

# Design of Ambient Intelligence

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## Abstract

*Ambient Intelligence is a new paradigm for the design of hybrid spaces. The expansion of physical environments for work and living into the non-physical realms leads to hybrid spaces and environments for work and living. To create a pleasing and supportive environment for the individual as well as the various ways of human groupings and eventually societies ambient intelligence is introduced. This contribution will centre around the development of an understanding of new process and space design concepts for hybrid spaces loaded with and enlivened through ambient intelligence.*

## 1. Ubiquitous Computing

Computer science has developed the notion of ubiquitous computing to describe environments in which it would be possible to have unobtrusive and calm access to any source of information at any place at any point in time by any person. Ubiquitous computing [1], is a computer and subsequently a space paradigm which is now emerging. The 'disappearing' computer technology becomes virtually invisible although omnipresent in our lives. Instead of having personalised computer devices, the technologies we use will be embedded everywhere in our environments. These worlds can be conceived as huge distributed networks themselves consisting of thousands of interconnected embedded systems that surround users and satisfy some of their needs for information, communication, navigation, and entertainment. Computing technology is embedded everywhere into the built environments, clothes of persons and eventually even the people themselves in such a way as to be unobtrusive.

## 2. Towards Hybrid Spaces

Space concepts for the physical have been developed ever since mankind started to build shelter. Space concepts for the non-physical of the digital started when the first computers were built. It emerged as topic of vivid interest when computational hard- and software performance allowed more advanced computational process and space concepts. This led to virtual space simulations of first a static nature and later on even to virtual spaces in motion. The hybrid space concept now transgresses the boundaries of the physical towards the non-physical realms resulting in a combination and eventually fusion (in various degrees) of the physical and the non-physical into new open territories which still need to be defined and designed.

### 2.1 Physical Spaces

Architecture as a profession used to deal with the creation of man made spaces in the form of buildings and spaces of a material built substance. Built artefacts and spaces of a material presence endure over a certain period of time a relative

permanence in space and time. Architecture as built artefacts of various scales then arises as a vivid and strong manifestation of human cultures within the physical realm. These traditional architectural spaces and surroundings still and will provide shelter and enclosure, giving space for inhabitation including cultures and various use scenarios. These spaces we call physical spaces incorporated within the physical realm.

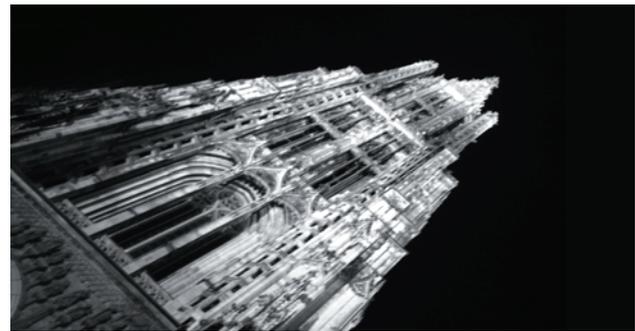


Figure 1: The physical as space of building and culture

### 2.2 Non-Physical Spaces

The non-physical distinguishes from the physical not as an opposition but only as something which differs from the physical in its parameters. These other spaces span the realm of the immaterial, the digital, the media, the cyberspace, the information and the knowledge territories. There qualities differ from the physical in that respect as their nature is dynamic. Their state is one of being in flux. Instead of a relative persistence these spaces are in general of a short persistence and life span due to frequent computer hard and software changes. Their building substance is neither stone, brick, mortar, concrete nor glass nor but immateriality. What started as a simple binary code transporting simple commands and simple messages is on the way to develop into complex four dimensional formations of information combined with spaces resulting in information scenarios and spaces. These spaces we name the non-physical spaces located within the non-physical realm.

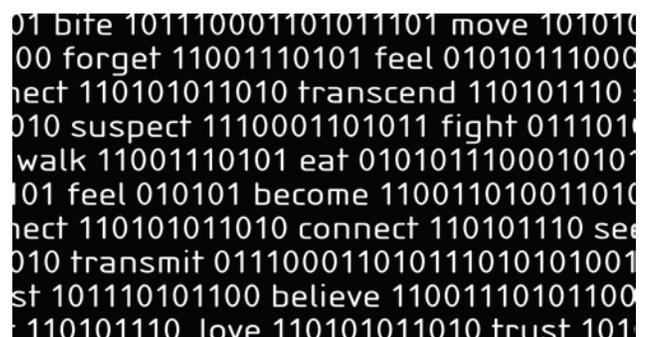


Figure 2: The non-physical as space of digital binary information

## 2.3 Hybrid Spaces

On these two kind of spaces – the physical and the non-physical - which can be looked at as a basis a third is newly build. These kind of spaces combining the physical with the non-physical we call hybrid. This path towards a possible feasible combination takes place in a direction towards fusion and merge. The result are spaces where clear boundaries between spaces and processes within these spaces increasingly blur as spaces and processes in the physical merge with spaces and processes in the non-physical. As a result we approach hybrid environments which consist of hybrid spaces in which hybrid work and living activities and processes take place. We set out to crossbreed physical space and its parameters with non-physical space and its parameters and technology with space. As in most cases hybrids are the result of human intervention so it is in our case. The result we call hybrid. In this sense we want to achieve an environment designed to incorporate specific desired traits through a hybridisation process. In this way we want to customise spaces for desired purposes. As a result physical environments find their extension in the non-physical environments of the digital world. In combination the physical and the non-physical environments lead to new hybrid spaces and environments.



Figure 3: Towards hybrid spaces – towards new territories

## 3. Ambient Intelligence

Following our approach to hybrid spaces we want to introduce ambient intelligence as a positive merger between space, technology and people within space. We look at hybrid spaces as a combination of physical space with non-physical space enabled through digital technology as in itself a neutral concept which can be developed in positive or in negative directions. As we are interested to shape our present and future surroundings in a positive manner we focus on space / technology configurations which support human ways of living. This positive interpretation of a hybrid scenario we call the concept of ambient intelligence. Ambient intelligence incorporates in itself the two trends of 'ubiquitous computing' and 'social user interfaces'. In this vision of an ambient intelligence' people will be surrounded by intelligent and intuitive interfaces embedded in everyday objects at numerous places around us. These environments will recognise and respond to the presence of individuals in an invisible way. Intelligence then refers to the fact that the digital surrounding is able to analyse context, adapt itself to the people that live in it, learn from their behaviour and eventually recognise as well as show emotion. This kind of awareness refers to the ability of the systems to locate and recognise objects and people, and their intentions. In this state we can talk of ambient intelligence as (almost) a being in itself which reacts to its inhabitants in the first place but in a second step (almost) acts in itself. The challenge of really adding ambient intelligence to hybrid environments lies in the way how the embedded systems learn and keep up to date with the needs of the user by themselves.

Because making a key able to compute and communicate does not make it intelligent just like that.

## 3.1 Interactions with Ambient Intelligence

Interactions between people and the ambient intelligence has to be a calm and unobtrusive not threatening but supportive scenario. Location positioning systems for example can enable smart mobile and ubiquitous computing support. But what allows an enhanced support in a development towards more sophisticated human hybrid work and living activities can also be a threat for human privacy and integrity. The personalized tracking of movements and activities allows profiles which in a positive scenario can be used for the optimization of technological support for human activities. In a negative scenario we might fear the system(s) trying to take over control much like HAL in Stanley Kubrick's film '2001. A Space Odyssey' (1968). This has to be avoided through technological and social rules and regulations which will not be easy to define and even more difficult to secure. Data abuse in this context is a violation which needs to be considered very seriously.

## 4. Implications for Hyperrealities in Hybrid Spaces

In opposite to Jean Baudrillard's [2] definition of 'hyperreality' where the physical reality is substituted by the virtual to create a hyperreality, we think of coming new hyperrealities as a mixture of physical and non-physical scenarios and events where the presence of things and events have counterparts in the physical and non-physical realm. These hyperrealities in hybrid spaces then are kind of new scenarios with partitions in the physical linked to or referred to partitions in the non-physical. Both spheres eventually will influence each other in complex interaction patterns. In these scenarios the transitional spaces and transitional states of being then become new territories to explore. These are the territories in which James G. Ballard [3] and Philip K. Dick [4] showed interest. Both authors wrote about constitutions of hybrid worlds where people try to explore the unknown frontiers towards these new realms. Ambient intelligence shall support access to hyperrealities and enable people to manifest their personalities in these fused hybrid spaces. The shortening of the distance between imagination and reality and the fusion between fiction and fact will then create the possibilities of visions where a fusion of external and internal mental worlds can result in entirely new scenarios. Having installed ambient intelligence in hybrid spaces we will encounter the shifting of perception and experiences for people incorporated within these hybrid systems. With our bodily presence and standpoint we will persist in the physical but our visual and audio perceptions as well as our imagined spaces can expand into other realms. We see ambient intelligence provoking a complex fusion of physical and non-physical spaces to hybrids. These hybrids are enabled through technology. Social rules and ways of conduct have to be expanded and adapted to this new set of spaces and technologies to create pleasing hyperrealities.

## Images

[1] [2] [3] *Michael Willadt, imagination(s)ma(s)chine international with Marcus Merz, m.adverts*

## References

- [1] Weiser, Mark. *Ubiquitous Computing*. <http://www.ubiq.com/hypertext/weiser/UbiHome.html>
- [2] Baudrillard, Jean. *Simulacra and Simulations*, 1988.
- [3] Ballard, James G. *Vermilion sands*. 1971.
- [4] Dick, Philip K. *The Three Stigmata of Palmer Eldritch*. 1964.