

# What is Empirical Modelling?

Some suggestions

Why so difficult to answer?

Compare EM with CS and programming

Some analogies

Technical work in EM and CS

Philosophical perspectives

## Motivation for the Module

New perspective on computing

Breadth and depth

Assessment invites, and allows, engagement with very broad range of your experience and module material

prog<sup>g</sup>

definitive prog<sup>g</sup>

databases

eddi

parsing

observ<sup>n</sup>-oriented  
parsing

conc<sup>y</sup> / distr<sup>d</sup>

ADM, LSD dtkeden

software dev<sup>t</sup>

modelling

# EM as framework for movement between the unreliable and reliable

state

behaviour

experience

abstraction

modelling

programming

experiment

construction

environment

system

# CS405 An Introduction to Empirical Modelling

Module Lecturers:  
Meurig Beynon and Steve Russ

1

## Empirical Modelling

What does Empirical Modelling (EM) entail?

principles and tools for constructing artefacts to  
embody what is directly experienced

primarily interested in computer-based artefacts

2

## Principles & Tools

Principles:

analysis and model construction centred on the key  
concepts of observation, dependency, agency

Tools:

EDEN: an evaluator for definitive notations  
the Abstract Definitive Machine (ADM)  
JaM2: a Java API for dependency maintenance

3

## Embodiment of experience

'artefacts that embody what is directly experienced':

- have observables that serve as counterparts of  
observables in the referent *in an experiential sense*
- exhibit similar indivisible links between changes to  
observables
- admit agency similar to that associated with the  
referent

4

## Applications of EM

... potential, but with proof-of-concept

- engineering design
- education
- business
  
- a new foundation for emerging computing practice
- observation-oriented software development

5

## Plan for the module

Part 1: a practical introduction to EM based on EDEN

Principal focus: reviewing and analysing EM thinking  
Foundation in Concurrent Systems Modelling

Part 2: a more detailed examination of application areas

Will include more reflection on status of EM in its  
relationship to other research and established ideas

6

## Resources 1

The EM webpage:

<http://www.dcs.warwick.ac.uk/modelling>

- extensive discussion about the nature of EM
- complete lists of publications for EM
- details of postgraduate theses from the EM group
- archive / screenshots of EM models
- information and documentation for tools
- instructions for downloading versions of tkeden

7

## Resources 2

The 'new' EM archive, linked from the EM webpage:

<http://empub.dcs.warwick.ac.uk/projects>

See directory /dcs/emp/empub/projects

- a web repository largely consisting of EM models
- most of the models are recent, and can be downloaded

The 'old' EM archive:

See directory /dcs/acad/wmb/public/projects

- EM models mainly pre-1999, in four directories: games + misc + simulations + tools + notations

8

## Resources 3

EM publications – index accessible via EM webpage

See directory /dcs/acad/emp/empub/publications

- an electronic library of EM publications: papers and talks

MSc92-9 – accessible via Teaching link from EM webpage

- a web-based compendium of the resource material for "Empirical Modelling for Concurrent Systems", a one week taught module delivered as part of a one year MSc programme run by the department from 1992-9.

9

## EM research contributors

Postgraduate research personnel 1984-2004

Meurig Beynon, Steve Russ

Russell Boyatt, Antony Harfield, Charles Care

Ashley Ward, Chris Roe

Edward Yung, Mike Slade, John Buckle, Samia Meziani, Simon Yung

Alan Cartwright, Paul Ness, Dom Gehring, Patrick Sun, Richard Cartwright

Y-C Chen, Suwanna Rasmeequan, Soha Maad, Jaratsri Rungtrattanaulol

Tim Heron, Ruyuan Wang, Allan Wong, J-P Dupont, K-C Tan

10

## Summary of main ideas

EM is primarily concerned with specific and concrete situations (cf. the emphasis on abstraction in classical modelling)

EM aims at creating artefacts that capture state-as-experienced

The complexity and subtlety of state-as-experienced is awesome, and cannot be circumscribed

The flexibility of human interaction in the world contrasts with the rigidity of the relationship between a typical computer system and its environment

11

## Exercises to the reader

1. Reflect on how the concepts of agency, observation and dependency relate to the bus service scenario.
2. Consult the /dcs/emp/empub/publications directory for characterisations and illustrative examples of observables, dependencies and agents.
3. Consider how you might go about building an artefact to embody the observation, dependency and agency in the bus service scenario.

12