
PREFACE

Context-aware mobile computing has been a topic for research since one of the earliest Ph.D. dissertations appeared on the topic in 1994. Recently, context-aware computing has enjoyed remarkable attention from researchers in diverse areas such as distributed computing and human–computer interaction. Such aware systems have become one of the most exciting concepts in early 21st-century computing, fueled by recent developments in pervasive computing (i.e., mobile and ubiquitous computing) including new computers worn by users, embedded devices, smart appliances, and sensors surrounding users and varieties of wireless networking technology. Software and hardware systems that are ubiquitous and aware of users, and their physical and virtual context (e.g., environment and circumstances), and can respond intelligently to what is perceived is an exciting, if not increasingly vital, addition to daily life and work. Whereas the idea of context has been studied in logic and the meaning of natural language sentences, the notion of context is being revisited in mobile and ubiquitous computing work. The experience economy has taught us that experience matters, and context awareness is a key idea for providing new experiences with devices, appliances and software systems, and automatic behaviors for convenience and innovative applications.

This book is a gentle introduction to a new breed of computer applications termed *context-aware pervasive systems*, and attempts to provide architectural blueprints for building context-aware behavior into applications. The book reviews the anatomy of context-aware pervasive applications, including:

- Context-aware mobile services
- Context-aware devices, appliances, and smart things
- The integration of context-aware computing with software agents and the Web

- The use of context awareness for addressing, and communication between, people, devices, and software agents
- Context-aware controlled sensor networks
- Context-aware security frameworks
- Context awareness via mirror worlds

In this book we aim to capture general design principles and architectures for context-aware applications. These applications are certainly not exhaustive and only serve to illustrate the usefulness and potential of context awareness in mobile and ubiquitous systems, and the range and diversity of context-aware behaviors, to the extent that can be done within one book. The book also highlights the notion of *mirror worlds* (a term I believe originated in Gelernter's book) and its interesting applicability to building aware systems, and discusses declarative approaches to constructing such systems. I have often used examples from my own work to illustrate the concepts presented here, perhaps not surprisingly; where appropriate, I have noted work by others in the area. Although related work has been surveyed, there is work which I have left out, given the extent of activity in the area. I trust that readers will find the extensive set of references useful, and use this book as a platform to further explore the area.

Context-aware pervasive computing is still an area of active research, and we will indeed develop a deeper understanding of such systems, better techniques, and architectures of greater generality. Hence, one faces a dilemma about writing a book too early for an area that is still growing and in many ways changing. Nevertheless, I feel that there is a need for such a book, serving as a timely and relevant introduction to the emerging breed of context-aware systems, and presenting an initial step toward bringing together in one volume architectures and principles — as they relate to the applications covered — of such systems, providing material already in use by practitioners and enthusiasts in an exciting field.

One of the titles initially selected for this book was *Inside Aware Systems: Introducing the Software Architectures of a New Breed of Applications*. Dropping the “context” from “context-aware” is a move toward a more general concept, which perhaps this book can help develop.

Readers can become acquainted here with an increasingly important new breed of software and their implications and possibilities, even if they are not experts in the field or directly work in the area. Students and researchers new to the area can quickly obtain familiarity with key ideas and concepts of the topic, all in one place, acquiring a framework by which to understand related work and perhaps to start working in the area. Practitioners can take the designs and architectures presented and implement their own versions of the systems, adding their own features

or improvising as their applications require. Researchers from other areas can find application of their own expertise within the area of aware systems, based on the abstract architectures presented here. Nontechnical readers, skipping over the technical material, will still be able to gain an appreciation for the ideas and concepts within the area.