A Visual Functional Programming tool for Computer Science Education

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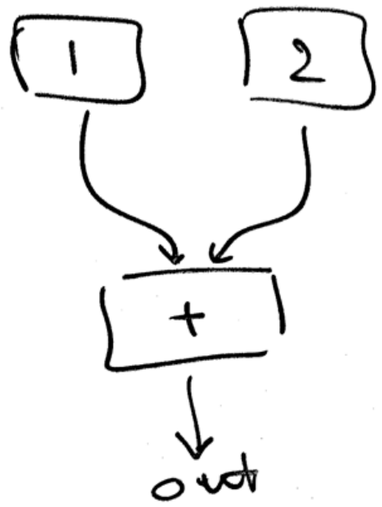
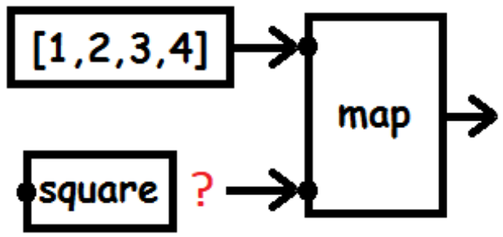
A Simple idea, but…

- Diffuse layout
  - just too many boxes
- Abstraction-hard
  - We can't "zoom out" to see less detail



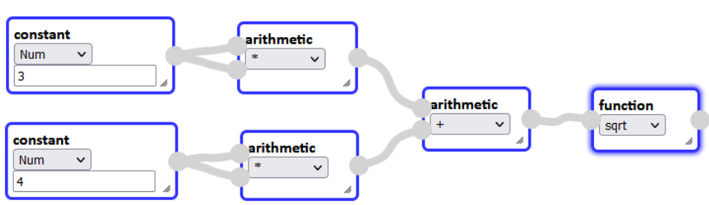
Source: Green and Petre (1996), *Usability Analysis of Visual Programming Environments: A 'Cognitive Dimensions' Framework*

- Worse: the visual doesn't match the key functional programming concept: is the "square" function a box or a wire?



The method

A simple model, *underdesigned* (working, but where no attempt is made to resolve the issues) given to an expert panel



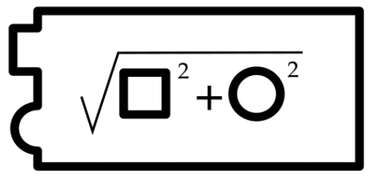
DELPHI Panel

to interrogate expert views, generate a consensus and highlight where there is none

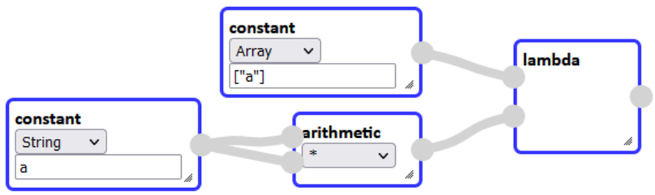
Three rounds:

- Comments and drawings from working model
- Panellists rated each other's comments
- Revised model seeking consensus

Underdesign and the opening of graphical and textual responses facilitated divergent thinking

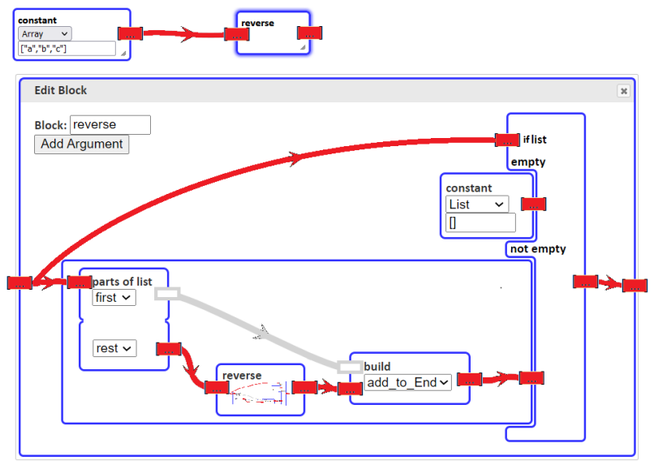


Above: a proposal to identify parameters by shape; if the shape had been used to mark typing, as is common, there would have been no space for this original proposition.

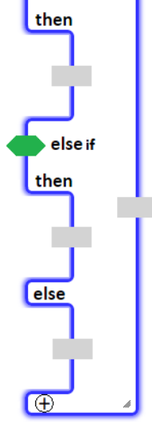


Some results so far

Diffuseness and Abstraction-hardness have solutions



- Data types
- Clearer visual subdivisions expressing scope
- Presenting anonymous and named functions in the same way
- Larger structures grouping "boxes" in legible chunks



The main point of tension is representing higher order functions. To quote a respondent: "*there is no feasible way to represent dataflow. Thus, the block representation should represent only Abstract Syntax Trees*".

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