Topical concerns …

Coursework for CS405 module: WEB-EM-4
.../dcs/research/em/teaching/cs405/assignment

Practical basis for working with EDEN has been laid in Lab 2: adequate for coursework … but more advanced aspects to be covered

Examination paper to be based on questions posed in conjunction with the labs

MSc projects on Empirical Modelling themes
.../dcs/research/em/teaching/projectideas

Getting from …

modelling with definitive scripts

to

a conceptual framework
for very general computing applications

Single-agent modelling

Archetypal use of MWDS
human-computer-environment interaction

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

a definitive script can imitate physical experiments
[cf. the role of spreadsheets in describing and predicting]

Environment not document

A script = an **environment** rather than a document.

In a document:

meaning of a symbol has to be represented in a stateless fashion

the **reader** animates it by studying the contexts in which it occurs

In a definitive script:

can explore the significance of 'symbols' via experiment and observation (hence "observables")

Variable values, observations and state

Definitive variables

correspond to observables of phenomena external to the computer system

have an identity and a value that can change according to the circumstances of observation.

The term *state* refers to what we understand by
a set of observations made 'simultaneously'

Interpreting the current state

The current state =
  what I deem to be simultaneous observations

The concept of state is
  relative to the observer ("observing agent")
  relative to focus of attention and mode of observation

A definitive script can represent several states at once …

Several states at once …

Who is the agent?

What is the focus of their attention? their intention?

What mode of observation is being adopted?

What metaphors available within the modelling medium?

Different modes of observation …

roomYung1989
    … primitive DIY support for the designer and user
roomviewerYung1991
    … enhancing the interface for the designer and user
room3dMacDonald1998
    … introducing physical and mechanical concerns
graphicspresHarfield2007
    … studying the projection from 3D to 2D
room3dsasamiCarter1999
    … experimenting with lighting in rendering the room

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symcubeWong2001

Model illustrates combined use of ARCA and SASAMI

Note the many possible interpretations of nodes in S4:
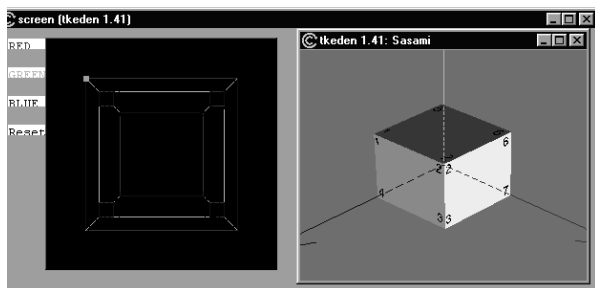   points in 2-space and 3-space
    permutations of {1,2,3,4}
    transformations of cube
    matrices (see the text output window)

Matrix algebra manipulation implicit in model: re-use

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symcubeWong2001

Recall …

Single agent modelling

Archetypal use of MWDS
        human-computer-environment interaction

Variables in a definitive script represent ORACLE
the values that the 'user' can observe   HANDLE
the parameters that the 'user' can manipulate
the way that these are linked indivisibly in change
                                            DERIVATE

definitive script can model physical experiments
[cf. the role of spreadsheets in describing and predicting]

LSD

"Language for Specification and Description"

Appropriate way to distinguish the perspectives of different agents on a single state …

… classify observables so as to discriminate between ORACLES that can be observed by the agent (if only conditionally and imperfectly), HANDLES that can be changed (perhaps conditionally), and what dependencies pertain in the view of the agent DERIVATES

… possibly also identify routine patterns of response that an agent might make (e.g. how a button works, user guides)

Beyond single agent modelling …

Motivate multi-agent modelling …

dependency serves to identify state-change for which the observer/modeller can presume responsibility

in most environments, there are (apparently!) other sources of state-change: attribute to other agents

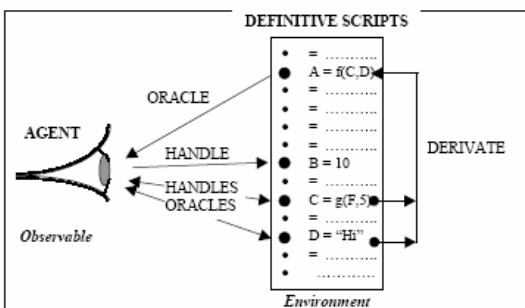state-changes can occur concurrently through agent action

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Figure 2-18: Definitive script as observer's model of state ('one-agent' modelling)

Multi-agent Modelling

In EM for multi-agent modelling, model concurrency

generalise MWDS for the user-computer interface to model the relationship between all interacting agents

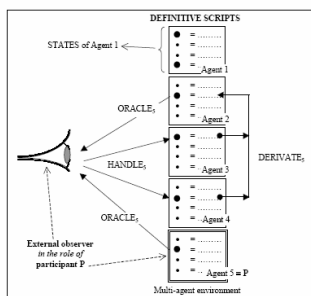each agent-environment interface is treated as a domain for experiment

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Figure 2-19: Definitive script as observer's model of state ('multi-agent' modelling)

Broad objective in MWDS

Use as a basis for

universal agent-oriented modelling …

capture human-like and machine-like agency not typically closed-world and system-like

Very general applications of computing can be treated as specialisations e.g. programming as a specialisation of concurrent systems modelling

3

The experimental paradox

A key element in specialising from multi-agent Empirical Modelling to traditional programming is concerned with a reinterpretation of action associated with experiment:

… an action is at first carried out with uncertain expectations about the outcome …

… the very same action is subsequently carried out with absolute conviction that the outcome will be as expected

Some modelling challenges …

perception of state in everyday observation

mode-switches in perceptions of state

    cf. developing functional program / evaluating function

interpreting the constructs in program design and

    development with reference to MWDS

the uses of reference that arise in mathematics:

    exposition of proof that can never be formalised