela and how to use Gisela for finding information in the knowledge base. A number of example applications are described as well as the general methodology used to incorporate definitional reasoning machinery based on Gisela into object-oriented applications with GUIs.

Keywords: declarative programming, functional logic programming, definitional programming, knowledge based systems, medical informatics.