METAPHORS IN COMPUTING
Signs and Realities

by
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Much has been said about the role of metaphors in our dealing with representational media, such as the computer. Generally speaking, we have the media we deserve, and that includes computers. But to develop the media we *want* to have, we need to understand them. However, understanding involves *metaphoring*: not only in an abstract sort of way ('all understanding involves metaphors'), but down to the nitty-gritty of where the computers enter our daily lives. Here, the notions of '*differentiation*' (and especially, its converse, '*dedifferentiation*') turn out to be crucial for a correct understanding, and handling, of computers. Thus, in a way, there is nothing wrong with the computer, metaphorically speaking; but there may be a lot wrong, and dramatically so, with the way we think and speak about computers, that is, with our choice of the metaphors we use to deal with them.

1. Metaphors and representation

To understand reality, we need metaphors. But what do we mean when we say 'understanding reality'? Understanding involves representation: 'carving out a piece of the real world', so to speak, and placing it on some mental shelf. However, three important questions have to be addressed in this process:

> *Which*, or better, *whose* reality? That is, in what ways are human representations bound to the people that make and store them?
>
> *What* is represented *of* reality? That is, what are the particular aspects that humans single out for a particular representation?
>
> *How* is reality represented? That is, which metaphors are used in our representations, and what are the consequences of using a certain metaphor in a certain situation?

The *which*, the *what*, and the *how* are all-important in any discussion of metaphors as the collective human representation of our

surroundings, our 'pieces of the world'. Basically, we get the representations we deserve, by choosing the right or the wrong metaphors. But notice, as I said above, that it is not a matter of indifference *which* pieces are picked for representation; neither is it irrelevant, even *a fortiori*, *who* does the picking, and *how* it is done.

These three questions will be our guide lines in the discussion below.

2. Metaphors as conceptual instruments

Consider the ways people understand the world: they represent the unknown in therms of the known, one domain of reality in terms of another. In Nelson Goodman's classical definition (1968; cf. Friedrich 1991:39), a metaphor is 'a figure of speech in which one thing is likened to another by being spoken of as if it were the same'. 'Metaphoring' is essentially a (the?) way humans use for representing reality, inasmuch as metaphors are, in Lakoff and Johnson's words, essentially a way of 'understanding and experiencing one kind of thing in terms of another' (1980:5). However, as Lakoff and Johnson also admonish us, metaphors do not only assist us in *representing* the world: they are actively involved in our *creating* it (ibid.:153).
Consider an example due to Max Black:

> When I first thought of Nixon as an 'image surrounding a vacuum', the verbal formulation was necessary to see him in this way ... metaphors enable us to see aspects of reality that the metaphor helps to constitute. (1984:39)

Black's 'aspects of reality', like the 'things' that Lakoff and Johnson talk about, are not material objects, but elements of a world of *signs*: metaphoring is a semiotic activity, a manipulation of signs.

3. Metaphors, signs, and computers

Metaphors are signs creating signs. They are signs inasmuch as they represent reality ('understanding something in terms of something else'). But inasmuch as that reality is understood, it creates a new reality: the reality of the sign. The metaphor, as a sign-creating

device, is part of a semiotic network of representations, a signed reality, whose objects are defined not by what they 'are', referentially, but what they point to, relationally, in the network.

This signed reality is part of a culture (or sub-culture) that is characteristic for any given point of time and place in the world of human activities. Culture is not something that is added to reality: rather, it is a constitutive part of it. Culture creates reality, mainly through metaphors. Thus, reality is not the sum of whatever is, whatever will be (either as a matter of simple future, or as a consequence of the present), and whatever has been, but a selection of the huge, jumbled mass of facts that is the world's actual and potential existence. Reality, as signed reality, is *metaphorically exclusive*: that is to say, it cannot be equated with the sum of all (possible) worlds, but only with those parts that are culturally (i.e. historically and socially) relevant.

As far as the 'reality' of the computer world is concerned, the corresponding problematic can be formulated in a few, basic questions such as the following:

- In what way does the computer create reality for its user?
- To what extent is the computer a sign which creates signs?
- If the computer is a metaphorical representation, what is its reality?
- A practical question, to be taken up later: What can we learn from the metaphors of the computer world, in particular insofar as they are helpful in creating a useful and non-constraining world of signs? Can good computer metaphoring result in a user's deepened insight, rather than in mere accelerated operations or enhanced technical skills?

The alternative, of course, is that we accept the (often implicitly uttered) thesis that the computer is simply a stultifying device (which may or may not be true, precisely according to the set of metaphors in which it is embedded).

4. Metaphors and modelling

In general, one can distinguish a non-technical and a technical use of metaphors. Consider, e.g., the metaphorical dimension of 'high-low' (or 'up-down') used to evoke the mind-state of being up-beat vs. depressed, as contrasted with a particular, area-specific use, such as 'high-low' in the case of phonetic features. As we will see, the non-technical metaphors often 'substitute' for the technical ones; otherwise stated, the restricted use inherent in technical metaphors (such as when we speak of 'male' vs. 'female' couplings, e.g. of garden hoses, conduit nipples, and so on) has a remarkable potential of recuperating the 'lost' terrain, so to speak, and reintegrate our consciousness in the non-technical direction.

Metaphorical models are either *spatial, temporal, functional,* or *directional.* Here are some examples from the computer world:

space: the computer has a 'desk-top' that the mouse 'moves' across;

time: we conceptualize our computer activities as 'prior' and 'posterior', e.g. when writing programs, we visualize a recursive rule as happening 'before' some other process;[1]

function: the computer may be thought of as an invisible tool (Mey 1987), or as a black box vs. a glass box (Tamura 1987, 1990; Mey & Tamura 1992)

direction: user and computer being thought of as representing each one end of a communicational channel or a decision procedure, the flow of communication or the direction of the decision-making can either be from user to computer, or the other way round, from computer to user; for examples, cf. the discussion on 'adaptability' vs. 'adaptivity',[2] or the controversy on the merits of 'windowing' vs. 'scrolling' in reviewing a text on a computer screen (Nielsen 1987; cf. below, Section 8).

Furthermore, one can distinguish (albeit not too sharply; cf. Lakoff and Johnson 1980:3-6) between metaphors oriented towards human *action* (e.g. the tool metaphor) and those dealing with human

thought processes (cf. abstract models such as 'differentiation', see the next section).

5. Conceptual interlude

In general, conceptualization can be characterized as 'rapid' or 'delayed' (the terms are borrowed from Tsur 1987:182; 1992:305-316). In *rapid* conceptualization, we operate with quick applications of standard notions or models: we 'jump to conclusions', in a typically rapid movement, as in run-of-the-mill psychiatrists' dream explanations; by contrast, in *delayed* conceptualization, we defer the concluding, in the meantime starting to think about the 'what's', the 'how's', and the 'who's', as I indicated above.

Rapid and delayed conceptualization are special cases of more general distinctions in the use of metaphors; thus, we may operate conceptually on metaphorical levels of

greater or lesser abstraction
greater or lesser complexity
greater or lesser detachment,
etc.

Similarly, Reinhart's (1982) concepts of 'focus' and 'vehicle' are used to distinguish two kinds of semiotic activities such as are current, e.g., in the discourse of psychoanalysis. As an example, take the interpretation of a 'flute' as a dream symbol: here, one can either 'focus' on the flute as a phallic instrument (focus), or one can use a 'vehicle'-oriented approach (the flute as an instrument, a vehicle carrying sounds of a specific texture and timbre, 'flutey' sounds).

Applying this line of thought to the computer, we can either focus on the machine as a tool, all the way from the relatively simple 'glorified typewriter' to the highly sophisticated calculating monster dedicated to number crushing; alternatively, we may consider the computer as a 'carrier' of thoughts, either in the form of a simple thought organizing outfit (the electronic notepad, or the 'outliner'), or as an instrument of thought expansion and an aid in conceptualizing complex issues.

To capture the latter, extremely important aspect of a possible whole new range of conceptualizations (which can be said to be

extremely 'delayed', in the terminology introduced above), it is necessary to create a whole new concept (maybe even an art) of metaphoring; a concept and an art that are specially geared towards capturing the conceptually overpowering, emotionally engulfing, and environmentally whole qualities of such a delayed conceptualizing; that is, an understanding that operates in terms that are simpler and more concrete, and involve the human as a whole. This process is characterized by what has been called an 'oceanic dedifferentiation' (Tsur 1987:177-190; 1992:269); I will come back to this, but first, let me tell an illustrative anecdote.

6. Metaphor: A case story

Here is an anecdote told by Robert Sternberg (1984:347):
When Sternberg and his wife were about to buy a house situated on a street called 'Wolf Tree Drive', they were at first unable to decide whether they could afford it. During this process of deliberation, they also inquired about the meaning of the street name, and were told by the owners of the house that 'Wolf Tree' actually was a kind of tulip tree, something which sounded pleasing to the Sternbergs.

However, on looking up the word in an encyclopedia, they found out that the tree had presumably gotten its name, because its growth and size prevented 'the growth of many small and potentially more valuable trees around it by usurping their space, light, and nourishment' (ibid.).

Here, two metaphors for the acquisition of the Sternbergs' future home offered themselves: one pleasant (a nice tree growing white flowers over time), the other unpleasant (a tree prohibiting or killing other growth). The metaphors were respectively interpreted as images of a peaceful life in a quiet, flowering environment, and a life full of constraints on the couple's activities (not least because of the high price of the house).

The Sternbergs eventually resolved these conflicting metaphors by combining the idea of an initial period of limited growth around themselves (including the need to say good-bye to a number of habits and activities that just would have become too expensive) with another property of the tree: its flowers appeared only high up, and after many years of preparation. This latter property was interpreted by the Sternbergs as: '... that after a few years had passed and their

financial position had become more secure, their investment would flower!' (ibid.)

Although, of necessity, we cannot tell whether or not the resolution of the conflict in this case was successful (in particular, if the Sternbergs lived forever happily in their new home, and if there ever were any flowers on their tree, metaphorical as well as real), the story is interesting because it shows the importance of metaphors, and of the way we put them to work in our daily lives; furthermore, it demonstrates how all metaphors must be used and interpreted in a social context. Abstractly taken, the Sternberg story makes no sense: again, it's the 'who's', the 'what's', and the 'how's' that determine successful metaphoring.

7. Metaphors and differentiation

Metaphors are 'cognitive instruments' (Black 1984:39): they allow us to expand our understanding and knowledge of our world. Metaphors do this by operating a transfer of such understanding and knowledge from one domain of experience to another. But to be able to function as cognitive instruments, metaphors must both be *based* in that experience and, at the same time, *transcend* it.

The basis of our experience is the world of our senses; our metaphors are based on sensual experience and simultaneously transcend the senses, thus creating meaningful wholes out of our sensual experience: 'experiential *Gestalts*', in Lakoff and Johnson's terms (1980:178).

If what we do in metaphoring is understanding one thing in terms of another, the experiential *Gestalt* that results from our understanding is necessarily different according to the sensual experience(s) that lie at its bottom. Whereas some sense experiences allow for a lot of differentiation, such as those belonging to sight and hearing, others recognize fewer degrees of differentiation, as in *Gestalts* based on the sense of taste and smell or the sense of touch (including experiences of temperature). These experiential *Gestalts* being constructed out of the lesser differentiated sense experiences, we would normally expect them to be expressed in less differentiated terms as well.

But what happens when the metaphor we choose in order to build up a complex 'experiental *Gestalt*' that I mentioned above,

belongs to a lesser differentiated domain of the senses (for instance the opposition between hot and cold), and we use such it in relation to another domain, where the sensual experiences (or other phenomena, not necessarily or exclusively restricted to the senses), exhibit a greater degree of differentiation? Take the domain of the affective feelings; there is no doubt that these represent one of the most complicated areas of the human psyche. Yet, when one's love-life is up for discussion, the metaphors used to obtain an understanding of what is going on, are often gathered from a very lowly-differentiated domain such as that of the touch, including the sense of temperature. A friend's feelings for one are optimally said to be 'warm'; alternatively, they may have 'cooled', and be neither 'hot' nor 'cold', but somewhere in between, with the well-known result of rejection, as in the case of the hapless Laodiceans, who were 'lukewarm, and neither cold nor hot, and consequently were spue[d] out of [God's] mouth' (Revel. 3:15-16).

Thus, a rather intricate emotional structure is reduced to a very simple sensual dimension of experience: love, in all its complicated shades and nuances, is interpreted along the dimension of temperature, usually exhibiting at most three gradations: hot, tepid, cold. When the less differentiated sense dimensions (such as touch, temperature, weight, etc.) in this way dominate the more differentiated ones (sight, hearing, emotions), we call it *'dedifferentiation'*.[3]

The Israeli semiotician and linguist Reuven Tsur, who has coined the term (1992:415), explains 'dedifferentiation' and its function in literary contexts as follows:

> ... poetry in general, and figurative language in particular [here interpreted specifically as metaphor, JM], consist of a permanent pursuit after finding ways to overcome the tyranny of highly differentiated linguistic categories. (1987:228)

But why is dedifferentiation called 'oceanic' (with a term originally due to Anton Ehrenzweig 1970; Tsur 1988:713)? This aspect of the process has its origin in a certain feeling of total immersion, of losing one's foothold and transgressing one's traditional boundaries that accompanies the loosening, through 'dedifferentiation', of the tyrannical seizures which cripple our use of language and its categories. Such an experience is especially frequent in the exercise of

the sense of hearing, as in listening to poetry or concentrating on a piece of music, where the intricate texturings of the sound continuum produce a feeling of total *abandon* in the listener. Such a feeling is not directly related to the texture of the poetic musical work, and can only be expressed in 'dedifferentiated', that is, wilfully simplified, dimensions of other sensual experiences, that is, through the use of metaphors. In this sense, I say of Prelude #7 (E flat major) of Bach's *Well-tempered Clavichord*, Book I, that it 'swings', using a metaphor from the sphere of physical motion, or that listening to *The Doors* gets me 'high', where the strictly spatial, simple metaphoring serves to express a very complicated and mysterious feeling of well-being.

8. Dedifferentation and the computer metaphor

The question before us now is: how can we use the concept of dedifferentation to clarify the problems at hand; in other words, where does *dedifferentation* come in, when we talk about metaphors in a computer environment?

The first question to be answered is:

> From which sensory experiences are metaphors ordinarily taken in daily life? Does this affect the way we talk and metaphorize about computers as well?

And the second:

> Given the concept of dedifferentation, where do its major 'transfers' take place? Which are the preferred sensory dimensions ('experiential *Gestalts*') used for building metaphors in the computer world?

As to the first question, it seems beyond doubt that metaphors of sight are by far the more frequent ones, in daily life as well as in the computer surroundings. We talk about 'viewing windows', 'headers' and 'footers', we ask to be 'shown' rulers, clipboards, hidden text, and so on. By contrast, no metaphors based on the sense of hearing are found in the current environment in which I am writing this particular piece (the window of a Macintosh Plus).

With regard to the second set of questions, I want to discuss the experiments performed by Nielsen (1987:27-30) to which I alluded to above, Section 3.

While the immediate focus of these experiments is somewhat outside of our interest (but see below, note 4), the metaphorical processes ('windowing' vs. 'scrolling') used in the experiments deserve closer attention. Strictly speaking, both 'windowing' and 'scrolling' are metaphors from the realm of vision: we all look regularly out windows; some of us occasionally, or even weekly, contemplate a piece of rolled-up text, a scroll. What makes these two processes different, despite their superficial likeness, however, is the role that the user plays on the respective scenes. This role is very much different in the two cases, first of all as regards *direction.*

In the case of windowing, the user moves a metaphorical gadget, a 'window', vertically across the screen. I open a window on the text; subsequently, I may move the window up and down to look at different portions of the text. The direction of my operation is from user to screen: I operate on the screen, I am the *subject* of the viewing operation.

Quite the opposite in the case of the scroll. Here, the metaphorical representation of the text (the 'scroll') moves up and down the screen. The scrolling happens in front of my eyes, while I am the more or less passive *object* of the viewing operation.

In both cases, the metaphorical operations involved translate into the spatial operations of moving an arrow up and down the 'scrolling bar' with the help of a mouse or by pressing an arrow key. What we have here can be called a 'transfer' from one domain to the other: from the complex, sensory domain of sight to a simpler representation in terms of spatial motion.

Even more interesting is the fact that the spatial motion itself goes in opposite directions, depending on the device used: in the case of *windowing,* if I want to go to the metaphorical 'top' of my text, I have to move my window up, either by pressing the 'UP ARROW' key or by moving the mouse in an upward direction on the mouse pad. Conversely, for going to the 'bottom' of the text, I must use the 'DOWN ARROW' key or move the mouse downward.

Consider now the case of *scrolling.* If I want to see the beginning, or 'top' of the scroll, I have to move the text down, either by using a function key (e.g. 'Move text down *n* screenfuls') or the 'DOWN ARROW' key, or by moving the mouse in downward direction along

the scrolling bar. Conversely, to see the end of the scroll, I must move the text up, using the corresponding upward directions of key or mouse.

Thus, the same metaphorical universe is represented, in the domain of metaphorical transfer, by spatial movements of completely opposite polarity. This representation is a dedifferentiation, in the sense defined above: metaphorical representation in terms of movements in a less complex domain. As to the direction of this movement, and thus the polarity of the dedifferentiating process, these depend entirely on whose point of view I place myself on when defining my bearings: 'up' for the user may be 'down' for the text (the computer), and vice versa..

Three important consequences follow from these considerations:

One, in order to manipulate a complex metaphorical environment, I have to *dedifferentiate* it: in the present case, by going from a visual, complex whole to a sensory space that is related to location and to a simple, one-dimensional movement ('up-down').

Two, in order to execute this manipulation correctly, the *direction* of the model is important: the dedifferentiated motion goes in opposite ways, depending on whether it is the user or the computer who 'directs' the original metaphorical movement, and on whether I see myself as an active 'viewer' of the text (through my metaphorical window) or as a passive 'viewee' (who is presented with a metaphorical scroll).[4]

Three, with regard to the original question: Where do the *preferred transfers* of computational metaphoring happen?, the answer is: In the tactile sphere, in particular the realm of *touch* and *motion.* The intellectual domain whose abstract perception is expressed in cognitive metaphors of (mostly) visual dimensions, is 'transferred' (or: differentiated) to tactile dimensions of positioning things and moving them around in certain, well-defined spaces and along certain, well-defined dimensions: 'high-low', respectively 'up-down'.

In the following section, I will make some concrete suggestions as to what should be the preferred metaphoring for the domain of humans dealing with computers.

9. Active dedifferentiation: The 'Japanese garden path'

Elsewhere (Mey 1991), I have shown how a 'garden path' can be used as a means of positive manipulation. The concept is based on the importance of 'global' constraints, as compared to specific rules, in determining an individual's choice of alternatives in a decision process, at a given moment of time, in a particular situation. 'Garden paths' are complex 'defaults', dedifferentiating summaries of complex situations; the computer equivalent of these defaults is the *script*, as it is used in AI and related research fields. (For more on this notion, see, e.g., Schank 1986).

To illustrate my point, I want to appeal to the well-known cultural artifact called the 'Japanese stone garden', considered as a metaphorical expression of the world around us. The terms of this particular metaphoring process are again those that I sketched above: a complex cognitive whole (here: the world) is expressed in a 'dedifferentiated', metaphorical mini-universe, in the simple geometric designs of the Japanese stone garden.

The Japanese garden obtains this effect by dedifferentiating. For instance, at Daitokuji temple in Kyoto, the complex spatial relations of our world are expressed by carefully raked spaces of white gravel representing the sea, while meticulously placed rocks represent the land. A single rock placed in the 'sea' somewhere near the edge of the 'land' may represent a turtle. And so on.

The point of these dedifferentiating metaphors is not to picture an immediate and intimate connection between the 'imaged' and the 'image': rather, the arrangement of the Japanese rock garden, by the very simplicity, yet closeness to 'reality', of the imaged relations lets us ponder reality in simple, 'dedifferentiated' terms. It cuts down reality to human size, so that we can handle it metaphorically in simple, safe, yet seductive ways. In this way, the garden inspires our thinking and provides food for meditation.

If we want to apply this kind of dedifferentiated thinking to the computer environment and its metaphorical representation, there are three main points to make:

First of all, the representation has to be *simple*. That is, it must operate along one or two dimensions, taken from a simple sensory category, such as touch or spatial motion.

Second, it should be *safe*. That is, there should be no interference from other domains, either real or metaphorical.

And third, it should be *seductive*. That is to say that there should be an immediate, sensual appeal about the metaphor, e.g. by its referring to a tactile dimension.

These three properties, safe, simple, and seductive, can be illustrated as follows:

Simplicity: once a transfer has been established, e.g. from the visual to the tactile, there should be no further, more complicating transfers. For example, the mouse is an instance of a transfer of the dimensions of time, place, function, and direction (cf. above, Section 4) to simple 'spatial motion' along at most two dimensions: up-down and left-right. Extending these dimensions, or introducing additional, possible ones (such as could be done by introducing a 'five-fingered mouse', a 'foot mouse', and so on) will probably not enhance the ease of metaphoring, except in rather special cases for highly qualified users.

Safety: the metaphor should be contained within itself, and not 'spill over' into other domains. Hence, metaphors such as 'kill' (for stopping a program or removing a file) are not suitable, as they connotate a number of other activities that have nothing to do with the operation at hand (such as war, hunting, crime, etc.).

Seductivity: the metaphor should be immediately appealing by ease of execution, familiarity of surroundings, pleasurable connotations, etc. The metaphor of the 'invisible tool', as discussed extensively in the computer literature (see in particular Mey 1987, Sections 4 and 5; Mey & Tamura 1991) seems to fulfill most of these requirements, while remaining susceptible to additional refinements, as we will see below.

Thus, in creating the combined metaphor of the 'Japanese garden path' we are able to supplement and redirect current computer metaphoring, both by providing a way of *thinking* and a possibility of *doing*, at the same time supplying some of the elements that are at present lacking in considerations of human-computer interaction. We do this in conformity with the three criteria identified above, by 'dedifferentiating' the complex computer environment into *simple*, geometrical dimensions (as in the case of the 'up-down' orientation), by capturing the element of *safety* that is inherent in the garden (what one contemplates are not 'real' things, but very carefully maintained and groomed artifacts), and, finally, by conveying numerous pleasurable sensations along with ample opportunity for

meditation along the well-organized paths of the Japanese garden environment.

Thus, certain classical metaphors (such as the 'tool'; cf. Mey 1987; Ehn 1988) are reinserted into a semiotic environment of *human* qualities. When it comes to tools, those used in Japanese gardening tools are both very specific (like the sand rakes that are used to create the 'seas'), but at the same time extremely simple. easy to understand, and pleasurable to operate. In the same vein, what by some has been advocated under the label of tool 'invisibility', is now given the additional dimensions of 'uncomplicated handling', 'ease of understanding', and 'satisfaction at work'.

10. 'Design-by-doing' in Sweden: A 'Japanese garden path' approach

In the following, I will briefly outline a successful Swedish proposal for dedifferentiation of human-computer interaction that bears a good deal of similarity to the ideas sketched above, viz., the 'design workshop' developed by 'Project UTOPIA'.[5] UTOPIA was part of an ongoing effort to further cooperation between skilled workers in the graphic industry and the developers of computer-aided tools for that industry. The overall aim of the project was to 'investigat[e] social, political, technological and methodological limits to a more democratic design process and the design of skill enhancing computer artifacts in the interest of the ultimate users.' (Ehn 1988:331)

The problems confronting UTOPIA were those of a new (in this case, computerized) technology confronting 'old' know-how and skills. In the design workshop, technology researchers and graphic workers established a new working practice for the development of 'requirements and wishes on a concrete level by actually carrying out the page make-up and image processing on simulation equipment.' (ibid.:335) This new working practice was established when more traditional methods of design (such as data flow charts, scenarios, and the like) had proven useless, as being too abstract and hence dysfunctional. What the project mainly is known for is its development of a practice of 'design-by-doing', operating on a 'workstation mock-up', that is to say, a paper and plywood imitation of a workstation on which all the necessary operations of the desired final product could be imitated by 'computer-based tools'. The results of the mock-up operations had the form of images drawn on paper,

displaying 'a series of snapshots simulating the work done while using the work-station'. Thus, the device was used to simulate the interaction between the workers and the computer, without expensive equipment or time-consuming programming being required.

What Ehn and his colleagues did in this experiment (which, by the way, and in spite of its eventual lack of funding, proved to be a great success) was to effectively create a metaphorical world, a 'Japanese garden', in which 'paths' were laid out that were supposed to give a realistic (albeit not real) picture of the 'world' (in our case: the introduction of new technology into the graphic industry) and its problems (in our case: the new division of labor in layout, typesetting, and so on, along with the concomitant necessities of a new mode of cooperation and its problems). The means of doing this, that is, the actual creation of the 'garden', consisted in a process of 'dedifferentiation' (see above, Section 8) by which the 'world' and its problems were scaled down to size and reduced to simple, 'dedifferentiated', tactile dimensions. This making up of a mock model from simple ingredients is an exact parallel to what the creators of the Japanese rock garden at Daitokuji temple did when they designed the 'waves' of raked white gravel to engulf the rocks of the 'continent' – not fo forget the stone 'turtle' in the middle of it all.

After their method of 'doing-by-design' had proven its worth in the original surroundings, the Swedish group started experimenting in other directions. They found it profitable to use the 'mock-up world' also for simulating relations in work organization; the result of these experiments was an 'organizational tool kit' (Ehn 1988:337-339), which could be used for discussing such things as work boundaries, safety measures, work schedules, and the like, as well as for solving conflicts about the new division of labor in the changing technological surroundings.

It is important to realize, as Ehn himself states (ibid.:338), that the main emphasis in this design is not on *correctness* of description, but on the *use* of the tool. This is in agreement with what I have said earlier, in Section 9, about the Japanese garden metaphor: it is not intended to provide a 'true' picture of the real world, but rather, by its metaphoric qualities, it allows us to use the pictures representing the world in order to perform certain operations on that world in a 'dedifferentiated', hence manageable way. Notice, by the way, that

the pleasurable aspect, too, is safeguarded in the design-by-doing experiments: rather than viewing their metaphoric activities as necessary and unavoidable drudgery, the Swedish group referred to their work (in Ehn's words) as 'playing games with the organizational tool kit' (*ibid.*:339).

11. Conclusion

My conclusions shall be few and brief. For a better use of metaphor in a computer-related environment, we must base ourselves on the idea of dedifferentiating complex surroundings into *simple, safe,* and *seductive* metaphors, which then can translate into appropriate devices that will deal with the technological problems, while protecting the special flavor of the human operations that are involved.

The problems that may, and will, arise are not primarily technical, but have to do with our human mentality. As I have shown in another, related paper (where we focus on problems of communication; Mey & Tamura 1991), the stumbling blocks on our paths are mostly in the mind, not in the real world. The correct, and only, solutions to our problems are to be found in the creation of the right metaphors: simple, safe, and seductive.

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Notes

1. This takes place on the metaphorical level only; the actual execution can be strictly serial, of course.
2. Roughly, the distinction can be described as adaptivity (human to computer, adaptation of human to tool), vs. adaptability (computer to human; adaptation of tool to human user). (For details, see Mey 1992.)
3. When the rich borrow from the poor, we are facing the phenomenon of 'pauper's sheep', as Tsur calls it (1987:218). The reference is to the events

described in 2 Kings 12, where David dispatched his general Urias to the front in order to get him killed, and marry his wife Bathseba. Nathan the prophet rebuked the king for his deeds, using the well-known parable of the rich man coveting his poor neighbor's only ewe lamb, and following up David's righteous indignation with the famous words: 'Thou art that very man!'

4. Incidentally, the result obtained by Nielsen in his experiments indicate that there is a *preference* as to direction, and that this preference may be task-oriented, depending on the 'direction' of the given task. Thus, Nielsen found that the results for windowing operations were significantly better in the case of *search* tasks, whereas scrolling resulted in better achievements for tasks of the *monitoring* type (1987:30).

   In our framework, this would correspond to the better fit of direction in cases where the user steers the process (e.g. in text manipulation: here, the user is the most important element of the situation). However, in monitoring an ongoing process, the user is given a more passive role, especially if the process is such that it cannot be stopped or changed at will (consider a user monitoring the flow of coolant in an atomic energy plant). Here, the user is at the opposite end of the directed process: the process is the most important element.
5. UTOPIA was a Scandinavian research project carried out at the Swedish Center for Working Life and the Royal Institute of Technology, both Stockholm, and Aarhus University, Århus, Denmark, from 1981-1985. Its purpose was to develop design for new computer technology and work organization in the graphic industries of Scandinavia.

   Project UTOPIA had the strong support of the Scandinavian trade union movement, and (in its later phases) also of the Swedish Board for Technical Development (more or less the equivalent of Japanese MITI).

   While the design part of the project proved to be a success, its organizational suggestions could not be put to the test, owing to the unwillingness of the Swedish newspaper industry to engage in experimenting in this sensitive sector of working life. (For more information on the project, see Bjerknes et al. 1987.)

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