Intelligent environments

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We have argued that the broad field of intelligent environments comprising networked devices, sensors and activators can be classified in terms of both configuration and control and that whether this is carried out by machine processes or persons is a significant characteristic (see diagram).

Where a person is able to both configure and control the ensemble of networks and devices that constitute the intelligent environment then we would anticipate least resistance and greatest satisfaction in general from people with the caveat that these processes are simple to carry out and effective at delivering the required functionality.

Where a machine process or set of machine processes are dynamically both configuring and controlling the ensemble of networks and devices that constitute an intelligent environment we would anticipate the most resistance and the least satisfaction from people with the caveat that these processes where they are functionally effective and unobtrusive may well be acceptable e.g. some form of automation.

However it is very easy to imagine a situation in which the latter scenario is quite acceptable and indeed welcome to the persons occupying the environment. If we imagine a space laboratory or space ship where the task and the functionality of the vehicle are robustly programmed to deliver clear air, light etc and they have been optimised to be as energy efficient as possible without losing the sort of responsiveness that the people need e.g. when you enter a darkened area the lights go on, then the crew's satisfaction with this environment is likely to be high if only because there is a higher purpose that outranks personal satisfaction and is vital to the communal achievement of the goal – flying to Mars, experimenting in zero gravity, observing the universe. Under these circumstances and with a dangerous mission to carry out the crew would willingly accept tagging and body monitoring so that their whereabouts and wellbeing, the state of their bodies and their emotions, could be monitored as a matter of safety for themselves and their cohort.

It has been argued that such manifest invasions of privacy for some would be strongly resisted if such systems were developed for less dangerous terrestrial projects but it is not clear that this is so depending upon the context. A nuclear or biological facility might even require that such monitoring is essential to the safety of the installation. There may be differences in expectations regarding privacy in different countries, cultures, communities etc that means that the development of these systems is likely to be uneven. But as with other social innovation the development of successful systems that involve tagging and or body monitoring may lead to this approach becoming far more acceptable than it is now in the west.

If we return to the initial scenario where configuration and control is in the hands of the people using the environment this may make the use of tagging and or body monitoring more acceptable. At the same tie it opens up the whole problem of social co-operation that is currently very poorly researched or represented in the intelligent environment research world. How do two, three, five, seven, eleven etc people all

agree on the configuration and control strategies of their shared environment and more importantly how do they ever work together to achieve them?

This of course raises the problem of the acceptability of any device and its use within and intelligent environment since all bought in devices will have been both configured and have control features that have been developed by someone other than the occupants of the intelligent environment. The whole problem of HCI is reproduced her where the device may fulfil a wide variety of functions and may itself contain a computer or computers. It is possible to imagine that all devices in the future will have software-based interfaces that allow you to configure and control them yourself in a style that most suits you but the question of standardisation and compatibility will be huge. If this were to happen this might allow a relatively seamless move into a world where individual devices and their functionalities could be combined with other devices to produce new functionality under user control.

An alternative view that sees artefacts as enabling the creativity of the person occupying the environment to flourish which might work synergetically with devices with soft interfaces. A picture frame which allows you to send pictures to your loved ones when you are away from home say. Here the focus is on enhancing and allowing to develop the autonomy of the individual and their hopes and desires, memories and wishes. These artefacts are not controlled by the user in any detail it is their functionality which is regarded as beneficial. This again raises the problem of the social context since it is very difficult to see how a device directed towards enhancing an individual's creativity can be made to enhance all of the individual's creativity except in the simple way in which a personal computer say might be used by a number of different people serially in completely different ways.

In the diagram of the way we have been thinking about the relationship between different approaches to using technology to develop intelligent environments we suggest that configuration and control are the two axes and that machine or personal control of each provides a space within which to discuss these matters. Automation hasn't previously been included within this diagram but it can fit into this space and depending upon the system does allow for a degree of user control. So automation probably sits somewhere near the centre of this space with some degree of user control of functionality but probably not much control of configuration.

There are specific and detailed objections to A.I aspects of intelligent environments based upon a variety of assumptions in many cases taken over from unsolved problems within A.I.

Similarly the whole question of what is an environment, how do environments relate one to another, how do they interact and to what extent are they part of complex social processes that can engender the deepest feelings. One has only to think of the disputes that can arise between neighbours, or within the household between family members about who controls or owns or has priority over what space, place, parameter or device etc to see that we are only scratching the surface so far.

At the level of personal autonomy within British society at this time there is at least some evidence that people are wary of ceding too much information and control to others in matters they consider to be their own private business e.g. the response

against I.D. cards. In general as far as I can judge people want to be in charge of their own environments – with all the complexities that entails – so it would be sensible to try to make intelligent environments support that situation.

This would suggest that systems that support intelligent environments only act to fulfil conditions chosen by the user of the environment. If the temperature of the environment varies significantly from the thermostat then the system should restore the temperature chosen etc. This would suggest that the system should never take the initiative and change some settings however good its grounds for so doing based in past experience because it undermines the users belief that they are in charge. If the apparent autonomy of the people using the system is undermined by the system taking independent action this is likely to lead to frustration in the person and a non-acceptance of any such system.

