Adaptive Systems for Ubiquitous Computing

Ubiquitous computing offers a vision of computing systems which are embedded in the fabric of everyday life, providing us with seamless access to information and communications regardless of our location. However, if people are able to interact with any ubiquitous computing environment they visit, we must allow the owners of the local resources to manage their usage according to their security, resource allocation or charging policies. This problem is even more complex if resources are offered on a commercial basis as services, must rapidly accommodate changing business transaction patterns and value chains. Ubiquitous computing environments therefore must respond dynamically to a combination of user needs, the policies of resource owners and service providers, the current usage context and the capabilities of available services and resources. This will require a high level of adaptivity in the collective behaviour exhibited by ubiquitous computing systems and the networks that connect them. This workshop brings together research into a range of issues related to providing such adaptivity for ubiquitous computing environments.

One of the major challenges facing such adaptive systems is maintaining communications between the many ubiquitous computing elements as users roam between different spaces which are supported by different wireless communications providers using various wireless technologies. There is a wide and growing range of wireless technologies available, with quite different approaches taken in the licensed and unlicensed bands at present. O'Connor and van der Meer discuss the commercial challenges faced in trying to marry these different approaches into a seamless but still profitable wireless data communications service. Murray et al examine using policy-based management to automate the continuous multi-network admission control and network selection decision-making needed for such seamless communications.

Mobile devices must be able to configure themselves to changing patterns of inter-connectivity resulting from their movement and varying wireless signal strength. This requires the adaptive configuration both of ad hoc networks of devices and of ad hoc compositions of services operating over those networks. O'Grady et al discusses the IP address assignment and routing problem of ad hoc networks. For adaptive ad hoc services, Dobson argues that compositions of fine grained services will provide better adaptivity than monolithic applications. Such a service-oriented approach requires dynamic service discovery as described by O'Grady et al. It also requires automated composition of services, though here several approaches are possible, such as the task-driven approach described in Higel et al and the context-driven approach of Nixon et al. To be effective from the user's point of view, adaptive service behaviour must be influenced by the user's intent and the current context in which the user's actions are conducted. Higel et al and Greene and Finnegan examine various approaches to aiding the use of ubiquitous computing systems using multiple-modes of interaction. Greene and Finnegan also examine the extraction of context information from a user's application usage, while Power addresses how the multiple source of context information can be integrated and Nixon et al propose a runtime mechanism for dynamic context information flow.

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