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(<http://ecate.itc.it:1024/SpringDays00-WP12/contributions-plain.html>).

## **New Interfaces**

Computers link human users in the physical world with a series of computational worlds often behind a screen. From the 1950's to the 1980's while computing occurred mainly on a two-dimensional surface, the window and mouse metaphors were dominant. Beginning in the late 1980's thinkers such as Hiroshi Ishii (MIT) suggested that we might move from Graphical Human Interfaces (GUIs) to Tangible Human Interfaces (TUIs).

With the advent of virtual reality and the potentials of three-dimensional navigation a series of new possibilities arose. Although introduced as idea in c.1965 it was not until 1986 that this new mode began to gain ground. Thanks to new computational power this 3-D metaphor will become widespread within the next decade. While many assume that the 2-D metaphor will simply be replaced by the 3-D metaphor, we would suggest that both modes will remain valuable and that one of the major challenges in the next decades is to find methods of moving elegantly between two- and three-dimensional displays. Some examples will be offered for discussion.

Meanwhile, two other innovations are changing the world of interfaces. A first is mobility with wireless connections to the Internet. A second is miniaturization. There are at least nine approaches to have computing at the molecular or atomic level within the next twenty years. A new project of the US government, for instance, foresees putting the entire contents of the Library of Congress on an object the size of a sugar cube. The frontiers of interface research are thus turning to new combinations of gesture technology, and voice activation. It is feasible that these new methods would be tailored to an individual. If so what methods will there be to ensure authentication? How will the system cope with competing commands-- as when two persons want to watch different programmes on the same screen? If we have such means for action at a distance will the scenarios concerning TUIs be replace? If they are combined how will this work.

More radical scenarios include direct brain implants and wireless control of humans and machines. The advent of such nano-technology and possible brain interfaces raise many new questions. Suppose that thoughts can replace the mouse as a means of moving between interfaces. Presumably children will not have the same access and power as adults. So there will be hierarchies of commands. What about two persons at the same level with different plans? How will the interface deal with this?

The above developments challenge us to rethink the entire subject-object distinction, which evolved from the Renaissance. Where does inner end and outer begin? How much of a "person" will become "visible"? These are the old questions of privacy at an entirely different level. It is useful, for instance, to map a spectrum or continuum from the unconscious to the conscious (figure 1). Will the entire spectrum be visible? If so what point along this continuum in the inner world will trigger action in the

external world? Clearly it cannot be the whole spectrum else everything that passes through our minds would be translated into action and thus remove one of the most central qualities of a human being: the ability not to do everything one is able to do, which is the essence of choice.

1. Dream
2. Intuition
3. Suspicion
4. Passing thought
5. Wild idea in passing
6. Thought
7. Contemplate
8. Intend
9. Pre-meditate
10. Plan
11. Rehearse
12. Act

Figure 1. Twelve steps in a spectrum from an unconscious notion to a conscious act.

To clarify the problem it is instructive to recall experiences with earlier interfaces. In the past if someone was "thinking" of writing a letter they might well mull it over for a few days: first whether to write or not to write, then what to write. Thereafter, there might well be various rough drafts, which might well end with a decision not to send the letter after all. E-mail has considerably increased the ease with which to create a draft and also increased the tendency to send on impulse before we have considered the possible consequences of what we have just jotted down. Thought mail will increase these problems.

Thought interfaces raise fundamental new ethical and legal questions. Traditionally we have made a very clear distinction between a) a healthy, sane, upright individual, who reads about murder in a detective novel or watches a film of the same and b) a criminal who performs a murder. The rise of the Internet has already brought some confusion into this distinction. Persons describing murders of real persons in "fictive" on-line novels have on occasion been charged with "being" criminal.

Will the mind become like a home: a place that is private in principle and open to searching only under special search warrants? If so what will constitute the right to enter the complete mind? These problems exist not only in criminal cases but also in everyday life. In the past, I might well have many thoughts about an enemy, a boss or even a neighbour, which I usually did not "express" as part of being a civilized human being. Will this remain the case? Or will a boss in the future literally be able to see what I mean, think, suspect etc. If so will all this be "wireless" from one brain to another? Or will there be projections in the external world? Will artists and designers project their "ideas" onto boards for collaborative work, collaborative design? Will there be collaborative "creation"? The viewpoint of an individual historian or author in the humanities has typically made their work a solitary act as opposed to collaborative acts in the sciences and especially in so-called big science projects such as advanced physics. How can interfaces represent viewpoints? How can they render visible differences between conjecture and fact, between different schools of interpretation, between levels of logical coherence, between accepted fact and uncertainty?