

Process and Language for Design

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ABSTRACT

In this paper, I introduce Nelson Goodman's analysis of 'worldmaking' paraphrasing it in the terms of software design, which is I think a kind of "worldmaking" activity.. Major tool we use in design are variety of languages. We must be careful about the nature of languages. In that sense, I believe we should recognize the importance of '3 dimensions and 5 patterns' principle, which was proposed by a Japanese philosopher Tominaga Nakamoto in 18th Century.

Author Keywords

Design, Process, Language

DESIGN PROCESS

In his controversial book "Ways of Worldmaking", Nelson Goodman wrote as follows:

Countless worlds made from nothing by use of symbols – so might a satirist summarize some major themes in the work of Ernst Cassirer. These themes – the multiplicity of worlds, the speciousness of 'the given', the creative power of the understanding, the variety and formative function of symbols – are also integral to my own thinking.

The many stuffs – matter, energy, waves, phenomena – that worlds are made of are made along with the worlds. But made from what? Not from nothing, after all, but *from other worlds*. Worldmaking as we know it always starts from worlds already on hand; the making is remaking. My interest here is rather with the processes involved in building a world out of others.

Software design is an activity to make a model of the target system to computerize out of existing non-computerized system. So, it is a kind of worldmaking (or remaking as Goodman said) activity.

About the processes involved in worldmaking, Goodman proposed following natural categorization:

- Composition and Decomposition
- Weighting
- Ordering

- Deletion and Supplementation
- Deformation

Composition and Decomposition

This is the first logical step of conceptual design. All software design consists of taking apart and putting together, often conjointly: on the one hand, of dividing wholes into parts and partitioning modules into submodules, analyzing complexes into component features, drawing distinctions; on the other hand, of composing modules out of parts and members and subclasses, combining features into complexes, and making connections. Such composition or decomposition is normally effected or assisted or consolidated by the application of labels, names, predicates, etc. Thus, for example, temporally diverse events are brought together under a proper name or identified as making up 'an object' or 'a module'.

Weighting

The second logical step on conceptual design is to give weights for each component. When some relevant objects of a design are missing from another, we might perhaps better think that the two designs contain some classes sorted differently into relevant and irrelevant kinds. Some relevant objects in the one design, rather than being absent from the other, are present as irrelevant kinds; some differences among designs are not so much in entities comprised as in emphasis or accent, and these differences are no less consequential. Emphasis or weighting is not always binary as is a sorting into relevant and irrelevant kinds or into important or unimportant features. Ratings of relevance, importance, utility, value often yield hierarchies rather than dichotomies. Such weightings are also instances of a particular type of ordering.

Ordering

Designs not differing in entities or emphasis may differ in ordering. Ordering of a different sort pervades perception and practical cognition. The classic waterfall style ordering of software lifecycle model follows the linear logical sequence of development activities, but the spiral or iterative lifecycle model curls the straight logical line of sequential activities into a circle. Orderings alter with

circumstances and objectives. As we often see in various design diagrams, the nature of shapes (icons) changes under different geometries, so do perceived patterns change under different orderings. Radical reordering of another sort occurs in building a unified and comprehensive image of a system from temporally, spatially and quantitatively heterogeneous observations and other items of information. All measurement is based upon order. Only through suitable arrangements and groupings we can handle vast quantities of material perceptually or cognitively.

Deletion and Supplementation

Also, the making of one design out of another usually involves some extensive weeding out and filling – actual excision of some old and supply of some new material. According to psychology, in everyday life, we find what we are prepared to find, and we are likely to be blind to what neither helps or hinders our pursuits. In the painful experience of proofreading and the more joyful one of watching a skilled magician, we incurably miss something that is there and see something that is not there. Memory edits more ruthlessly. And even within what we do perceive and remember, we dismiss as illusory or negligible what cannot be fitted into the architecture of the design we are building. Perhaps the most spectacular metaphorical case of supplementation can be found in the perception of motion. There is a famous psychological phenomenon: under carefully controlled conditions, if two spots of light are flashed a short distance apart and in quick interval, the viewer normally sees a spot of light moving continuously along a path from the first position to the second. Another experiment showed that if the first stimulus spot is circular and the second square, the seen moving spot transforms smoothly from circle to square. Moreover, if a barrier of light is imposed between the two stimulus spots, the moving spot detours around the barrier. Just why these supplementations occur as they do is a fascinating subject for speculation.

Deformation

Finally some changes are reshaping or deformations that may be considered either corrections or distortions according to the designer's point of view. This process step is important because it is the final touch of design presentation rhetoric.

These are ways of that designs are made. As Goodman wrote above classification is not comprehensive or clearcut or mandatory. Often the actual processes will occur in combination or in random sequence. For example, some changes may be considered alternatively as re-weighting or reshaping or as all of these, and some deletions are all matters of differences in composition.

Design making process always starts from designs already in hand. At first, there is a kind of knowledge base which contains all existing designs already made. Every design activity is just retrieving some information from there and

process it somehow and putting back result into the knowledge base again. There are no predetermined sequence of process steps. Anything can occur in any order.

NATURE OF LANGUAGE

Major tool we use in design construction is the language consists of a variety of symbols. We must be careful about the essential nature of this tool. Most important feature of language is the dynamics of change. About this issue, Nakamoto Tominaga, a young philosopher of 18th century Japan, made an important finding.

Tominaga (1715 – 46, died very young) was a son of a rich merchant in Osaka. His father was a member of five sponsors of a merchant academy to study Confucianism named “Kaitoku-Do” (House of Virtue). He studied there but kicked out when he was 15 years old because he wrote an article criticizing all Confucian philosophers in the past. Then he moved to another private school and made an exhaustive critical textual study of the canonical scriptures of Confucianism, Buddhism, and Japanese Shinto.

In 1745, just a year before his early death, he published two books: “Shutsu-Jo-Go-Go”(Emerging after Meditation), and “Okina-no-Fumi” (A Note of an Old Man). The former is a comprehensive criticism of Buddhist sutra, and the latter is a remaking of his first controversial article. A lonely scholar of his time, however, Tominaga did not get much attention from his contemporaries. His unique contribution to the philosophy was discovered after Meiji Revolution. Now, these two books are highly appraised as the big achievement of “Linguistics Turn” movement in Japanese philosophy in Edo-period.

In his trace for the historical process of the formation and transformation of those canons and commentaries, Tominaga found that a basic human desire of "making a difference" and "adding something new" ("kajo" in Japanese) was the underlying cause for the accumulative scriptural writings by scholars of many generations. He also realized the reason that there has been so many different views on various issues were because each one was situated in a particular given position in terms of time, place, and availability of information.

More importantly, he paid great attention to the complexity and ambiguity of languages and ways of expressions, and coined a linguistic guiding principle of "San-Butsu Go-Rui" (3 dimensions and 5 patterns) to help scholars to get the possible true meanings from the texts according to their contexts.

Tominaga's 3 dimensions are:

Personal Preference, Historical Time, and Linguistic Patterns.

Personal Preference

Language cannot be neutral. All discourses reflects author's personal preference or partisanship in debate. Interpretation

of words should be along the line of context of the discussion. Language cannot be treated as the carrier of neutral truth.

Historical Time

Language changes over the time. Meaning and use of words will change. Looking back to the short history of software technology, the use of words like “module” or “object” was very naïve in 1960-70s compared to nowadays. Also the meaning of the word “process” radically changes after Belady-Lehman’s proposal of software evolution dynamics.

Linguistic Patterns

Tominaga found five patterns of linguistic expression through his textual study of scriptures. They are:

1. Expansion
2. Inclination
3. Afloat
4. Limitation
5. Irony

At a glance these patterns looks like the mode or rhetoric of expression, but Tominaga realized that these patterns are the hidden driving force for the change of language. This is a great finding because, as Witgenstein said, the structure of our language determines the structure of the world.

Looking back my own career in software engineering, structured program design methods in 1960s were somehow influenced by programmers’ major concern of program execution process in hardware with limited capability of the age, and tend to be in “limitation” pattern of logic. In the case of my own version of structured design was particular about the form of the logic because of my background as an abstract painter.

Then in 1970s, SASD method came into the scene. They are “expansion” pattern of use of structure from inside of hardware to outside (application system’s architecture). Object Oriented method is also considered as one of “expansion” patterns. It is a good example of “Add-on” principle going back to the ontology/epistemology as fundamental basis for design. OO language like Simula or Smalltalk are typical “afloat” pattern. Formal method is considered as “inclination”, and agile method is of course an “irony” in design.

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