

CAD ABUSING COMPUTING

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DIFFERENTIATIONS

I should like to differentiate three ways in which computers can be applied (used) in any field—although, in this case, I shall speak of architecture as the universal exemplar: that is, three approaches. I should also like to differentiate two attitudes to what computing is.

The three approaches are:

- a) the computer as.
- b) the computer as illustrating.
- c) the computer as making.

The two attitudes are:

- i) computing as obeying our commands (not participating or (in-)forming)—when it is a tool.
- ii) computing as participating and (in)forming without, literally, obeying our commands—when it is a medium.

And I should like to confirm that my interest as an architect and teacher is in design, in teaching design (and designing teaching); and that my interest in computing in architecture is in how it might help us develop, extend and improve our abilities, and the abilities of our students, designing. As for my interest in computing—ah! that's something else.

In order to explore the distinctions I have made above—the main business of this paper—I need to explain some of what I mean when I talk of design, and why I wish to make these distinctions—so that I can examine what I might get out of them.

DESIGN

Design is (in English) a confusing word, for it has so many different meanings and language roles, from noun to verb, and from the almost criminal “having designs on something” to the pidgin “de sine”. For me, a design (object) may result from (the activity of) design(-ing). This activity I depict, mentally, as a conversation with the self, usually via pencil and paper. (It is possible for some, sometimes, to do it non-materially.) In the process of this conversation, ideas grow and take on their own life, developing and changing in a manner that is essentially unpredictable and which increases in variety, richness and depth. Design is not, thus, (as some would have it) in any sense primarily problem based, and is not, most certainly, a deterministic, problem solving activity. For me, it is necessarily and essentially mysterious, it cannot be predicted, it takes on its own life, and, like any genuine conversation, starting from somewhere meanders somewhere else, via various events and places, eventually arriving somewhere which we find, upon arrival, to be an end, the end, and which makes sense of the journey, giving it purpose and logic (after the event). For, the new is, by definition, unpredictable and from the unknown—and design is about creating a new. Hence the postrationalisation of our design actions, accounting for them only when their sense becomes apparent after the event. (The metaphor I have used is of a more-or-less aimless, wandering walk in the countryside¹.) So, I use the word, here, to denote this “wandering” activity that I have described.

When I talk about design, in this paper, this is what I intend. I do not deny the value of other meanings and intentions, or of virtually contradictory uses and interpretations to those I make here, but they are not what I want to say or what interests me, or why I care to teach.

It is important to be clear on these matters at the outset, for they are the reason for this paper, for both the thinking and the writing that are in it and that are it. They are why I do what I do, why I teach what I teach and teach as I do: and why I have worked at finding ways of using computers in architecture, of computing in architecture, the ways I shall explain here, and the reasons I am no longer interested so much in the approaches inherent in the work of so many others: and, most of all, why I love and live in education, which is why architecture and, occasionally, computing) interests me—as a vehicle and a world for doing education.

THREE APPROACHES

It is time to explain what I mean by each of the three approaches I have mentioned.

a) the computer as.

¹ See Glanville (1978) and (1980) for a fuller exploration of the metaphor.

There is a use of the computer in architecture (or whatever field is the focus of concern), such that it is the architecture itself. This is a very exciting approach, but one beyond most architecture schools and most of architectural education, because we rarely have the facilities to make such things. For instance, the intelligent building, still a research project, will need actual buildings, and we can't usually afford such things. However, it is possible to run pilots and carry out research. Two examples I know at first hand are person recognition using neural net computers for building security being carried out by colleagues in the Land Management Department at the University of Portsmouth (think of the consequences in environmental control), and the work of the Architectural Association's (AA) Diploma Unit 11 in intelligent interactive environmental objects: and genetic algorithms the products of which are so extraordinary they defy any meaningful brief description.

b) the computer as illustrating.

The most common architectural use of the computer is in what I think of as project illustration—the automated draughtsman. This is the traditional approach of CAD (usually extended as computer aided design, but better expressed as computer aided draughting), and is, I believe, what most, in architecture schools, mean when they talk of computing or, even, just of computing in architecture². Essentially, what is exploited here is the computer's ability, from a set database, to extrapolate fast, and, hence, to produce many images (normally, and seemingly convincingly, perspectives). Since many perspectives can be produced relatively fast, and other factors such as light can also be changed, it is possible to produce the computerised version of the flick-through book that we all produced as children—the impressively “realistic” walkthrough, sometimes even made interactive. Other sorts of “visions” can also be generated: for instance, costings, clash recognition, structural analysis, etc.

This is a powerful explanatory tool: a project is illustrated, in almost frighteningly “realistically”³. It is , however, deeply, frighteningly convincing⁴. But, for all sorts of

2 How often did you hear an architect talk of office automation, accounting, communications, word-processing, databasing, spreadsheeting as “Computing in (or for) Architecture”?

3 See, for instance, the computer generated, building exploring and explaining “videos” produced by students of my University of Portsmouth colleague, Jay Potts.

4 I have put “realistically” in inverted commas because of the extreme difficulty of knowing what this means. Perspective projection, as we construct it, is optically incorrect, and how we construct perspectives (view points, field of vision, angle of vision, degree of precision and focus, for instance) are all variables we just guess at or ignore. Goodness knows how correct this can be, cognitively, but it is convincing. We have no way of deciding this at the moment: thus, the best we can assume is that the perspectives and consequent walkthroughs show us wishful thinking (this does not mean they are wrong: it means we cannot be sure they are right, and we cannot, therefore, truly evaluate what they tell us about our designs. (See Broadbent (1981).))

Furthermore, even if we could evaluate them, we would not be able to do anything about them without an enormous amount of work, because the file structures etc into which we organise our computer models do not allow us to change parts in such a manner that they will sort themselves out, except in very simple sketching programs that have a certain elegance, such as Virtus WalkThrough and Alias Upfront. If we wish to change our design, we have (generally) to strip back our decisions to remake the appropriate one and then re-incorporate all

theoretical and practical reasons, and reasons of control, it is rarely used for questioning exploration.

c) the computer as making.

The third approach that I distinguish is the computer as making. By this, I mean the use of the computer to generate (novelty) to, from and with us. For instance, I mean unlikely combinations or points of view, strange associations, unfamiliar descriptions or renditions, peculiar combinations and compositions, shocking fragmentations: automated, or created by and between users working together or alone; serendipitous or intentional; through proper use and improper abuse of the computational environment; with exactness or imprecision of recording and processing (if the digital—as opposed to the discrete—can ever be exact). These can occur or be instigated in many ways, and I shall indicate some, later. I say some, but I intend to indicate only a most tiny sampling.

ATTITUDES

Before looking, in detail, at some of the possibilities that these three approaches offer, I should clarify the meaning of the two attitudes I mentioned.

i) computing as a tool.

As is highlighted in the Macintosh Graphic User Interface (GUI) and “Toolbox” metaphors—themselves taken from Xerox—that seem to have been borrowed by most computer people, we have come to an understanding of computing as the provision (and utilisation) of tools. They are so shown on the screen, they are so referenced in manuals. This metaphor is, however, only an explicit depiction of the old idea of all computers as tools. They were born, in the physical sense⁵, as tools. Tools are things—physical devices, concepts,

the subsequent decisions. All this takes a long time—both ours and the computer’s. Thus, all we can realistically do, at the moment, is illustrate, and this is why the conviction of the illustrations is so frightening. We rarely change much: having the design on a computer ossifies rather than liberates it.

I should add that I was recently to write in support of (the scientific value of) a large research programme proposed by the Tampere University of Technology in Finland into the use of CyberSpace (Virtual Reality) in architecture: the ability to change and the possibility of the evaluation of verisimilitude seem to me to be at least as important, at this time, as the apparent conviction and the freedom to manoeuvre that CyberSpace offers—if not more so. (See Rheingold (1991).)

5 Although it is quite clear that, to the theorists who developed the notion of the “mechanical” (later “electronic”) computation machine, this was not so: questions of computation and of computability have interested mathematicians, logicians and philosophers for millennia. And, in more recent times, Babbage’s proposals to build his engines were surrounded by much theoretical speculation as to the limits of the computable (including Lady Lovelace’s determination of the limits of computer—later artificial—intelligence). In the age of the electronic machine, while the Americans were building EDVAC and ENIAC for purely unique utilitarian purposes, Alan Turing, who had written the key paper on the computability of numbers and been the key code-breaker in the British unravelling of the German Enigma machine in the Second World War, was determined, in the machine he was building at Manchester, that the computer should not be directed towards calculating one task fast, but be adaptable—which is the root entry notion for computing being other than

whatever—that help us carry out (pre-) determined tasks, and are intended and fitted (by design) for these particular tasks⁶. It is, normally, I believe, the understanding that the fit will be 1:1, unique—that is, that the tool will do the job it is intended to do perfectly (but will only do that job). The history of the development of many of our more common tools shows this⁷. But, equally, it shows variants (there are many, regional variants on, for instance, the hayfork, all of which work quite well). And it is also the case that we can abuse tools—use them not as they were intended and for tasks for which they were not intended.

It is interesting, then, to contemplate what happens when we abuse our computing tools. And we do do this: hackers do it, in one way, and students, hemmed in by the inadequacy of our computing facilities, do it in others. These are just examples. So that, although we present computing as a kit of tools, and although many of us are intimidated by this image and by the power for conformity that we invest in the computer, a few dare to use these tools in unconventional ways to do unexpected things, extending their range and showing some considerable creativity in so doing.

ii) computing as a medium.

In contrast, there are those who have argued that computing is a medium. By this, I mean that they see computing as moderating, even mediating, our behaviour. This is no longer a one way concept, in which we, as it were, tell—INSTRUCT—the tool what to do in our project, with some resultant cause-effect-by-means-of relationship. Rather, computing is seen as something which helps us form out thoughts and ideas, and actions—which informs them. A medium is, thus, a participant in whatever action is taken—acting, thinking and forming (and communicating). It is no longer a simple mechanistic, causal agent, but it helps form (or, if you hate this concept, it perverts) what we try to do and how we try to do it, and, in so doing, it often changes what we thought we wanted to do, or, at least, it changes what we thought we wanted to do from aim α to achievement ω .

simply a tool. To consider the computer as a fast calculator carrying out (a set of) complicated tasks is to miss the point. (See Randall (1975) on the development of computing, Swade (1991) on Babbage, and Hodges (1983) on Turing.)

6 Richard Bunt has made an in depth study of how objects become objects-of-attention (denoted Objects, after Glanville (1975)) and are turned into tools. See Bunt (1980, 1981).

7 Richard Gregory, (1981) the perceptual psychologist and philosopher of science, has argued that it is, in fact, our tools that determine how we think of the world and thus conceive the projects we will tackle and how such projects are, through the tool kit we have, rather than seeing projects and thence making an appropriate tool. As the reader will understand, I like this approach better: but I believe that the connection is more essentially circular. Hence my concern for computing as a medium. I am using the word “project” because I do not wish to confuse the reader by using the word “problem”, when I have indicated that I do not believe design is primarily a problem (solving) activity. Design happens to solve problems, but that is, in my usage, a necessary incidental. (Why I believe this is another matter and cannot be discussed here: however, I do NOT deny that problems are set and solved, only that they are not essential to the activity of designing, even if they do provide the excuse.) Under normal circumstances, I would rather have used the word “problem”

In this, computing can be acting to liberate us to creativity. Although this is not the place for me to undertake a long discourse on what I believe creativity to be, and how I believe we can raise our creative abilities (or teach them), I must elaborate a little. Design is a way of creativity. There are many devices which can be used to help us find a way of creativity, be they design, inspiration or whatever. For instance, brainstorming, sharing ideas, association, automatism and chance, to name but a handful. What distinguishes design (in my sense) is that it is a means of creating, elaborating and enriching wholes—of adding in more and more in until the whole achieves a level of acceptability we recognise and which we recognise in saying “That’s it!”⁸. Of course, we sometimes have to reject the enriching or even the finished whole: in finding the new there is no certainty of correctness, as logicians know to their sorrow⁹. Then, discipline, honesty and quality become more important than ever. And, sometimes, we manage it in some other way. Regardless, I believe that this depiction of an activity is a good description of how we build our thoughts and concepts, and there is some evidence to support this¹⁰. Making concepts is, in my conceptual universe, a design activity¹¹. And this, in turn, depends on testing, serendipity and play. Ideas, when they come, do not belong to those through whom they appear (although I am as reluctant as anyone else to give up my fraudulent claims to ownership: they, like—or even identically with—the new, are unpredictable, unpredicted, outside the bounds of the expectable yet completely appropriate, fitting, when they come. To their “authors” we give respect, but not ownership!).

MASHAGE

It was Marshall McLuhan who brought to our explicit attention the significance and the nature of “media”. He taught us that the “Medium is the Message” (and, later, that the “Medium is the Massage”) (McLuhan (1962), (1964), McLuhan and Fiore (1989)). He explained, at enormous length, the significance of “Gutenberg’s Galaxy”¹². Of course, he was not the first to notice. For instance, the change in the novel brought about by the development of the audience arising from the availability of the written word that the printer (and his

8 Although not quite the classic interpretation, I believe this to be the intent of “chunks” as developed in the work of Simon and Newell (Simon (1966)). I take the idea of the chunk to be that it’s a lump of idea: the so-called “expert” can build more complexity, into their lumps, enriching them. The limitations on the rate of our enriching are provided through George Miller’s (1956) “Magical Number Seven, Plus or Minus Two”.

9 The so-called problem of induction. I believe that John Stuart Mill (1843) was the man most disturbed by the difficulty of not being able, as I would put it, to predicate the novel, but the concern is as old as age.

10 In particular, the constructive psychologies founded in the works of Jean Piaget (1955) and George Kelly (1955), and much developed (also in computerised forms—see, for instance, Shaw (1981)) since. It certainly ties in with the notion that there are Gestalts (see, eg, Katz (1951)).

11 See, for instance, the work of von Glasersfeld (1990).

12 Jonathan Miller, a keen student and McLuhan scholar, has opined extensively on the subject of the importance of the medium. A specially nice piece of his, dealing with aspects of the particular effect of tv was given in a lecture series I organised at the AA. (Miller, J (1981).)

publisher and distributor colleagues) made possible was demonstrated by the Victorian penchant for the serial novel: which novel was often not complete in plot or even outline, or deviated much from that initially planned, by the time the first instalment was available in the monthly magazines¹³, to use only the novel as an example.

It was only when we recognised and allowed the “mediumness” of printing—and all the other media—to exist that we understood its power and its potential to help and encourage us to generate the new and the enriched. When printing was understood no longer simply or just a mechanised, precast form of pen (tool) in neat kit form, automating the scribe’s job, we could benefit from its actuality and value as a medium. And the results were astonishing. Look at the role of the library, for instance, which, instead of the place for the preservation of the secrets of knowledge that gave power (the original sin), became the source of the opening up of knowledge, and hence a strong institution of democracy.

My experience of the power of computing as a medium is most obvious to me in my writing. For a long time, I did not notice it. But recently, I have found it harder and harder to tell a story, to start at the beginning and move, logically, inexorably, to the end. In the case of a prolonged piece of writing, it is harder still. I used to manage this with facility. Instead, I now cut and paste, mosaicing and collaging¹⁴—or I keep the length to a hundred words or so. This is, I believe, a direct result of my growing dependence upon a wordprocessor. The way I write has changed, and so has what I write about, and the style in which I write¹⁵.

However, in terms of computing as a whole, I believe the first expression of the explicit understanding that it is, in general and in toto, a medium was by Gordon Pask. I am not sure he discussed it in these terms before the turn of the 1980’s¹⁶, but he built it, with his colleague Robin McKinnon-Wood, in the 1950’s when they invented the self-adaptive computer program¹⁷: a strange case, perhaps, of the actuality preceding the dream.

13 So, for instance, Charles Dickens, apparently, completely discarded the original intentions of “The Old Curiosity Shop” (as I was informed by Shane Jell, a diploma student at Portsmouth, last year), and Thomas Hardy’s novels have many endings that the author notes were not what he had intended, but were included virtually at the serial’s publisher’s demand.

14 My practical experience is essentially Apple Macintosh (and before that BBC) based. Hence my range of practical computing references, whether to Mac metaphors or software development. I apologise to PC clone and DOS users, or those lucky enough (?) to have bigger machines and software suites for the narrowness of my allusion and the occasional inadequate generalisation and overstatement.

15 The (UK) Construction Industry’s Computing Association’s Director, Rob Howard, told me that the UK Government had carried out research into the consequences of translating a typical office from typing to wordprocessing. Efficiency is reduced for at least 9 months, and paper use quadruples. Is this an effective tool? Or something else?

16 In his popular book about the future, and the computer and information revolution, which he refers to, collectively, as the “Information Environment” (Pask and Curran (1981)).

17 These programs were: SAKI (Self Adaptive Keyboard Instructor), which has taken many forms and is the original of all those keyboard skills trainers—the program adapted itself to your performance and your

In the current past, there has been a lot of work in which the mediumness of computing has been most clearly the driving force. For instance, the popular developing field of Computer Supported Co-operative Work (CSCW) uses information technology (IT) (that neat semantic generalisation of computing) as the basis of its appeal as a field and for funds. The whole point of the field is that, with IT, it is possible to develop ways of working in which co-operation might be both easier and more productive. This can happen because of the medium in which workers are working, which, apart from obviously necessary tools, has a whole ethos, and allows a new way of working. (CSCW is definitely NOT remote accessing, database sharing, etc, although these may come into it. It is an approach and it inhabits its medium.) The interest extends to shared workspaces for architects¹⁸!

As it happens, Apple Computer, in their research into developments of their interface, are working (according to a series of MacUser articles¹⁹) on a more drawing-like screen graphics presentation, where the worked-over remains, and darkens, while the less used is shuffled to the back of a stack of tracing paper, and greys out—to use a metaphor.

Taking another tack, John Frazer (1991), who runs the best equipped university graphics facility in the UK at the University of Ulster as well as the already-mentioned Unit at the AA, has designed commercially successful CAD software for years²⁰. Yet he speaks of Computer Obstructed Design (COD), meaning two things: that CAD does not help but rather hinders designing, and that, contrarily, the way in which computing might help designers is by obstructing them, encouraging them to act more inventively (COD). Is that a tool?

On a completely different front, Reimä Suomi (forthcoming) has argued that business is being significantly hampered by its lack of consideration of what computing can offer, limited by the lack of imagination that we all share as professionals—that what we can imagine is profoundly based in what we know, so that we do, indeed, ask for the automation of those tasks we can specify, rather than letting the computer suggest novelty, in and of itself

performance in response caused it to adapt again; and MUSICOLOUR, a special purpose computer that responded to live music, and then, when “bored”, started to attempt to modify the musicians’ behaviours by adjusting its responses so that change was encouraged. MUSICOLOUR toured clubs such as Churchill’s, pursuing the indestructible and central theatrical theme of Pask’s life. It must have been quite a phenomenon, of far greater behavioural sophistication than even today’s Rave shows, as SAKI is still in the vanguard (although rarely recognised and known) of its latter-day, wizz-kid Mavis Beacons. (See Pask (1968) in Reichardt (1971).)

18 There is a surprising amount of work going on in design sharing, which is also leading to some very interesting ideas about how designers work. Although, myself, suspicious of CSCW, I have begun to believe my suspicions are not well founded, and have been supported more by a solid dislike of e-mail than a serious consideration of what is involved. For a good collection, see Bannon, Robinson and Schmidt (1991).

19 The most immediately relevant is Chen (1991).

20 Available for PC’s and clones from AutoGraphics, these packages are standards in schools in the Netherlands. Amongst the nice things Frazer has done was to ‘tween between a T-model Ford and a 1986 Ford Sierra, and then extend the time forward, extrapolating to the year 2110, when a very sleek and aerodynamic car no longer had room for any human cargo.

(the dependence on established practice). Of course, we cannot always stop the mediumness of computing asserting itself even when we do treat it as a tool: the Crash of the London Stock Exchange after the so-called Big Bang is evidence enough²¹.

For, in the end, what is that research centre and wonderfully over-endowed toy called that Nicholas Negroponte built? The Media Lab. And what did it come from, what is its provenance? The Architecture Machine Group²². And what was the Architecture Machine Group? It was a few likely lads who thought that computing was an interesting enough area for architects to play in, just for fun, regardless of buildings, and who, as a result, brought such fresh insight that the old master²³ of AI was known to say that the only intelligent work being done in Artificial Intelligence was being done by the Architecture Machine Group, even though he was professor of Computing at the same Institution!

MESSAGE IN THE MEDIUM

I may have let things run a little ahead of themselves (that is the nature of the wordprocessing medium I am working in), but it must be quite clear that, for me, the most important feature of all in computing is that computing is a medium, not a tool box. I hope the reasons for this belief are also clear and convincing, and that some of the resultant riches, stemming from the holding of this belief, are apparent and delightful.

The question that I, at least, have to answer (though I hope I am not alone in this) is HOW TO TREAT COMPUTING AS A MEDIUM? particularly in architecture, and especially when I am, as is any architect, trapped into the tool box by the blinkers and horizons I have chosen to adopt and can no longer escape.

There are two answers that I know of. They operate at different levels.

The first is the harder. It is to LISTEN. To what the computer is telling, is offering—if I may be allowed a personification that is not intended to be animistic.

By this, I mean not to tell the computer what I want, not to order, but to listen, to watch, to leave myself open to whatever it offers (without censorship or even

21 The computers started dumping selling to each other so fast that they created a slump that instantaneously became a crash. The systems programmers had not foreseen the possibility of the tools hitting back. Actually, if they had read W. Ross Ashby's (1956) "Introduction to Cybernetics", they would have known about the value and powerful influence of buffer states, and might have written in something to cope with the sort of local fluctuation that can drive a catastrophe, by allowing the system to move slowly!

22 The original Architecture Machine Group (Negroponte (1969), (1975)) has a long history in experimental computing, culminating in the founding of the Media Lab at MIT. For the story, see Stewart Brand's (1987) excellent "The Media Lab".

23 Marvin Minsky at MIT. He told me this 20 years ago in 1972. I don't know if he ever wrote it down. He knew I was an architect, of course!

evaluation in the first instance), letting it take part. I do not know what this is. I repeat, I DO NOT KNOW WHAT THIS IS: this is axiomatic.

What this is like is tutoring architecture. In my world, the teacher's job is to listen to the student in order to find out what he is trying to do, and to help him do this (or decide not to). This involves the assumption of ignorance—a conceptual *carte blanche* and a willingness not to know better—the abdication of expertise. That is why I say I must know even less than my students to teach them this, which I refer to as “teaching from behind”. It's a very hard trick, one for which I am by temperament and skill extra-ordinarily ill-fitted, and is in complete contradistinction to that other sort of architectural teaching, in which we lead, we demonstrate our expertise and we instruct.

It means dropping pre-conceptions and pre-conditions, and leaving the toolkit behind. It means not knowing what the use will be, being surprisable and alert and open, and, quite possibly, ending up a blind alley—or at least not being an architect any more! It means remembering that for the first time inventor, the wheel is NOT being re-invented. It means sharing the novelty and the bemusement and the surprise and the thrill and the delight. And the hurt. It is very difficult, and I think it involves a very great deal of courage. And innocence.

The second is more straightforward: it is not an attitude but ways of doing this (could these be tools?). I can list some: I am sure everyone else could add as many. I wish you would.

- recognising and grabbing hold of serendipity
- play
- association
- brainstorming
- sharing (respect, not ownership, of ideas)
- abuse (use in the wrong, or unintended way, or beyond the intended range)²⁴
- distortion
- collage and mosaic
- following rules to the bitter end
- interaction
- the effect of another on “my”
- randomness, change, automatism, accident
- accepting the system's performance as it is
- (inter)active tagging
- within an environment of discipline, criticism, honesty, rigour and quality.

²⁴ I like to give examples of this. One is the “correction” of random typing by a spelling checker, which can produce the most astonishing verbal co-incidences of breath-taking freshness. Another is the re-creation of images after compression, following focusing an intentionally fuzzed image, converting a vector to bit-mapped graphic and then vectorising it again. Of course, the example of Frazer's extended ‘tweening of the Ford belongs here: as would 3D ‘tweening (imagine ‘tweening from Savoie to Mairea).

It's all about creativity.

I think I know how to begin to do some of these. They need to be explored and extended. They provide a way by which the medium of computing may be used to help the designer in developing his or her creative powers and range. There are many ways of trying to set up situations in which we can begin to explore, in which computing in participating with the designer in the creation of projects: and that is a novel form of computing in architecture.

I will report on them when I have collected a few more, and tried them out a bit²⁵.

IN THE END

I have a recurring architectural nightmare. I go to a DIY²⁶ store with my inadequately drawn floor plan of the room I want to be my kitchen. The man at the kitchen fittings sales advisors' counter puts it into his computer, adds in a few known standard construction details and asks me about my windows and drains. Then he gets me to name my price. He adds on what he thinks he can get me up to. And he gives me a plan and a perspective. Ready-made cabinets: the doors change to colonial from fifties, and on to pine. I press a superscape²⁷ button and the draw opens revealing 57 varieties of tinned food. The tap gushes to fill the sink. Out come the cartons and the fitter, and the credit card. Off we go, home. In a moment, it's all done.

Later, a bigger man, I go to a large, international architectural practice with a city site plan. They enter it in the computer and tell me how many storeys I can have, how much space, the cost per unit area I will need to balance against my predicted rental income. From my assessment envelope. This happens today, now.

²⁵ I will, nevertheless, give a few personal examples of what I have in mind, as examples of what I mean by the use of the computer as a medium, starting with creative accidents: the use of a spelling checker to create surprising images from random typing (as when I teach wordprocessing to students and need some basic text to manipulate) that I have already mentioned; the extraordinary quality of the collage face that occurred when I attempted to produce an assembled image from photos of a young girl to demonstrate the principles of Cubism; and the amazing textural quality of text set on a line spacing far smaller than the text size. And a truly delightful one from a student, who scanned in plans of the Queen Mary liner, distorted them to wrap around the Clydeside site where the liner was built using a drawing program, imported these into a 3D modeller and produced a housing scheme.

My current project is to use a large hard disc with a dynamic file tagging system as a continuous shared student brainstorming medium for a semester long experimental design research programme. All student work will be handled through this resource (drawings will be scanned), accepting the limitations of grain and compression algorithms. All material will be shared: there will be no notion of ownership, though respect will be shown for the originator. The approach in this work derives a lot from the research programme "Support, Survival and Culture" under the direction of Gerard de Zeeuw at the University of Amsterdam, with which I am fortunate enough to be associated. This remarkable programme has been concerned with matters such as designing and the user, multi-level languages, quality and action (mostly in social studies), vastly expanding our understandings of the richness of these concepts and their uses.

²⁶ Do It Yourself—a home-improvement, hobbyist shop.

²⁷ Superscape is a Virtual Reality interactive walkthrough program for 486 PC's, from Dimensions.

Then, I take this space use assessment envelope to the kitchen fittings sales advisors' counter. Only he has now moved up into whole properties. He runs his extended kitchen program, and I walk out of the store with larger cartons and a fitter called a contractor.

Automated design with no joy.

I don't care if the construction assumptions were wrong, about whether it stood up or not in this dream. What I care about is that the whole thing is without quality or care or consideration or love. It is the worst sort of computer nightmare. It happens when the tool takes over and we are not aware. It happens because of that lack of awareness, but, most of all, because we treat the computer as a tool—a slave.

We need, rather, to treat it as what it is, a medium in and through which our imaginations and our imaginings are extended, collaboratively, instead of perverting it so that it perverts us. In the End.

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28 After many years, this PhD is to be published. It will probably be published under the second name, The published version will not contain all the original material, and will contain some new insights and reflections on the development of its main content—which will, of course, not be removed.

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