Ambient Intelligence, The iDorm and Social Care

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The concept of ambient intelligence refers to a world in which people are surrounded and empowered with networked digital technologies that are sensitive and responsive to their needs. In practical terms this means creating a domestic environment composed of appliances containing "hidden" computers, which connect to other similar appliances. Users are empowered, as they can design the functionality of the environment by managing how these devices coordinate their actions. This new functionality is different to that offered by any separate appliance as relates to collective "social" actions that are not possible from individual appliances, and even not envisaged by the original appliance manufacturer. These spaces are called intelligent environments and open up new and creative possibilities for supporting the lives of ordinary people in their homes, particularly those people in need of home care services..

The world's ageing population poses challenges to society in terms of funding the cost of the care that will be needed. For instance, it is predicted that the number of people aged 60 years or older in the world will rise to over 20% by 2050 which will have serious consequences to the future development of the human society. In some countries, such as the UK, with a greater proportion of older people this problem will be even more acute. In addition, there are predictions that an increasing proportion of the population will be living alone. As a consequence of these trends, the task of providing care will fall to a diminishing pool of people, with an increasing financial burden on the people of working age. Fortunately new technology has the potential to counter this problem, by harnessing advances in ambient intelligence and intelligent environments.

An intelligent environment is a space that people live in (eg room, a house etc) in which all the services (eg heat, light, communication, entertainment, security etc) is managed, intelligently, by computers so as to support the occupants in their daily activities". These environments vary in complexity being in their most simple form just a collection of automated systems or in their more complex form "intelligent" systems that can be taught by the user, or even learn for themselves, how best to serve the occupant's needs..

The Intelligent Inhabited Environments Group (IIEG) at the University of Essex (http://iieg.essex.ac.uk) are exploring new ways to apply the notion of ambient intelligence to care services. We have built what we term the intelligent dormitory (iDorm - see Figure 1). This is a real pervasive computing testbed comprised of a large number of embedded sensors, actuators, processors and networks in the form of a small self-contained room containing areas for different activities such as sleeping, communicating (writing or video conferencing with remote family and friends) and entertaining (watching TV, listening to music etc). All the appliances have tiny computers in them, with network connections; even the fridges, chairs, tables and beds have computers and sensors fitted. The aim, is not to use these sensors to "spy" on occupants (in fact privacy, security and safety for the individual are the highest priority) but rather to sense and effect their world in a way that would resemble the actions of a caring companion sharing the room with them. Videos of the iDorm in use are available on our web-site http://iieg.essex.ac.uk

Fig. 1 - The iDorm

With the success of the iDorm, Essex University is constructing a more realistic test-bed for exploring care applications of ambient intelligence in the home. The new facility takes the form of a domestic apartment and has tentatively been called the iFlat. The flat has been built from the ground up to be an experimental ambient intelligence environment with many special structural features such as hollow internal wall to contain sensors and processors etc. All the basic services are electrically controlled (eg heating, water doors etc). The basic layout of the flat is shown in figure 2, together with a picture of its current state of build (it is due to be complete and handed over for the 1st Oct 04).
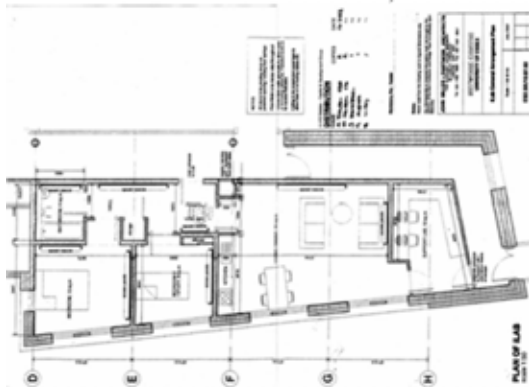

Figure2. The iFlat

One of our projects involves the use of what we term an intelligent-agent; an entity that can learn about the "normal" habitual behaviour of a person and later detect deviations from that "norm". We aim to characterise the behavioural changes associated with the onset illness or physical disability such as Alzheimer or dementia there are changes to the persons habitual behaviours. These vary from changes to sleep/wake rhythms to omitting steps in daily routines. In our research we are looking at ways of constructing intelligent agents that can both detect the early signs of the onset of these conditions by finding smaller, more subtle, changes in behaviour and trends in behaviour change, at an earlier stage together with providing a means of supporting people so as to extend the time they may live independently in their own home.. For example, as the agent learns what a person normally does, it could command the house to do this at the appropriate time (eg lock the doors and windows, switch off unattended appliances etc when the person is in bed), as though the intelligent-agent was a loving companion, caring for the person in the house (another branch of our work is agents that react to emotions!).