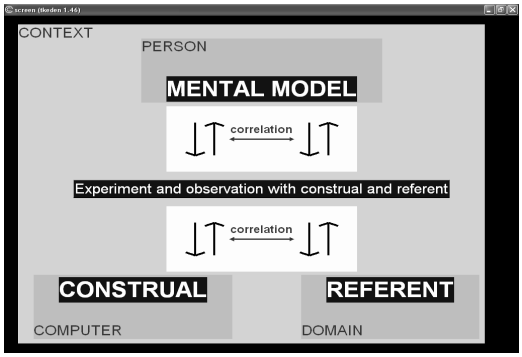
CS405 Intro to EM

Theme 1: Modelling state

Empirical Modelling

- empirical = based on observation and experiment
- empirical = given in experience
- *modelling* because it is intended to support an activity that relies upon establishing a correlation between the experience offered by the computer and some external experience moment by moment ... and thus is (as if) carried out in a situation in which there is a referent

Model making as construing



Modelling state

- spreadsheet
- "now" + "being-in-the-moment"
- state-as-experienced
- pragmatism: James and Dewey
- phenomenology
- Bose-Einstein condensation
  http://www.colorado.edu/physics/2000/bec/

Background and History

A *definitive notation* = a simple formal language in which to express definitions

A set of definitions is called a *definitive script*

Definitive notations different according to
types of the variables that appear on the LHS of definitions and **operators** that can be used in formulae on the RHS. These are termed the *underlying algebra* for the notation.

The definitive notation concept

Todd relational algebra query language ISBL
Brian & Geoff Wyvill's interactive graphics languages
spreadsheets
style definition in word processors

The term "definitive notation" first introduced by Beynon

"Modelling with Definitive Scripts" is fundamental to EM
[Rungrattanaubol's PhD Thesis: **A treatise on MWDS**]

Related developments

spreadsheets with visualisation mechanisms

spreadsheet-style environments for end-user programming (e.g. AgentSheets)

generalised spreadsheet principles in application-builders (e.g. ACE)

"object-linked embedding" in Windows

What does *definitive* mean?

definition has a technical meaning in this module
definitive means "definition-based"

"definitive" means
more than informal use of a programming technique.

Definitive notations are
a means to *represent state* by definitive scripts
and *how* scripts are interpreted is highly significant.

Significance of interpretation …

Miranda *can* be viewed as a definitive notation over an underlying algebra of functions and constructors
BUT this interpretation emphasises
program design as a state-based activity
rather than
declarative techniques for *program specification*.

[cf. 'admira' application and contrast with KRC]

Definitive notations

The tkeden interpreter uses many definitive notations

eden: scalars, strings, lists
DoNaLD: for 2-d line drawing
SCOUT: displays, windows, screen locations, attributes
EDDI: relational tables and operators
ARCA: edge-coloured digraphs in n-space

DoNaLD: a definitive notation for line-drawing

Donald = a definitive notation for 2-d line-drawing

underlying algebra has 6 primary data types:
integer, **real**, **bool**ean, **point**, **line**, and **shape**

A **shape** = a set of points and lines

A **point** is represented by a pair of scalar values {x,y}.

Defining shapes in DoNaLD

Two kinds of shape variable in DoNaLD:
these are declared as **shape** and **openshape**

An **openshape** variable S is defined componentwise
as a collection of points, lines and subshapes

Other mode of definition of shape in DoNaLD is
shape RSQ
RSQ=rotate(SQ)
- illustrated in definition of vehicle in VCCS model.

Projects relevant at this point

In EM archive at:
`http://empublic.dcs.warwick.ac.uk/projects`
jugsBeynon1988, jugsPavelin2002
roomYung1989
roomviewerYung1991
cruisecontrolBridge1991

room3dMacDonald1998
graphicspresHarfield2007
room3dsasamiCarter1999

Agents and semantics

Archetypal use of MWDS: human-computer interaction
"single-agent modelling"

Variables in a definitive script represent
the values that the user can observe
the parameters that the user can manipulate
the way that these are linked indivisibly in change
definitive script can model physical experiments

[cf the role of spreadsheets in describing and predicting]