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Dossier: Locative media

Reification of data

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ABSTRACT

This paper explores a series of transpositions; event to data to code to behaviour to experience. It draws off the experience of the authors working with augmented environments (architectural, social, and reciprocal), framed collectively as Operating Systems, culminating in recent developments implementing an environmental Operating System. Through the use of environmental sensors, "ecoids", a dynamic temporal model is emerging and that can be seen as a redefinition of the landscape and our relationship to it. Through the use of networked environmental data gathering, modelling and visualisation, the transpositions described above construct an ubiquitous sense of space and place, one that is simultaneously out there and in here, endowing an ability to be present in every place.

Placed within the context of the evolution of these Operating Systems, the paper articulates the development and deployment of real time data sensors and the manifestation of data as experience. The projects provide a new networked architecture for internal and external environments. Location aware data provides the public, artists, engineers and scientists with a real time temporal model of the environment. A critical aspect of data is that the reification of its metaphorical and experiential potential is a powerful tool for transformation.

Keywords: art; architecture; behaviour; data collection; information dissemination.

Context

The authors have been developing a range of "Operating Systems" which dynamically manifests "data" as experience in order to enhance perspectives on a complex world. Arch-OS (www.arch-os.com), an "Operating System"

for contemporary architecture ("software for buildings") was the first "OS", developed to manifest the life of a building. An Arch-OS kernel has been recently installed as the i-500 (www.i-500.org) in Perth (Western Australia) to reflect and manifest the research of a community of nanotechnologists. Arch-OS provides a framework for "tele-social navigation" in buildings that are far too complex to be understood just by looking at them. Tele-Social navigation refers to the feedback loop that exists when the movements of people are modified by environments that are responsive to the interests of the crowd. Arch-OS prioritises the activity framed by the building over its physical architecture.

Using this ubiquitous, networked and embedded model, similar strategies have been deployed through: S-OS, a "Social Operating System" developed a series of creative interventions and strategic manifestations to provide a new and more meaningful "algorithm" for Social Exchange and a better measure for "Quality of Life". Whilst town planners and architects model the "physical" City and Highways Departments model the "temporal" ebb and flow of traffic in and around the City, S-OS models the "invisible" social exchanges of the City's inhabitants; Likewise Co-OS is a collaborative Operating System, a "Reciprocity Engine" to enhance cultural brokerage and social networking. Co-OS will establish a social networking platform that couples an open Web 2.0 online network environment with a modified LETS (Local Exchange Trading System) scheme to develop new non-monetary trading model.

These initiatives provoke the disassembly of solid buildings and the re-manifestation of social exchanges, expanding the physical structure into a dynamic model and invisible values generated by human networks into a measurable and, significantly, experienced form. The ecoid's discussed below apply this modelling process to a mobile environment, from buildings and people to the landscape they inhabit. The potential with these projects is more than a reduction of a physical place and social exchange to numbers. The key issue is the transduction of temporal and spatial forms, things that are too slow, big or mundane, to human experience. This paper explores a series of transpositions; of event to data to code to behaviour to experience.

Dislocation of place

Knowing where we are, and when we are, has become a slippery subject. The "hard" model of time, that was synonymous with early Modernity,

has become softened as flexible forms of accumulation have facilitated more complex approaches to the production of time and space. In addition the advent of networked communication technologies has supported asynchronous relations with friends, colleagues and family, which has led to a need to sustain many communications with many people in different places. Consequently the contemporary sense of time can be seen to have accelerated in order to support relationships between people and resources. Real-time and real-space are not what they used to be, no longer do they orientate around a single church bell or sense of home but they are now subject to the streams of data that describe biological, meteorological, social and economic parameters that inform our relationship with the world and demand us to remain mobile. To understand the terrific shifts in temporal and spatial consciousness, the authors begin this paper by describing the change in relationship with the world that occurred from the Middle Ages to a contemporary post-modern condition.

In his book Spatial Formations, Nigel Thrift recounts the introduction of the clock into Medieval society. From an era when "natural rhythms dictate the pace of life and work and the content of language", and any expectation of a future "centres on a short lifespan and the imminence of the Day of Judgment" (Thrift, 1996), he illustrates how a combination of forces brings about the clock orientated society. Today, as we debate the next mobile phone contract, we do so in an acutely time conscious manner: how many free minutes do we get? Clock-time has become a primary element in organising consumer society and the production of space: after all, until very recently, it was more likely that you would carry a time piece on your wrist than a map in your pocket. Locative media however, and the rise of the smart phone, is beginning to change this. When asked for the time now, many people pull out their mobile phone, which as it happens, also has a map in it.

Thrift's proposition of the "temporal innocence" of the Middle Ages was equally spatial, and it was through the accounting of space in projects such as the Doomsday Book instigated by William 1st, that a sense of place could be divided into separate currencies. By the Age of Discovery, space and time were identifiable units that supported mapping projects on a global scale, and throughout the Enlightenment and toward Modernity, society was cultivated to measure experience using a split model for time and space.

Through the development of the clock, and subsequently the map, space was commodified, and as Heidegger suggests, we began to lose an intrin-

sic connection to land and, in doing so, we lost our sense of "dwelling" (Heidegger, 1971). By tracing the term "building" back to the German phrase "bauen", which is related to "I am", Heidegger concludes that building and dwelling are closely bound to the concept of being. For Heidegger dwelling does not stem from building, but the reverse; building comes from the need for shelter and a sense of being in the environment.

«The nature of building is letting dwell. Building accomplishes its nature in the raising of locations by the joining of their spaces. Only if we are capable of dwelling, only then can we build». (Heidegger, 1971).

At the end of the 20th century a new form of 'homelessness' was identified through the use of the internet, but its interpretation was more constructive. Stephen Perrella describes the «loss of being» as a central part of the cyberspace experience, one in which there is an «omnitemporal logocentricsm» (Perrella, 1995) or an «anywhere, anytime» through which we find ourselves further dislocated from a sense of place. This perspective was part of an excitement for a new type of space that was beginning to emerge across the digital networks of the early 1990's; cyberspace. A place in which dislocation and "homelessness" were embraced as powerful attributes of a new type of space, rather than being symptoms of an old one in crisis. Cyberspace represented an opportunity in which a reconciliation between dwelling and modern technology wasn't necessary, because there were ground rules for a new type of space in which artists, theorists and architects could regain the power to provide meaningful spaces. Cyberspace provided the re-establishment of a «metaphysical, even theological dimension» (Larner & Hunter, 1995) to space because it was constituted by a person to person communication. It constructed an 'instantaneous dynamic consciousness' (Larner & Hunter, 1995) with the potential to develop new aesthetic forms, away from the lineage of art and industry, and across the borders of countries and continents.

The implications of the development of the borderless environment of the internet were ones that offered an exciting element of lack of control and an element of decentralisation. Reliant upon their development by a rich mix of users, the boundaries and territories could not follow the planning models of any of the individual's authoritarian dreams. For Sadie Plant the "continual flux and change" that is offered by a highly socialised development offered an antidote to the consequences of Modernity in which «the sciences, arts, and humanities lose their definition and discipline: law and order fall into decay; social bonds slip beyond repair» (Plant, 1995). Roy

Ascott's conceptualisation of this organic model of the network of the internet led him to the term cyberception which «involves a convergence of cognitive and perceptual processes» that become «locked socially and philosophically» through the web to support a new model for seeing both virtual concepts and spaces as well as a close attachment to actual natural systems (Ascott, 1995).

Buildings in motion

> The Arch-OS combines a rich mix of the physical and virtual into a new dynamic architecture, and a pragmatic manifestation of this convergence of cognitive and perceptual processes. But more importantly it provides a new knowing of where we are, and when we are. Arch-OS uses embedded technologies to capture audio-visual and raw digital data through a variety of sources which include: the Building Management System (BMS) (which has approximately 2000 sensors in the Portland Square development); digital networks; social interactions; ambient noise levels; environmental changes. These vibrant data are then manipulated and replayed through audio-visual projection systems and broadcast through streaming Internet and FM radio. (Phillips & Speed, 2003)

The Arch-OS visualisation

The Arch-OS (Operating Systems for Architecture) infrastructure at the Institute of Digital Art & Technology, represents the early signs of a "substrate" across which the social construction of space may be informed, and the space between body and architecture dissolved. The Arch-OS system has been used to present representations of social systems, and its exposition of network and environmental data has revealed the invisible conduits through which we construct social relations. Whilst many of the projects that have used the Arch-OS data have engaged with traditional themes found within art, they all have at "different" times connected "different" sensors to "different" displays that explore the multiple associations between humans.

Precisely from an understanding of Arch-OS as a tool for evidencing social exchange and human activity, Wilfried Hou Je Bek launched the blog www.urbanxml.com which documents the growth of RSS feeds that trace human activity across the world. More strategic in its efforts to support architectures "environmental" communication across digital networks is

Haque's and Leung's Extended Environments Markup Language (EEML), which constructs protocols to support collaboration and exchange.

The perpetual and relentless streaming of Portland Square data to the internet over the past five years seems to demonstrate a potential for similar systems to operate not just after a building is open, but before (from pre-existing social and environmental networks) that operated on a building site, to during (as the building takes shape and as people can use networks to overcome the barriers to the site), and after the building is re-introduced to a space (through the growth of further connections from occupants). In doing so the construction of the building has the potential to become secondary to the sustaining of social networks that cross the space, and subsequently reduce the impact of the "new" buildings detachment from society.

With systems such as Arch-OS offering interfaces to communications on and around a building site, suddenly our wooden wall may not be so opaque. As we become smarter at driving through the city and relying even more on digital systems to help us negotiate socio/spatial networks, we can anticipate engaging with conversations and offering advice to people not just behind windscreens but also behind walls. In the same way the steel shell of a car has become irrelevant in the interface between the street and us, the running wall that surrounds a construction site will become less of a barrier between and to the building that is being built. The building no longer needs to be isolated from a social and environmental context, while the construction of a new building can be an extension of existing social networks.

The Renegotiated Self and the Space Between

The interaction between individual inhabitants operating as part of a networked composite model brings a new understanding of their social space. They are no longer a person in a room separated from other inhabitants by walls, doors and windows, they are participants in a larger space which requires a shared social responsibility. This is as much a psychological space as a physical or technological space is. The interaction of individuals within such a system generates a "social" space, which, according to Harré (1985), is the "space" where understanding and knowledge are exchanged and learning takes place. The Arch-OS model occupies such a space, it exists as much in the minds of the inhabitants as it does in code or on screen. This spatial consciousness is enhanced by the buildings' feedback on ecological and

temporal activities. Arch-OS here becomes a conduit for complex human interaction at a level not normally experienced in the built environment.

The perception of the self within the complexity of Arch-OS is problematic. The body exists within a fractured space-time architecture: sitting in a room and viewing the larger space of the networked building as a real-time 3D model can be both disorientating and exhilarating. The viewer is both within the model and removed from it, physical space dissolves into the Arch-OS model effectively sharing rooms in the same way that files are shared over a network. Arch-OS can model and manifest the implosion of space and time, the shrinking of distances and the multiplicity of moments that occur within a building.

This shrinking through a complex layering data over and through the building generates the new space between the physical and the digital. This 'space between' is a conceptual and temporal space, a space which can be experienced by the buildings inhabitants through their shared interactions with it. Consequently Arch-OS fractures the single point of view of the lived perspective of a building's inhabitant. By providing a dynamic telematic data model it is possible to extend the individual perspective, offering a high tech Baroque vista. Pallasmaa describes the expansion of the Albertian window and how the "paintings of Bosch and Bruegel, for instance, already invite a participatory eye to travel across the scenes of multiple events". With Arch-OS the potential is to extend this ocular space beyond the «soft focus and multiple perspectives, presenting a distinct, tactile invitation, enticing the body to travel through the illusory space» (Pallasmaa, 1996).

In this new dynamic the buildings' occupants are not just inhabitants, a term that negates participation. Telematic activity, as Sermon (1997) describes, «is nothing without the presence and interactions of the participants who create their own television programme by becoming the voyeurs of their own spectacle». It is at the crossroads of these interactions between the participants and the space of an Arch-OS enhanced building that a reciprocity is formed, a building that is continually reconstructed and renegotiated in real/lived time.

Reciprocity Engines

The Arch-OS Operating System for building has been extended through the S-OS.org and CO-OS.org projects. Here the approach of collecting data

from the residue of human interaction and manifesting it as experience has been extended; from the building to the inhabitants and then back out into the city. The S-OS project provides an Operating System for the social life of a City (in this instance the City of Plymouth). It superimposed the notion of an "OnLine" Social Operating System onto "RealLife" human interactions, modelling, analysing and making visible the social exchange within the City. S-OS is a collection of creative interventions and strategic manifestations that provides a new and more meaningful "algorithm" for modelling "Social Exchange" and proposes a more effective "measure" for "Quality of Life".

> […] people operate as a type of distributed intelligence, where much of our intellect behaviour results from the interaction of mental processes and the objects and constraints of the world and where much behaviour takes place through a cooperative process with others. (Norman, 1993, p. 146)

The algorithm used was: A(n): = nr [r = 1,2,…..N] where A(n) is probably the value of the Quality of Life, and [r = 1,2,…..N] are the numerous calculations that happen within a city. These calculations constitute an invisible fabric woven through the everyday processes of social exchange (a smile, a swap, a sneer) and can be understood as a Social Operating System when made manifest through the use of digital technologies. S-OS was developed to propose and calculate a new "Social Exchange Index" based on a unique methodology that links the strategic S-OS applications and processes to the Governments "Quality of Life Indicators". These indicators are used by governments to measure "success" and progress towards economic, social and environmental sustainability, calculating "quality" by measuring "quantity". They suggest that happiness lies somewhere at the end of a bell curve and that true love can be found in a slice of a pie chart.

S-OS Central Processing Unit

The project took the form of an exhibition located in Plymouth Arts Centre which was converted into a "Central Processing Unit" to run S-OS as a "RealLife" Social Operating System, generating creative interventions and strategic manifestations on, by and for the citizens of Plymouth. S-OS is framed by the individual projects or urban sensors which constituted the exhibition at Plymouth Arts Centre. These range from: the acoustic residue or echo of human interaction; traces that highlight the routines of human

behaviour; juxtaposed currency exchange systems with embryonic non-monetary exchange and trading systems; mobile phone apps to calculate personal values for 'happiness'; semantic ecosystems; the City as a tensegrity of the synergetic forces and volatile social relationships. Each one of the above projects feeds an output "value" to the S-OS Index. The index uses the S-OS Algorithm: A(n): = nr [r = 1,2,…..N] and allows visitors to the exhibition to prioritise one input over another. This last ambiguous human interaction provides the final value of A(n)! The calculation is/will be complete.

The playful application of the principals established through Arch-OS has a more pragmatic manifestation in CO-OS, a Collaborative Operating System. CO-OS, a "Reciprocity Engine", is a cultural brokerage and social networking project which facilitates a radical new network model of collaborative creative production. The intention is to use the principals of reciprocity evident within Arch-OS and S-OS to generate new opportunities, practices and collaborations in mutually beneficial or reciprocal relationships capitalising on available resources and those generated through new non-monetary trading models. The Reciprocity Engine uses interest-free credit, so direct swaps do not need to be made. For instance, a member may earn credit by providing software-programming skills for one person and spend it later on access to another member's technological resources. Each transaction is recorded and generated by the network software system and evaluated by its members in a distributed relationship with all data open to all members, in a mutual credit system.

CO-OS is being created on an experiential, anecdotal and theoretical understanding of shared networks and resources forming a major part of creative industries 'working culture'. It is intended to address practical issues around production and practice that leads up to the dissemination of new work. Primarily, but not exclusively, these works would have been previously described as "New Media" product; however as these practices and processes are now endemic to all areas of the "creative industries" sector, such distinctions are worthless. This sector is a resource heavy field that relies on good will and exchange in order to function. CO-OS aims to address these issues and to attach value to the actions and services that people provide in a network and to formalise that exchange of knowledge within the sector. It also looks to expand the resources out beyond traditional geographical networks through e-learning/exchange and knowledge sharing online.

Reciprocal and recursive landscapes

Like a matryoshka doll these Operating Systems endlessly fold in on themselves. Through ECO-OS, an ecological Operating System, the manifestation of collective activity and the calculation of social exchange are literally placed in the broader landscape. Eco-OS further develops the sensor model embedded in the Arch-OS system through the manufacture and distribution of networked environmental sensor devices. Intended as an enhancement of the Arch-OS system, Eco-OS provides a new networked architecture for internal and external environments. Networked and location aware data gathered from within an environment are transmitted within the system or to the Eco-OS server for processing. Eco-OS collects data from an environment through the network of ecoids and provides the public, artists, engineers and scientists with a real time model of the environment.

Ecoids

Ecoids: they are sensor devices (small pods) that can be distributed through an environment (work place, domestic, urban or rural). The sensors allow environmental data to be collected from the immediate vicinity. The sensors can be connected together through the formation of Wireless Sensor Networks (WNS) that enable the coverage of an extensive territory (several kilometres). Each ecoid has a unique id and its location within a network can be triangulated giving its exact location. Consequently locative content can be tailored to a specific geographical area. Ecoids can also be used to produce content by receiving instructions from Eco-OS. Distributed performance can then be orchestrated across a large territory through light displays or acoustic renditions.

Feeds

Of course in contemporary society the “homeless mind” finds a space to dwell in peer-to-peer and socially constituted systems such as Facebook, Bebo and Twitter. These digital networks bind together activities and relations within digital spaces to offer a context in which «we find community in networks, not groups» (Wellman, 2001, p. 227). Highly social, but totally unconnected to the landscape, digital networks operate at the extreme end of a secular and fluid

model of time and space. There is no universal time in cyberspace, only the streaming sense of presence as different people in the network update their status. The effect of these technologies is that time and space have slowly softened as media technologies have supported personal consumption across telecommunications networks. This softening is accelerating as people communicate more and more, and begin to appreciate the relativity of friends and colleagues personal time (Rheingold, 2002, p. 194). The projected amount of registered users for Twitter will be 18 million by the end of 2010 (Ostrow, 2009). The extraordinary rate of asynchronous postings is providing with subscribers to Twitter with a minute by minute update of life within their social network.

At the same "time" as social feeds are being posted and received, XML feeds from environmental monitors located in urban and rural landscapes also 'twitter' their change in temperature and chemical status. Pachube was launched in 2008 and is an open resource that «enables you to connect, tag and share real time sensor data from objects, devices, buildings and environments around the world» (Haque, 2008). Through this streaming information, social nodes on the network become mixed up with nodes from the landscape, re-establishing a connection to place.

Streaming updates provide us insights into the complexity of time and in turn the production of space. As feeds from people become accompanied by feeds from environments; air quality, CO2 levels, lighting conditions, noise levels all supporting a growing spatial and temporal consciousness that is expanding from a local to the global. With locative media it is possible to envisage the increase in the rate of feeds that we receive to a second by second, as we find ourselves moving from coordinate to coordinate past sensors in our social and geographical networks.

The social, spatial and temporal synthesis offered through locative media offers many characteristics of a time/space consciousness that is no longer split. A consciousness that situates the individual in a networked moment in which actual space can be superseded in value by the connection (social, temporal and geographical) to our friends and environments that we care about.

Transpositions

This paper draws attention to the series of transpositions; of event to data to code to behaviour to experience. As such these Operating Systems challenge the fallacy of ambiguity by concretising the abstract through experience —

less a "thingification" and more a shared manifestation. Data are the detritus of modern human existence; from the data shadow that trails our financial affairs to the server logs that trace online social interactions, we shed data like dry skin. The ambition for these projects is to put it to effective use by making data manifest and tangible. As an abstract and invisible material, their applications are at best dull and at worst terrifying, but with the reification of their metaphorical and haptic potential, they are powerful tools for transformation. The data collected by these Operating Systems generate a dynamic mirror image of our world, reflecting, in sharp contrast and high resolution, our biological, ecological and social activities with the reification of their metaphorical and haptic potential, they are powerful tools for transformation.

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