Ubiquitous Computing

An overview of and examination in relation to Industrial Design

David Bingham • ID 6201 • Georgia Institute of Technology • February 4, 2005

Electronic computerization is possibly human-kind's most rapidly progressing invention. Since the first mainframe machines of the 1940s, computers have become exponentially faster and more affordable, but also much more closely associated with people's everyday lives. This increase in abundance and availability is changing the relationship between people and computers from exotic to commonplace. While huge mainframe machines were strictly the domain of governments and large research organizations, the second generation of computing has become much more personal and widely available. This trend toward evermore personal and abundant computing is continuing into a third generation, known as ubiquitous computing.

First Generation

To follow this trend forward, it helps to look back to how people and computers have related through the earlier generations. Mainframe-type machines are large, very expensive, and require a high degree of maintenance. Their complex use and sophistication means they are used for only specialized tasks that require massive processing power. The earliest programmers and scientists would set up their calculations and bring that work to the machine in the form of punch cards. The program would be executed by the mainframe, sometimes taking days to complete, then the next user's program would be loaded. This first generation is defined primarily by a single, very powerful computer being shared by many users.

Second Generation

By the 1970's, computer cost had reached a level that was affordable to people outside large organizations. Computers became more of a consumer good with smaller sizes and comparable power to earlier mainframes. By 1984, the number of people using personal computers surpassed the number of people using shared computers, pushing the ratio towards one machine to one user. Moving closer to the present, many people have multiple computers at home or work.

While the physical abundance of computers is moving toward ubiquity, the dynamic of second generation computing is more comparable to owning multiple automobiles, or a company car. In both cases, the hardware is relatively expensive and the user can only be fully engaged with a single machine at any time. A user's machine-life is separated from the rest of their life.

Third Generation

The ultimate goal of ubiquitous computing is to transform people's interaction with technology into something completely transparent. It is the belief that the most profound technologies are those that become embedded in people's lives, such as electricity, light, and the printed word. Ubiquitous computing builds on the trend of increasing computer abundance and power, decreasing cost and size, and adds discreet assistance to people's daily lives. The use of such systems removes the direct engagement of personal computing and pushes the machine toward the periphery of the task at hand. The third generation relationship between people and computers evolves into a single user seamlessly interacting with many machines.

These many machines will be the evolution of the products people use today. Programed intelligence and network communication could be added to any product at an extremely low cost. An industrial designer attuned to the possibilities of ubiquitous computing is in a unique position to create tremendously successful products. Without the computing and electronics constraints of the previous generations, design will determine product quality through user need and task based methodologies. For ubiquitous computing to truly become transparent, the machine's form must integrate into its environment and perform its function without the direct engagement of today's personal computers. Engineering advances in power management, heat dissipation, and miniaturization will allow computers to be designed into any physical form. Interfaces will need to be created that break away from the typical screen, keyboard and mouse and allow more casual humanistic interaction. Computer science will help these new machines gain a level of self sufficiency, communication, self repair, and learn and mature through their life span.

Automobiles already embody many of these advancements in computing. The driver of a car is surrounded by a cockpit of instrumentation that works both in the active and periphery of communication. Computerization transparently monitoring tire pressure, suspension adjustments, safety features, engine timing, and just about everything else a computer can be responsible for, to allow the driver to focus on the task at hand.

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