4rd Report, Innovative Interfaces

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1 Some Computer Science Issues in Ubiquitous Computing

1.1 Context & Summary

This paper from 1993 [4] is the first to use 'ubiquitous computing' in the title, the concept proposes to integrate computers into our day-to-day environments, so that computational power may follow us where we go, and be present in virtually any type of everyday object. A requirement is that components are networked, and have the necessary knowledge, or communication means, to respond to the intents of an individual. For example, a person may indicate his presence to nearby units by use of a mobile computer. This could activate a personal computing environment at an arbitrary office or location, or a friend's stereo may be conveniently enabled to play ones favorite music. Ubiquitous originated at PARC research in 1988, the concept was defined and the term coined by their chief scientist Mark Weiser in an earlier publication [3]. The concept emerged because of a number of trends in computers, they were becoming smaller, cheaper, faster and more networked. All of the above points to the idea that computers may one day hardly cost anything and can be integrated into everything.

1.2 Evaluation

The paper mainly considers the technical challenges of ubiquitous computing, which are related to the characteristics of the time. The main ones are low power, wireless bandwidth and wireless protocols for mobile devices. These were limiting factors before but don't need to be considered such an issue today since they have also been subject to a sufficient improvement to mitigate these concerns. Possibly only for very rich data one would need to limit those type of applications to devices that have external power or can be rechargeable. Issues that are still relevant today are interaction paradigms, privacy concerns and new types of interaction media. Today the most prevalent form of ubiquitous computing are our mobile handsets (they have about the same capabilities as our desktops 5 years ago). Their use and applications serve to illustrate many of these issues and their evolving approaches, for example in location aware services, enhanced social networking and in a myriad of other sensor capabilities (e.g. video, audio, gyroscopes and accelerometers). The discussions on how this may change society are many, an observation is that that the state os technology has much more wider utilisation than currently embraced.

2 Sentient Computing

2.1 Context & Summary

Sentient computing [1] refers to the ability of a computer to be aware of, by sensing it's environment. The background reasoning is that in order to bridge the 'gulf of execution', computer's need to be brought closer to the human's level of thinking and perception, since human's base their decisions on sensing the environment, so should computers. The governing example through the text are that of the 'Active Badge', a mobile sensing device that will tell a central computing system the location of its wearer, or that of a mobile object. Computers are thus 'aware' of, say, every employee in an office building, and can now respond and transfer this information in various ways. Each employees can monitor the whereabouts of everyone else (if there is a density in a room it might be an important meeting), computer stations can load one's personal files on entering the room and the room itself may respond environmentally (Alex prefers to work at 20C, *etc*).

2.2 Evaluation

The paper is an invitational lecture by one of the originators of the Active Badge system [5]. The start of the paper explains and promotes the concept of sentient computing, which seems to have the potential to become a new term in computer science. The paper however is preventing this from happening, for a couple of reasons. First, it is difficult to distinguish concept from application. There is too much emphasis on the Active Badge application, which may event have unduly created the association of the term 'sentient' to mean a system of surveillance. It's also not exactly clear how 'sentient' computing is different from 'ubiquitous' computing. It would have been an advantage if explicit distinctions had been made, as it is the comprehension of the two terms overlap, for example the Active Badge application had already been associated with the term ubiquitous [3]. In short though, sentient computing can be interpreted as a computer's ability to sense and be aware of the environment, and ubiquitous computing lays emphasis on pervasiveness of computing, particularly the integration of computer's with ordinary objects, say garage doors or washing machines. However, for everyday objects to be useful they require sensor information. Sentient computing can therefore be considered a subset of ubiquitous computing, and the term 'sentient' unfortunately isn't such a useful concept in its isolation.

3 Building Disappearing Computers

3.1 Context & Summary

This paper [2] on disappearing computer give the ideas of ubiquitous computing a modern context, it explores three different experimental environments where computers and screens are embedded into our living and working spaces. Two of the environments are office type rooms where computers are embedded into tables, chairs, walls (large displays) and are carried as personal devices. The emphasis is collaboration, and different technologies have been provided for sharing and working together. For example, the use of gesture based interaction, and some flavour of sentient computing. In one system a display can change and load the personal environment depending on the operator. Some common challenges are drawn from across all of the environments, mainly concerned with consolidating different systems that exhibit dynamic and changing presence, and also considering new interaction techniques that may be more suitable. Since computers should now be everywhere, we shouldn't be confined to a location-dependent keyboard and mouse.

3.2 Evaluation

The paper highlights some pretty obvious problems ubiquitous and co-operative environments, but would have been nice to explore specific solutions. One of the main arguments are that computers are pushed subtly into the background environment, but this is obviously not true as the screens look massive and imposing. This observation is at ends with the title of the paper, which implies that computer are disappearing. The problem is independent of the sizes of our computers because we are considering the output mechanism. The type of approach implies that we should turn the very physicality of our spaces into interactive assemblies, but if pervasiveness is a priority, this is an infeasible approach. Additionally large screens do not have the option to be personal, so everyone must necessarily see what one person is getting upto. I think a more future directed approach would be to utilise individual screens while maintaining the co-operative functions and environmental responsivenes. For example in a hypothetical situation one could use fiducials on the tabletop together with an augmented view for each participant. This would create a co-operative virtual environment, and permit the continued use of individual keyboard and mouse. A different problem all-together is the expected usefulness of such collaborative environments. Is a virtual interaction more productive compared to a conversation? And if so, which specific types of problems are the ones that do have a production advantage in these types of systems?

References

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