Preface

The Handbook of Research on Mobile Software Engineering provides leading-edge research results and applications of mobile software engineering. Mobile software engineering is a systematic and disciplined approach to developing software for mobile devices. It applies both scientific and engineering principles and practices to the creation, operation, and maintenance of mobile software systems. The term “mobile” refers to freeing users from physical ties to desktop computers through the use of mobile devices.

The handbook is an original, comprehensive reference work on research and applications and aims at covering the construction, analysis, and management of mobile software systems. Topics range from software architectures, product lines, and user interfaces, to location and context-aware applications, multi-agent systems, sensor network applications, model-driven approaches, pervasive systems, ambient intelligence, urban environments, and augmented reality. The handbook is an authoritative source that provides an extensive coverage of the new and exciting field of mobile software systems and related emergent applications, and will be of broad interest to both the research community and those engineering systems and application software for mobile devices.

MOBILE SOFTWARE ENGINEERING

The new era of mobile communications is having an enormous global impact for innovative networked applications and information services. Globally, mobile devices have already outnumbered PCs by three to one, and credit cards and TVs by two to one, and, in many countries, the mobile phone has become an electronic wallet and the main window to the World Wide Web.

While the personal computer remains the dominant platform for accessing the Internet and the Web, access via mobile phone already outpaces wireless access from notebook personal computers in many areas of the World, indicating that the mobile phone has become an important factor in the Internet revolution. Internet browsing via wireless devices is showing robust growth in many global markets. All wireless device activities are experiencing growth, including location-based services and social networking. We are seeing the introduction of an increasing number of mobile devices such as PDAs, laptops, cellular phones, and Blackberries, and a wide range of communication support technologies for different types of networks such as Bluetooth and WiMax. In addition, a variety of other devices such as GPS and smart appliances are being connected to the Internet.

The combination of wireless devices, internet connectivity and service provision technologies have tremendous potential in terms of emergent mobile applications, and will lead to significant changes including potentially disruptive mobile and pervasive products, processes and applications. In addition, users want pervasive software applications, that is, applications that are adaptable to a variety of devices, user interfaces, and contexts. The scenario, in which hundreds of millions of people are carrying pocket-
sized, networked computers, requires innovation and extraordinary advances in the emerging area of mobile software engineering. Research and applications in this area are expected to revolutionize the world of mobile communications, and change users’ daily lives dramatically.

Although, the current state-of-the-art has established some elements to support mobile software engineering, proper engineering methods to design, build, evolve, and deploy applications are immature or entirely missing. Engineering approaches to new modes of mobile technology and user interaction pose significant challenges.

**OBJECTIVES**

The main purpose of the handbook is to offer a compendium of state-of-the-art research knowledge concerning the key issues surrounding current and future challenges associated with the software engineering of mobile systems and related emergent applications.

To achieve this goal, the handbook contains a collection of contributions from leading experts in the world aiming at: (1) presenting current research results on mobile software development, maintenance, and quality assurance methods, models, and processes; (2) providing a comprehensive description of some of the leading-edge research and practice related to mobile software tools and environments; and (3) offering an overview of current and emergent mobile applications.

The handbook addresses gaps in the literature within the area of software engineering and the mobile computing world, and will provide a valuable resource to researchers, industry personnel, managers, and students interested in the area.

**CONTRIBUTION**

The handbook provides an excellent contribution to information science and technology by making available research results and practices in an area where there is a clear research and implementation gap. The scholarly value of the handbook is justified by a need for systematic and disciplined approaches to the construction, operation, management and maintenance of software for mobile devices. Further, there is a lack of publications addressing the software engineering (e.g., design, development, assessment) of mobile systems and emergent applications.

This publication should have a significant impact in the area of information technology given the strategic importance of mobile software and its emergent applications, and the explosion in the use of mobile devices such as mobile phones, laptops, and personal digital assistants (PDAs). Further, mobile technology has become pivotal for economic development in developed and developing countries because it has emerged as the cheapest and fastest way of communication for small businesses and enterprises, and it will help in improving conditions of people as more and more businesses rely on cell phones for their daily operations and activities.

For these reasons, the theme of this handbook is strategic, and of central importance in the establishment of the science and systematic engineering of mobile software design and development. A critical issue is how to engineer mobile software systems, and the handbook will expand the mobile software engineering field by introducing methods and practices that address gaps in the literature while providing solutions to this general issue.
AUDIENCE

The handbook is intended for people interested in the creation, operation, maintenance, and management of mobile software systems and emergent mobile applications at all levels, including: engineers, researchers, scientists, practitioners, managers, developers, educators and students who are looking for the state-of-the-art information in mobile software trends and development, and require access to current information in this emerging field. In particular, software system developers and technology innovators can take advantage of the leading-edge research ideas, results, and case studies described in the handbook.

The combination of theoretical and practical content will enable a broader audience to take advantage of the handbook, and will enable readers to draw parallels with their own work or research, and apply or further the research efforts of others in their own projects. Readers will gain by having access to an original, comprehensive reference work on research and applications in the area of mobile software. The availability of the handbook will aid the prospective audience by providing a comprehensive set of research and practical contributions that tackles the challenges of engineering mobile systems and emergent mobile applications.

CONTENT

The handbook focuses on well-defined research results and applications that have potential impact on the construction, analysis, or management of mobile software and emergent mobile applications, and is divided into four sections:

Section 1: Mobile Software Design Models, Approaches, and Processes

This section focuses on mobile software design models, approaches, and processes. Topics relevant to this section include mobile system design and architecture; software models and requirements; mobile (Web-based) software frameworks and product lines; mobile services and service-oriented architecture; model-driven driven approaches; language-oriented approaches; software patterns; software reuse and separation of concerns; and advanced user-centered design models and approaches.

Section 2: Mobile Software Implementation Tools and Wireless Networks

This section focuses on mobile software implementation environments and wireless networks. Topics relevant to this section include mobile implementation environments, platforms, portals and middleware systems; recommendation and de-fragmentation tools; wireless network approaches and applications; and approaches involving wireless sensor networks, radio systems, and mobile devices.

Section 3: Quality Assurance and Formal Methods

This section focuses on quality assurance and formal methods. Topics relevant to this section include quality assurance, quality of context and quality of service (QoS); formal specification and verification methods; and software testing and analysis of mobile systems.
Section 4: Emergent Applications

This section focuses on emergent mobile applications. Topics relevant to this section include augmented and virtual reality; location and context-aware mobile applications and services; access control and privacy; multimodal devices; mobile agent-based approaches and systems; map-based applications; sensor-based applications; ambient intelligence and urban systems; distributed event-based applications and publish-subscribe systems; mobile real-time collaboration; mobile fleet applications; mobile participatory sensing; and wireless network applications (e.g., Bluetooth) and remote control.

In summary, although previous publications focus on aspects involving mobile implementation platforms and wireless applications, there is a lack of a more comprehensive set of research practical results about the creation, and maintenance of mobile software systems and emergent mobile applications. By addressing this literature gap, the editors believe this handbook will provide an extremely valuable resource in an emerging area.

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