

The role of tkeden in Empirical Modelling ...

Have illustrated

how we can model using with tkeden

dependency is a powerful model-building technique
rich and flexible models, if rather idiosyncratic

want to explore character of the models

why should we build models this way?

are there are principles behind their construction?

why don't we have better models and tools?

Room

state-based interaction

nature of my agency is obscure

architect? room user? office designer? scientist?

timeless interaction

lack of constraint

e.g. if open door then shut window and vv
can move table through wall

cartoon-like quality of the artefact

Key idea: create an artefact with which interaction can be contrived to
resemble interaction with an external referent

interaction and design guided by reference to an independent experience

'one experience knows another' William James, c.1902

can imagine extending the observation in many directions:

e.g. recording dimensions of the room (what area? what cost?)
supplying the model to a disabled person as an interface
elaborating object-based design for the room furniture

VCCS

model from state to behaviour

contrast concept of snapshot

- capturing at an instant what is perceived to change -
with perception of identity and change emerging from dwelling in the
experience of a particular state

possible function of the artefact is to stimulate the modeller's
imagination about possible purposes and scenarios for interaction

[cf. "this is how the model is to be interpreted and used"]

ambiguity of viewpoints

who's doing the observing:

an external observer wishing to understand the nature of a VCCS?

the driver of the vehicle?

an engineer interested in design decisions? (such as
- how many marks there are on the wheel

- how many bits in the revolution counter are required to measure the speed 'sufficiently accurately')

an EM modeller, interested in making best use of the artefact-building resources?

clock is not switched on

... can design speedo, car shape, profile of the hill

... change curSpeed (what is speed without time?)

to test the speedo, as an engineer might;
to check the appearance of the speedo as a dashboard designer;
to check to see whether there's a zero stop or not)

clock is switched on

... touch brake triggers the cruise control to switch off
vs cruise control on is dependent on brake off

... regime of observation (what is time interval between observations in computing the vehicle dynamics?)

... take account of load on vehicle changing as passengers get on or off etc

... driving in conditions where gravity is different

... maintaining cruise speed by dynamically reconfiguring the road contours

... making the length of the vehicle depend on its speed

Possible perspectives on modelling with tkeden

- 1) you're only building small models / programs
- 2) it won't scale up
- 3) object-abstractions would make tkeden much more powerful
- 4) global observables are far too dangerous for real applications
- 5) it's essential to be able to assert and impose constraints
- 6) you need better unified notations, and a formal semantics
- 7) your notations are far too primitive and low-level

Possible interpretations of the qualities of modelling with tkeden ...

- 1) tkeden is a brilliantly engineered piece of software
- 2) it's basically parametric design
- 3) it's basically constraint-based programming
- 4) it's a constructive form of algebraic specification
- 5) dependency is a very powerful programming construct
- 6) you're only building small specific models

The EM perspective on tkeden

tkeden is only a first prototype for supporting EM

it has many deficiencies, but lack of 0-0 probably isn't the primary one

we have a lot to understand about the design of definitive notations, and this raises issues (such as mode of definition and mode of observation) for which there little precedent in traditional programming language design

the expressive power of EM stems primarily from its conceptual roots, not from the technical support afforded by current tools

flexibility and richness in model-building using tkeden is intimately associated with the quality of our construal of experience

construal

what agencies do we believe to be at work?
what observables do we presume to mediate their interaction?
what dependencies do we suppose govern their observations and action?

our construal of our experience in a situation determines what we will (with a high degree of probability) find to be plausible ways both of interacting and modifying our interaction within the situation

if our construal of our experience in a situation is a 'good' one, our expectations and knowledge of interaction in the situation will be reliable

EM is primarily about constructing artefacts that embody our construals

Construals are
personal
provisional
particular to circumstances and needs

personal: Simon Gardner understands what a Formula 1 driver observes much better than I do (cf [racingGardner1999])

provisional: I have an idea that eating carrots helps you to see in the dark, but I may be wrong

particular to circumstances etc: I don't / needn't understand in detail how a piano action works, even though I play the piano

Plan of the module:

Part 1: we shall develop the framework ("EM for Concurrent Systems") within which EM can be used to build [artefacts that serve as] construals (cf [G90])

Part 2: we shall examine possible applications of our framework of principles and tools to traditional applications of computing

References

[G90] David Gooding: Experiment and the Making of Meaning, Kluwer Acad. 1990

... and quotations obtained by typing 'grep Gooding *' in ~emp/public/papers:

Gooding's research (1990) into "aspects of scientific work largely neglected by modern, especially analytical, philosophy. These are the agency of observers and the way their observation of nature is mediated by their interactions with each other, with their instrumentation and with the natural world."

"Construing may be thought of as a process of modelling phenomena while the conceptual necessities of theory are held at arms length."

In his analysis of Faraday's evolving understanding of electro-magnetic phenomena, Gooding refers to the essential role played by "objects and images which conveyed likely relationships between electricity, magnetism, wires and magnetised needles". [These [G90] calls 'construals']

"Construals are a means of interpreting unfamiliar experience and communicating one's trial interpretations. Construals are practical, situational and often concrete. They belong to the pre-verbal context of ostensive practices." ([G90], p.22); "... a construal cannot be grasped independently of the exploratory behaviour that produces it or the ostensive practices whereby an observer tries to convey it." ([G90] p.88).

