Some Computer Science Issues in Ubiquitous Computing

Submitted by Ravi Prakash Giri (rgiri8)

This paper investigates the concept of Ubiquitous Computing and explains the design challenges that researchers are facing in this field. The author then describes the essence of ubiquitous device such as `tabs`, `pads`, and `boards` which will eventually blend themselves into our daily life to the point where we will not realize they are at our disposal. The author had predicted the scenario almost two decades ago in which we are now. We not only have pads and tabs today but also `smartphones` which is an extreme example of ubiquitous computing and demonstrates the vanishing of traditional computer box. According to the author, the goal of ubiquitous computing is thus to get computing devices woven into our environments to such an extent that they become invisible or unnoticeable, and we interact with them without being aware that we are using computers. The essence of Weiser's vision was the creation of environments saturated with computing and communication capability, yet gracefully integrated with human users.

The issues described in the paper is quite similar to what is present even today after decades of presentation of that paper. The author presents three categories of interaction in ubiquitous computing: `natural interfaces` that support richer variety of communication capabilities, `context aware applications` and `automated capture and access`. On the other hand, the issues presented in the paper when articulated, this vision was too far ahead of its time – the hardware technology needed to achieve it simply did not exist at that time. The technology for ubiquitous computing requires: Cheap and low power convenient displays, Software for ubiquitous application and Network that ties them together. Unsurprisingly, the implementations attempted by Weiser and his colleagues at XEROX fell short as most of these were not available. Besides the Hardware and Network issues, Privacy of the data in Ubiquitous Computing was another problem. Although Mark Weiser was not successful enough to make it possible at that time, he correctly identified the obstacles to the development of the Ubiquitous Computing. He explained that the following requirements must be met when designing the ubiquitous computing systems: Mobility, Entity Authentication, Corresponding Entity Authentication Data Outgoing Authentication, Connection/Non-connection Confidentiality.

After decade of development in hardware technology and other elements that were exotic in 1990s, today we are better and equipped to make his vision viable. In fact research are going on in both academia as well as in industries. For Ex. Project Aura at CMU, Endeavour at UC Berkeley and Oxygen at MIT. In industries also at AT&T Research in Cambridge, U.K. and at the IBM TJ Watson Research Center. These projects addresses different issues of ubiquitous Computing. In my view, The point of minimizing attention devoted to human machine interaction is valid since the goal of ubiquitous computing is

to make computers unperceivable. Individuals will be more aware of people on the other ends of their computer links as computers are in the background. Weiser believed that ubiquitous computing will gradually emerge as a dominant mode of computer access over the next 20 years. With Ubiquitous computing people are not going to get something new but everything will be faster and easier to do.