

What's Next In Pervasive Computing?

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Extended Abstract

We are moving towards a world in which most physical objects (people, animals, vehicles, other assets of all scales) are instrumented with sensing and computing devices. Moreover, the objects and their environments are increasingly enabled by ubiquitous network connectivity. This connectivity allows interactions among objects and their state with the now omnipresent computing cloud. We are only just discovering the applications, benefits, and hazards of these trends. This evolution is creating a codependence between the cloud and the physical devices – a new equilibrium for independently controlled and operated devices and ones that are dependent on the cloud. There are many interesting implications of this evolution that form the basis for a diverse research agenda. Specifically:

- What are the future human-computer interfaces enabled by pervasively instrumented objects that obsolete dated interaction models? For example, much richer context-dependent interactions that are based leveraging rich accumulated data about places and individuals that can have persistent state.
- How much intelligence, and computational effort/cost, will be relegated to mobile, object-centric devices? How much will be embedded into the fabric of the network infrastructure? What is the equilibrium between what is required for autonomous operation and what is provided by the collective knowledge base?
- When can we rely on distributed instrumentation to participate as part of safety-critical control systems? At what levels of safety performance can we adopt computer control to achieve its benefits?
- How do we balance individual privacy with collective societal benefits as policies; and how can we realize and ensure compliance with these policies in a massively distributed system with multiple vulnerabilities and failure modes?
- What impact will such a massively connected system have on economic, political, and societal stability? How can it be designed and managed to realize benefits to humanity while minimizing its ills?
- What of the collective intelligence – accumulated and immediate – enabled by the cloud and its associated distributed sensors on all objects. If and when will humans become accessories to this one interconnected machine?

In summary, we are in a period of rapid change in the human ability to connect to collective knowledge and control via physical and virtual means and are increasingly co-dependent on these connections to support our daily lives. It is both exciting and a bit frightening to observe these rapid changes as the technology races towards an indeterminate destination with so many unanswered questions.

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1. Introduction

2. References

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