

Arch-OS v1.1 [Architecture Operating Systems], Software for Buildings

Mike Phillips and Chris Speed, representing the Arch-OS development team: (B. Aga, P. Anders, M. Beck, G. Bugmann, G. Grinsted, E Miranda, A. Montandon).

Arch-OS, 'Operating System' for 'Cybrid' architectures, has been developed to manifest the social, technological and environmental life of a building and provide artists, engineers and scientists with a unique environment for developing transdisciplinary research and production. Arch-OS, 'software for buildings', has been integrated into the fabric of the Head Quarters of the Institute of Digital Art and STAR (Science Technology Arts Research). Using embedded technologies to capture raw data Arch-OS fuses the physical and virtual into a new dynamic architecture. This License agreement discusses the development of Arch-OS, some technicalities and the implications of living with intelligent buildings.

Architecture, Cybrid, Intelligent, Operating-Systems, Software for Buildings, Tele-social, transdisciplinary.

Arch-OS v1.1:



fig1: Arch-OS boot screen.

Arch-OS.com.

Software License Agreement for Arch-OS (figure 1).

Single Building License.

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3. System Application.

Arch-OS is an 'Operating System' for 'Cybrid' architectures. Cybrids, a term coined by Peter Anders, are "native to the increasingly mixed reality in which we now live. They integrate physical and cyberspaces within new entities comprising elements both material and virtual. In so doing they marry the affordances of digital media – among them virtual reality, telepresence and on-line environments – with the grounding stability of matter. In cybrids physical and virtual domains become interdependent: actions in material and virtual spaces mutually affect one another." Arch-OS, 'software for buildings', has been developed to manifest the social, technological and environmental life of a building and provide artists, engineers and scientists with a unique environment for developing transdisciplinary research and production. Arch-OS has been integrated into the fabric of the University of Plymouth's Portland Square building, which houses the Head Quarters of the Institute of Digital Art and STAR (Science Technology Arts Research). It has also been commissioned for installation into the three new buildings of the Peninsula Medical School, distributed across the South West of England. The PMS is a unique 21st Century model for the education of medics in a diverse rural peninsula. Arch-OS extends the social and learning communities of these individual and distributed spaces by providing a dynamic networked collective public space.

4. Framework.

The Arch-OS provides a framework for 'tele-social navigation' in buildings that are far too complex to understand 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. The Arch-OS project was born out of the desire to explore and illustrate the complexity that defines contemporary buildings. One form of knowledge that the experience of architecture evokes is a social one; the influence of others activities upon our own, and a shared understanding of a space. Social Navigation, the study of social groups and their influence upon their own environments, provides a dynamic source of data, which transforms the architect's drawings, the brick, steel, glass and fiber-optic infrastructure into a living-breathing environment. Arch-OS provides users of buildings with a spatial and temporal consciousness, essentially re-programming human activity through a heightened social and architectural awareness.

The Arch-OS combines a rich mix of the physical and virtual into a new dynamic architecture. 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. This vibrant data is then manipulated and replayed through audio-visual projection systems and broadcast through streaming Internet and FM radio.

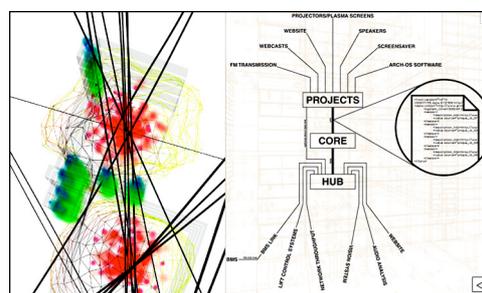


fig2: Arch-OS system diagram.

By making the invisible and temporal aspects of a building tangible (figure 2. Arch-OS system diagram) Arch-OS creates a rich and dynamic set of opportunities for research,

educational and cultural activities, as well as providing a unique and innovative work environment. The Arch-OS takes the notion of 'smart' architecture to a new level of sophistication. A Cybrid is a 'intelligent' entity, it interacts, responds and anticipates, and Arch-OS is its nervous system.

5. Systems.

There are **3** system levels to the Arch-OS building:

[A] Interface: the construction of the internal media networks and data collection devices. The interface (between the physical and the virtual) consists of a dedicated network that transports data from a range of sensors (intelligent cameras that monitor the 'flocking' of people, microphones to monitor ambient sounds, BMS information, network traffic data, lift location and movement) to the 'Core'.

[B] Core: the processing and manipulation of the dynamic data generated by the 'interface'. The Core computer systems incorporate a range of interactive multimedia applications (video and audio processors, neural networks, generative media, dynamic visualisation and simulation software) that generate a dynamic 3D sonic model of the building and its activities. This model allows artists, scientists and engineers to manipulate and control the buildings media output which can be broadcast within and between each structure, and out over the internet. The core enables the sensing and monitoring of social, spatial and technological interactions such as:

- the movement of people and spaces occupancy can be translated into metaphorical representations such as flocks of birds, and many forms of natural phenomena: clouds, waves, buildings being constructed, viruses forming and collapsing.
- Temperature can be read and again translated into images and forms, and particularly into lighting systems that modify colour and ambience.
- Exploring 'Lift Zoning', we are able to develop interesting programming techniques that will make the lifts more intelligent, able to learn user habits and needs and provide a far more intelligent service to the standard dumb lift.

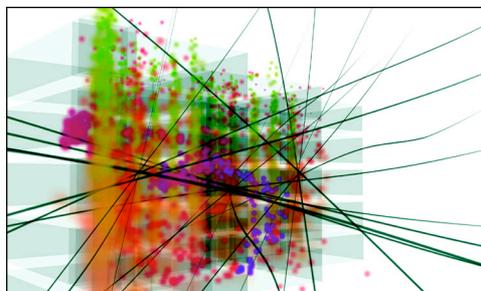


fig3: Arch-OS Core Model.

[C] Projects: the projects enabled by the Arch-OS system are the audio-visual manifestation of the dynamic data processed by the Core. The Projects component of Arch-OS are a curated ongoing programme of cultural events, musical performances, installations and exhibitions which take advantage of the unique digital opportunities presented by the building. The Institute of Digital Art and Technology (i-DAT) is housed in the centre block of the Portland Square development and will develop, exploit and curate the Arch-OS Core systems to display and disseminate digital works produced by transdisciplinary practitioners. Example projects under development for the Portland Square implementation of Arch-OS include:

A: Sloth-bots: The Sloth-bot (figure 4: Arch-OS Sloth-bot.project) develops the autonomous robotic technology previously incorporated in work such as Donald Rodney's 'Psalms'

autonomous wheel chair. These fully mobile robots are spatially aware and sensitive to interactions from passers by, and integrated into the atria furniture. 'Sloth-bots' are large architectural robotic constructions that move almost imperceptibly slowly. Equipped with sensors to keep them from blocking each other, people and sensitive areas, the sloth-bots creep around the atria area reconfiguring the architecture and responding to the flow of people and the movement of each other.



fig4: Arch-OS Sloth-bot.

B: Random Lift Button: Random Lift Buttons have been installed into the new Portland Square Building as a component of Arch-OS. The Random Lift Button project was conceived as an opportunity to exemplify further the role of space at the mercy of time. Certainly in large commercial buildings lifts are implemented to squash space and enable people to move more quickly from one work activity to the next. Lifts become a temporal slippage in the experience of a building as a whole; we skip space and avoid people, places and the opportunity to see the 'whole'. Indeed corridors and stairwells are recognised as important social spaces within businesses and many more negotiations and affairs occur between office spaces than within them. Just like in hypertext our choice of destination is provided to us with the minimum of 'journeying'. The Random Lift button is exactly what it suggests; a button to take you anywhere in a building, thus expanding the space and enabling you to visit spaces that otherwise the economic architectures of today would attempt to hide you from.

C: Generative Symphony: For the opening of the Portland Square development a generative symphony has been created using " created through the synthesis of human utterances. Hybrid voices are constructed by the system which wail and chant somewhere between the human and the simian. The symphony feeds of the data generated by the Core model and takes advantage of the 3 dimensional audio system installed in the building. This consists of a fifty-six speaker audio mixer that allows sounds to be panned within the three dimensions of the buildings atria to any specified location. When coupled to the vision system specific soundscapes can be 'attached' to individuals walking around the public spaces of the building.

Further planned commissions include:

- the modeling of the microscopic colonisers of our bodies, particulate airborne organisms and residents of our furnishings and appliances exist in great number and diversity,
- collaborations with Peter Fend and Ocean Earth,
- Art Science collaborations with the Eden Project...

12. Third Party Acknowledgements.

Portions of the Arch-OS Software utilise or include third party software and other copyrighted material. Acknowledgements, licensing terms and disclaimers for such material are contained in the "online" electronic documentation for the Arch-OS Software, and your use of such material is governed by their respective terms.

The Arch-OS project is managed by the Institute of Digital Art and Technology and produced by members of STAR and CNAS research groups based in the University of Plymouth. Arch-OS is produced in collaboration with the Architects and Engineers: Feilden Clegg Bradley Architects, Buro Happold, Nightingale Associates, Hoare Lea, DrMM (Derijke Marsh Morgan), Signwave/CASM.

Arch-OS: is a collective of individuals working from the School of Computing at the University of Plymouth. Mike Phillips (Director of i-DAT) and Chris Speed (Tele-Social navigation/Spaceman) are here representing the Arch-OS development team that consists of: Birgitte Aga (web mistress), P. Anders (cybrid architect), Martin Beck (Intelligent Systems/Genetic Data), G. Bugmann (Autonomous Robotics), George Grinsted (Sys Op), Eduardo Reck Miranda (Generative Audio), Adam Montandon (Data Architect). Previous collaborative projects include: 'Psalms' Autonomous Wheelchair for Donald Rodney, the STI Project (The Search for Terrestrial Intelligence), Arch-OS is managed by i-DAT. These projects and other work can be found on the i-DAT web site at: <http://www.i-dat.org>. i-DAT is a division of the School of Computing at the University of Plymouth. Email: mike.phillips@plymouth.ac.uk