

CS405 Introduction to Empirical Modelling 2009-2010

On Construal

In the last lecture Meurig did three main things.

- He discussed some classical approaches to programming (programming 'paradigms'), namely: **procedural**, **declarative**, **data-flow** and **spreadsheet-style**, giving examples of some of these and some of their pros and cons.
- He drew attention to the human dimension of the programmer and user in the 'reconceptualisation' of programming. This was described in terms of the experience of those engaging with programming - what they **observe** and in what **context**, and how they **interact** with, and manipulate, a program or model. Some detail was given for Turing machine computation - close to procedural programming.
- Finally some DOSTE examples showed influence from different programming paradigms and also a different relationship to experience. The idea of a construal of experience was introduced.

What do I mean by a 'different relationship to experience'? Some of the phrases used in the description of DOSTE were:

*.... a human experiential activity of creating a computer model....
... a blend of programming and using that takes place in one continuous stream of experience
... the computer ... develops rich visual experience ... through a continuous process of updating state from one moment to the next according to rules that can themselves be adapted on-the-fly, moment-by-moment*

I suggest there is an important difference in the **quality of experience** between that used, on the one hand, in (most, not all) of classical programming, and on the other hand, that used in DOSTE, or in the older EM tool, tkeden.

In preparing and designing classical programs we usually make use of what we might call experience 'at one remove', 'detached' experience. It is remembered, or imagined experience. Think of the kind of 'thought-experiment' involved in simple procedural programming - e.g. you might have done some of that looking at the isprime(n) program shown last time. (Didn't you think of some improvements?) This is a kind of (visual) experience you can have with your eyes shut!

The quotations above, from the description of DOSTE, surely refer to a different kind of experience. It is a 'now' experience, like that you are having reading these precise words soon that will recede into a 'remembered' experience. But, of course, the computer can readily give us now-experiences through interaction in a suitable interpreted environment. These are experiences for which you essentially need your eyes (or some senses) open!

It seems part of the human condition that we cannot 'just' have experiences. We have to do something with experience of a phenomenon that we call 'making sense'. It is a kind of 'taming' of experience. Maybe it is just gaining familiarity, but without making sense we are liable to be bewildered or terrified - as children or any of us - are sometimes when

confronting brand new experience. This is where construal comes in. It can be used of sentences, or of phenomena of experience. It is the latter use with which we are concerned.

Another essential way of 'taming' experience is modelling. We cannot cope with the incredible richness of experience (or our imagination) when taken 'all at once'. One of the crucial components of the modelling process is to make a selection from the richness of experience. Sometimes this results in line drawings or diagrams. We select those things (observables etc) we think will be most relevant for the purpose we have in mind (if we have one) or the aspect of a phenomenon on which we will concentrate.

Programming is modelling of a special kind. Much of our thinking is, or makes use of, modelling of many kinds. A huge amount of human creative activity - in the arts, sciences, humanities etc - consists of modelling parts of the world and our imagination. Modelling is a very fundamental activity which is much broader than programming. We'll return to this in a later lecture. We shall often refer to our work as modelling when 'programming' (as currently used) would not really be appropriate. Programming suggests a mechanism, and automation, which need not be present at all in a model.

In Empirical Modelling we are typically putting these two ideas together - making sense, and making a selection - a good model must do both. The usual way we can make sense within a model is to create, or to recognise, a correspondence between patterns of interaction in the computer model and patterns of interaction we know from the world, or our imagination. It is that correspondence that we mean by a construal. It is a 'making of meaning'. The term 'construal' was used in a technical sense by the philosopher of science, David Gooding, in his book *Experiment and the Making of Meaning* (Kluwer, 1990). There it is in the context of Faraday's extensive experimentation (prior to any theory) on electromagnetism. We have adopted and extended his sense of the term. We may revisit this in a later lecture. From Gooding's paper in *Cognitive Technology: Instruments of Mind* (ed. M. Beynon et al. 2001):

'... I have labelled interpretative images and their associated linguistic framework as 'construals'. This term denotes proto-interpretative representations which combine images and words as provisional or tentative interpretations of novel experience.'

We look now at an example of the use of an EDEN notation 'Donald' for line drawing. This is a line drawing (room.d) which has been used in previous versions of this module in various forms.