Short article written in April 1997 for the "Architects' Journal" to seek synergy between IT and Building Technology.

Intelligent Buildings: Opportunities For The Integration of Architecture and Computing

Graham Clarke and Vic Callaghan
Department of Computer Science
University of Essex
Wivenhoe Park
Colchester CO3 3SQ
email: intelligent-buildings@essex.ac.uk
http://cswww.essex.ac.uk/intelligent-buildings

Architecture and Computing: a New Partnership?

This article is concerned with the integration of computing technology into architecture at a fundamental level. It is not concerned with the uses of computers within the design process which has developed rapidly and successfully over the past quarter of a century. What this is about is making a space for a dialogue between architects and computer scientists so that the potential of computer technologies can be properly integrated into the architectural design process and the finished building.

When we addressed some email to a number of sites, found by searching the World Wide Web with the keywords "architecture" and "computing", asking about recent architectural thinking on the use of computing within buildings, and the effects this might have on architecture, there were very few replies and none that pointed to any ongoing research and design involving both architects and computer scientists. The bulk of references received suggest that the only intelligent buildings research going on is in engineering and construction management departments and firms. This may be a false picture of the relationship between the two disciplines and if so we would welcome information to the contrary.

The End of the Machine Age?

The discipline that gave us the slogan "a house is a machine for living in" in the 1920's had, according to Reyner Banham in his book "The Well Tempered Environment", almost abandoned the design and integration of services by 1969, preferring to leave it up to service engineers. It is tempting to see the addition of computing technology to the home as little more than an extension of other services - electrical, plumbing, air-conditioning etc - but we want to argue that there is a difference between this new service and all the others. In the first place, with the exception of its ability to connect to outside broadcast or networked services, the use of computers and networks within the home opens up the possibility of an integrated approach to environmental control plus the ability to control the range of domestic and other appliances around the home. Naturally this needs to be thought through in an appropriate way before suitable designs will be forthcoming and accepted in the consumer and building services markets. There is little point in providing remote controls for the oven or the washing machine if the food and the washing still require human intervention to get them to the device, and the prospect of total robotisation, although possible, conjures images of the ultra-modern house of "Mon Oncle" which rapidly ensnares Jaques Tati in its dumb machinations. One of the few responses we got from our request for references to the integration of computing and architecture was an apocryphal story about a system that ran the whole house and managed to lock the owners out and otherwise abuse them. Sod's law applies to complex computer systems in spades so projects concerning integration of computers and architecture needs to be thought about carefully from all sides. The systems developed need to be flexible, intelligent, human-tolerant and fail-safe.

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There are already undoubtedly a number of instances of computers being used in houses and other buildings to great effect. The last few years have seen the worlds largest IT companies (e.g. Novell, Microsoft, IBM, Compaq, Sony) joining consortiums (e.g. The Consumer Electronics Bus, CEBus) or launching building network products (e.g. Novell Nest) specifically targeted at facilitating the connection of general household appliances. Thus, there are potentially large commercial forces targeting the intelligent buildings market with the aim of making such technology commonplace; wresting it away from what is currently the exclusive realm of the enthusiastic but amateur home automater. These new systems will include complicated environmental, building and appliance controls, integrated through the use of computers, which are in some part no doubt already familiar to architects. However, in general, they are not familiar to Computer Scientists and it would be of great value and use to be able to study these buildings, and the uses of computing they entail, as part of the process of developing sound strategies in the approach to the problem of integrating the computer into buildings. It may just be a matter of leaving sufficient duct-space to run network cables around the home in a relatively simple and easy way but we doubt it.

A Wired Society?

Naturally enough these consideration spill over into the wider consideration of how media and other services are to be provided on a global basis. Whether we are talking about using emerging technologies such as Internet, Cable & iTV (interactive TV), RF based cellular GSM (global system for mobiles) and LEO (low earth orbital) satellites, as proposed by the likes of Microsoft's CEO, Bill Gates, this will not be decided by the outcome of our considerations here and it may be necessary to treat each building as if it could be connected reliably to a widely used global network.

One main purpose and benefit of a much closer integration of architecture and computing is to enable otherwise housebound and perhaps lonely people to communicate through email, tele-conferencing and other means using the same networks that might also enable them to remotely control their central heating etc. How much this will have to do with architects will depend upon the degree to which architects think it is worth their while getting themselves involved with what might look like a peripheral issue (no pun intended). What effect will these new possibilities for integrating architecture and computing bring? The answer to this is still open which is why it is important to start a dialogue now whilst the current renaissance of intelligent-building work emanating from the IT industry is still in its infancy. The answer you give will probably range from "None" to the more futuristic hope that every room might become a "holosuite".

It seems to us that the environment in which the citizen of the future might be living and working will be more than just a room with a PC or similar in it. It might get left to the manufacturers of this equipment to recommend or impose the layout of the workstation, or whatever the device will be called that integrates the functions currently carried out by television, radio, video recorder, telephone, CD player and personal computer but that doesn't mean that there will have been any adequate research or design put into this area. The ergonomics of the unit, the seating, lighting, spatial containment of the unit are all going to be worthy of some considerable design effort. Many of us already work for long hours with our computers in badly lit, badly designed rooms. There is legislation to try and make all this better but without a serious design effort one of the main consequences of this unplanned move to the dominance of computer based communications will be poor eyesight, bad backs and frayed nerves.

New Opportunities for a Caring Society?

For the person who is remote from their home for some part of the day, or for a longer period, the linking of the house to a network would allow the tenant/owner to minimise the likelihood of its being burgled by allowing them to monitor the house, or remotely control some of the services, to give the appearance that the house is occupied. The level of this control is also a matter for

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serious discussion. Do we want or need to be able to control each curtain or each light individually? If so why, if not why not? And so on through the house. What is the purpose of this remote control going to be and is it going to be worth it for anyone?

At every level of the problem there is a need for some searching questions to be asked that are relevant to both architects and computer scientists. These systems can be left to grow under pressure from enthusiasts and manufacturers but the chances are that they will fail to live up to the obvious promise that a closer link between architecture and computing might bring. Above all these systems need to be designed and placed into buildings that have been designed to incorporate them.

Another possibility is that the provision of local networks will allow a greater degree of both co-operation and autonomy to small communities. For instance, using networked (and movable) surveillance cameras "Crime and Vandal Watch" chores could be made more effective and shared by the whole community. Also, and perhaps more importantly, such technology could enable community members to keep in contact with each other, perhaps providing a focus for what might, almost paradoxically, become the foundations of a renewed set of possibilities for local democracy. The ability of this technology to enable local co-operation and communication that is currently threatened by the globalisation of manufacturing and supply and the increasing influence of globalised media empires could produce some remarkable changes in the ways in which people connect with their communities in an active way.

Last but not least the careful co-ordination of architecture and computing could enable people who would otherwise be removed from their home and community (eg the elderly) to stay in contact and be relatively autonomous with the intelligent help they might be able to get from computer systems designed to provide help and support of an appropriate kind in a sympathetically designed setting.

A Call for Co-operation.

We in the Department of Computer Science at the University of Essex who are engaged in research into intelligent buildings would welcome dialogue and co-operation from architects whose experience and interests would complement our own synergistically. For our own part we have a number of research projects which are looking at topics ranging from the basic intelligent building technology (e.g. the underlying networks building sensors and actuators, software & electronics for intelligent & autonomous control, user and management interfaces) through to technology for end user applications (e.g. environmental control, personal & building security, care of the elderly, community support). One example of our work (currently being commercialised) is a gadget (about the size of a pound of butter) that enables the Internet to be extended beyond being simply a means of interconnecting computers, allowing it to connect and control building services such as alarms, access, heating and surveillance systems (with control capable of being exercised from any authorised Internet connection anywhere in the world!).

We are at the beginning of an era in which the integration of computers and architecture is going to come about anyway. The wired society is at hand and we would like to be ready for that rather than be driven by commercial forces in an uncoordinated way.