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Declarations

This thesis is presented in accordance with the regulations for the degree of Doctor of Philosophy. It has been composed by myself and has not been submitted in any previous application for any degree. The work is this thesis has been undertaken by myself except where otherwise stated.

Abstract

Modelling with definitive scripts (MWDS) is an alternative approach to computer-based modelling. It enables the modeller to develop a computer-based artefact in which his/her experience of a situation or subject of interest is embodied, in much the same way that the experimental scientist devises a physical model to represent a phenomenon, or an investor creates a spreadsheet to model his financial situation. In MWDS, the dependencies amongst observables in the situation are faithfully reflected in the relationships amongst variables that are linked by spreadsheet-like definitions. The values of such variables may themselves be directly associated with observable features of the computer. As a treatise on modelling with definitive scripts, the thesis will frame the concept of MWDS, discuss its background and history, introduce the tools that have been developed to support it, illustrate and document its use with reference to many diverse examples, compare and contrast MWDS with alternative approaches to modelling and programming, and identify and – to some extent – address problematic issues surrounding its application.

The abstract definitive modelling framework (ADM), based on the concepts of observable, dependency and agency, is introduced. With reference to an ADM artefact, the versatility, flexibility and extensibility of MWDS is illustrated and elaborated to show the potential for using MWDS to support universal agent-oriented modelling. The model developed in this framework is open-ended, flexible to change and easy to extend to reflect changes both in the modeller's perspective and in the external situation.

Rather than focusing on representing behaviour, MWDS emphasises the representation of state as experienced and perceived. This makes MWDS distinctively different from classical procedural computation in character. Every state in a definitive model is interpretable, whereas not every state in a classical procedural program can be. However, MWDS may help in comprehending the program if the program is treated as a physical artefact whose behaviour is to be construed by the modeller.

The thesis describes how MWDS provides an open-ended framework for the modeller to interactively cultivate and refine a computer-based artefact in which several roles of agents and modes of observation can be embodied. It also discusses how such artefacts can be specialised and treated as devices with specific modes and conventions of use. In this context, the development of the model can be seen as the collaborative integration of the roles of the designer and the user.

Abbreviations

adm – Abstract Definitive Machine

ADM – Abstract Definitive Modelling framework

ARCA – Definitive notation for displaying geometric diagrams

CSP – Communicating Sequential Processes

DoNaLD – Definitive Notation for Line Drawing

Eddi – Eden Definition Database Interpreter

Eden – Evaluator for Definitive Interpreter

EM – Empirical Modelling

GUI – Graphic User Interface

HCI – Human-Computer Interaction

ISBL – Information Systems Base Language

ISM – Interactive Situation Model

L.E.G.O. – An interactive computer graphics system for teaching geometric

LSD – Language for Specification and Description

MVC – Model View Controller

MWDS – Modelling with definitive scripts

OLE – Object Linking and Embedding

OO – Object-Orientation; Object-Oriented

PDL – Pictorial Description Language

PRTV – The Peterlee Relational Test Vehicle

Scout – Definitive Notation for Screen Layout

UML – Unified Modelling Language