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Space, Time, Information and Knowledge

1. Introduction

This paper suggests that computers entail much more than a simple translation of space, time and knowledge into digital form. Computers are transforming these concepts and require new fields of study. By way of introduction attention is drawn to a paradox. On the one hand, the new technologies seem to imply an ineluctable move towards convergence and simultaneity, a new synchronicity. On the other hand, these same technologies are introducing a spectrum of asynchronous tools. While the rhetorical emphasis is on tele-presence and sychronicity, the more profound implications of the new technologies may lie on the side of asynchronicity.

2. Seeming Convergence of Space and Time

The rise of civilization has seen an ever increasing mechanisation of space and time and, on the surface, an ever greater move towards convergence and standardization. In the case of time, sundials in Antiquity introduced ways of measuring variable hours. During the middle ages, clocks introduced a technology for fixed-length hours. During the Renaissance, perspective introduced a means of creating homogeneous, integrated spaces. In the nineteenth century, the advent of photography introduced a technology of capturing a given space at a given time. A combination of new technologies such as the telegraph and the train led to standardized time zones.

These developments are so central that some have effectively reduced the history of early modern science to a series of inventions relating to the measurement, representation and reproduction of space and time: from simple rulers and surveying instruments, through proportional compasses, calculators, and converters, to automatic measuring devices.

The twentieth century has seen the spread of the telephone and television whereby there is an increasing impression that tele-presence is possible: that persons in different spaces can be united in a single time. The rise of computers has greatly added to this rhetoric of

convergence. Computers are integrating all the conventional measuring devices for time and space: clocks, calculators, and conversion tools for all the basic functions: area, currency, energy, length, light, mass, pressure, speed, temperature, time, and volume.

Thanks to the interchangeability of digital records, texts, photographs, films, telephones and televisions are now increasingly interchangeable. In theory, a user can speak into a microphone (sound), see the result as text on a monitor or have it printed. Alternatively a user can take a text on a screen and have it read out loud. From this emerges a vision of the world where everything is supposedly simultaneous and at a distance: e.g. the tele-conference, tele-presence, tele-learning, tele-marketing, tele-shopping etc. With all this emphasis on real-time, we should be getting ever closer to "reality". Yet at the same time everything around is becoming virtual: the virtual-tourist, the virtual-museum, the virtual marketplace, the virtual university etc.

3. Renaissance Perspective and Disjunction of Space and Time

In order to gain insight into this paradox, it is useful to step back, for a moment, to the Renaissance, and look more closely at one of the early examples of seeming convergence. The advent of linear perspective brought with it the ability to record a given space at a given time using the perspective window. A painting such as Ghirlandaio's *The Pope conferring on Saint Francis the Rights of the Order* (Florence, Sassetti Chapel, Santa Trinità) gives the impression of such a new synthesis of space and time. On closer inspection, however, we find that the painting is much more complex. The scene depicted occurred in 1223. The fresco was painted in 1480 and it shows the Piazza della Signoria and the Palazzo Vecchio as they appeared in 1480 rather than in 1223. Moreover, many of the figures in the painting depict Ghirlandaio's contemporaries: patrons such as the Medici and poets of the time.

If a viewer took this painting literally, as if it were a snapshot, they would be in trouble. For underlying the seeming harmony of the space and time is a fixed space (Florence in 1480) linked with an event over two and a half centuries earlier (the conferring of the Franciscan order in 1223, which almost certainly took place in Rome and not Florence). Viewed literally the painting is entirely anachronistic. Hence, we discover that we are not looking at an actual scene. The painting shows the Medici "as if" they were bystanders. To see the painting correctly requires a metaphorical viewing: an understanding that the external synthesis paradoxically entails a disjuncture between real space/time and historical space/time.

From this example it becomes clear that the perspectival window, which introduced a methodology for recording the reality of the physical world also introduced new levels of ambiguity and illusion. With this came a need for new tools: how can the viewer verify that what looks like a window is an actual window and not the juxtaposition of a fictive one? How can the viewer identify whether the figures belong to the historical scene depicted or are juxtapositions of contemporary figures into/onto that historical scene? From such needs grew a considerable part of a new discipline which we now term the

history of art. In a nutshell this discipline is about scholarly methods for providing captions and footnotes to what is represented.

Modern computers allow us to produce digital versions of Ghirlandaio's painting. Much more is involved, however, than a simple translation from one medium to the other. The windows of a computer screen multiply the methodological problems of the perspectival window. In some cases the windows are truly windows onto reality at a distance. A video camera attached to a computer in Berlin can be operated by a viewer in Tokyo or anywhere else in the world. A video camera on a satellite gives users throughout the world snapshots of weather from outer space. Thus whereas Renaissance perspective offered static records of the physical world, the new technologies offer dynamic records of the physical world. This means that the windows are enormously richer in the variety of information they can record. So too are the attendant methodological problems. How can a viewer be sure that the view through the window is a real place when it may well represent a location which they have never visited? Or even if the view is real how can a viewer be certain that what looks like news (something that appears to be happening now) is not in fact footage from some other time in the past or, indeed, an interpolation produced by actors: i.e. a fictitious reconstruction of what could have happened, or of that which someone would have us believe happened? During the war with Iraq (Desert Storm), CNN actually paid actors to enact scenarios which never occurred.

In the case of manuscripts, a whole field of palaeography grew out of attempts to verify sources, which ranged from examining the flow (*ductus*) of handwriting to the watermarks of the paper on which the text was written. In the case of books, scholars developed footnotes, references and bibliographies in order to create an apparatus for checking the precision, reliability and veracity of an author. In the case of computers many of these same techniques are being re-invented. Hence there are now digital versions of watermarks both at the visible and the invisible level. We need the digital equivalents of footnotes, refereed journals, and of a rating system whereby the reliability of a source is traced. The difference between one and five stars in the case of hotels and restaurants may not be an infallible guide, but it definitely helps by way of orientation. Curiously most computer programs focus on quantity: measuring amounts, rates, percentages, but give very little indication of quality.

3. **Synchronous and Asynchronous Reality**

Once we understand how the same tools which introduced a seeming convergence of space and time also brought a disjunction in space and time: a need to look at the world both as recorded and as potentially (re-)constructed, it becomes easier to understand how the extensions of those techniques have brought both synchronous and asynchronous experience.

The telephone offers an excellent case in point. When I pick up the telephone and make a local call there is a great sense of synchronicity, that the two of us who are separated in space are somehow united in a single temporal framework. This same sense is possible on long distance calls but there are distinct limitations as I go further afield. If I am in

Toronto, I need to remember that a person in Los Angeles lives in a time zone three hours earlier than my own, so I cannot reasonably hope to find someone in their office until 11 a.m. my time (i.e. 8 a.m. their time). By contrast, someone in Rome lives in a time zone six hours later than my own. Hence I cannot reasonably expect them to be in their office after 12 a m. (i.e. 6 p.m. their time). If I am trying to have a conference call from Toronto with someone in both Los Angeles and Rome, this means that there is exactly one hour per day, 11-12 a.m. my time (i.e. 8-9 a.m. Los Angeles time and 5-6 p.m. Rome time), that a conference call is possible.

Hence for all the rhetoric of telephones and video monitors helping to give us tele-presence through tele-conferences and video-conferences there are clear limitations to this practice when we attempt to apply the principle globally. Ironically even when it is physically possible, the question remains whether we are not imposing outdated conceptions to the process. Lectures by live video-conference are a case in point. In this scenario Professor x in Amsterdam gives a lecture and multiple audiences in a series of cities, say Leiden, Delft and Toronto listen to the learned words in real time. This costs a considerable amount of money. During the lecture the audience is passive. Indeed, if four tapes were sent ahead of time to the four audiences, the effect would have been exactly the same and the cost would have been much less. The value of a live video-conference lies in two way exchange which comes in the discussion period after the lecture. Hence it would make much more sense to transmit the lecture itself asynchronously (either by tape or even as an ATM package at a cheap transmission time) and use the synchronous connection for the two way interaction between the speaker and audience(s).

Closely related to the hype about tele-presence is the even greater excitement about collaborative work. The possibility of sharing plans and designs over a network is undoubtedly an extremely powerful idea. But again the question poses itself: to what extent should this, need this, be simultaneous and to what extent can it reasonably be asynchronous? A person in Toronto makes a proposed improvement to a design in the evening. While the person in Toronto rests, a person in Rome has a chance to reflect upon the proposal and offer some changes of their own. By the time the person in Toronto returns to their office they can then pick up where Rome left off and make the next changes. This is probably much more efficient as a general rule than a scenario which would require both or multiple parties to be on-line synchronously throughout the design process. Hence while the rhetoric stresses tele-presence, it may well be that connectivity and potential tele-presence is the more powerful combination.

Local telephones offer us synchronous connectivity. But most of us are so busy with work and meetings that if we always answered every call we might never get to our real work. Hence answering machines, voice mail and secretaries become asynchronous coping mechanisms. The rhetoric is about "being there" and tele-presence. The reality is about an ever greater disjunction between space and time. Paradoxically this is taking us back to earlier modes. In the days of letter writing it was taken for granted that a few days or even a few weeks might pass between receipt of a letter and a sensible reply: asynchronicity in another sense.

There are now occasions when someone phones and is genuinely surprised to find a person on the other end of the line. They were expecting to leave a message instead. In the realm of known media such as letter writing there is an etiquette concerning acceptable things to say, what not to say and the formulations for steering between the two. In the new media we need an etiquette not just about what to say and not to say but also a whole new approach which will help us to discern when it is appropriate or effective to contact the person directly (synchronously) or indirectly (asynchronously). Nor is this limited to contact with persons. It applies equally to how we deal with information and knowledge. When do we need an on-line connection to a library or museum in what may be rush hour on the Internet and when could our request be dealt with more efficiently off-line at a time when there is little traffic and the same transaction is much cheaper?

4. Conclusions

The everyday rhetoric of the Internet would have us believe that we are on a path of increasing convergence towards a context where everything is in real-time and tele-presence is the order of the day. While this view of imminent synchronicity is undoubtedly valuable, it only addresses one aspect and probably the less important aspect of the revolution that is occurring. The revolution of space and time caused by new technologies applies as much to asynchronous communication as to on-line synchronicity. It is not just about translating or conveying information down new pipelines. It is about new methods for defining how we can be sure of the quality of the information that is being conveyed. The revolution is about new decisions when to be on-line and when to be off-line; when to synchronous and when to asynchronous; when to be reachable and when to be unreachable; when to be present and when to be consciously absent. The revolution is not only about information: it is about changing the ways we know and are known.

 The new technologies can reach us in any space and in any time, every minute of the day and night. Yet those who let a cellular phone disturb them at any time and in every space are not necessarily the new examplars of virtue. They may merely be the victims of an electronic hype. The revolution in time and space brought through electronic gadgets can assure us an ever more efficient information highway. In the end, perhaps we also need a knowledge highway, an intelligence highway, a wisdom highway. Such goals will lead to further changes in our concepts of space and time, lead away from attention to data and information and prompt us to focus on knowledge and wisdom.