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Kenneth P. Fishkin
Bernt Schiele
Paddy Nixon
Aaron Quigley (Eds.)

Pervasive Computing

4th International Conference, PERVASIVE 2006
Dublin, Ireland, May 2006
Proceedings

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Preface

Welcome to the proceedings of the Fourth International Conference on Pervasive Computing. We are honored to serve as chairs in this conference series, founded in 2002, which has emerged as one of the most respected venues for publication of research in pervasive and ubiquitous computing.

This year's conference demonstrated the increasing breadth and depth of worldwide research on pervasive and ubiquitous computing, with a record number of submissions (178) from a record number of countries (26). From among these high quality submissions, the Technical Program Committee accepted 24 papers. These papers were chosen solely on quality, using a double-blind review process.

There was also a striking breadth of submissions. The submissions covered 29 topics, ranging from health care applications to embedded systems programming, from sensor networking to ethnography, from novel user interface techniques to power harvesting hardware. This year the most popular topics were programming environments, location-aware computing, and cell-phone interaction techniques.

Our first thanks goes to all the 541 authors who submitted full papers to this conference. Presenting research work in a paper requires a great deal of effort. We hope that these authors were rewarded with insightful reviews and an enjoyable conference program.

Any conference is only as strong as its reviewers and Program Committee. This is particularly true for this conference, which placed a very heavy load on its Program Committee. We were fortunate to have an outstanding and hard-working Program Committee: each Program Committee member was responsible for personally reading and reviewing at least 15 papers, and each paper discussed at the Program Committee meeting had been read by at least 3 Program Committee members.

To handle this breadth and depth, we were fortunate to have a talented reviewer pool with the multi-disciplinary expertise required. The 148 reviewers, from 57 different institutions, wrote over 1.5 million words of reviews – we thank them again for their selfless constructive criticisms.

In addition to the technical sessions, we were delighted to have two keynote speakers. David Tennehouse, CEO of A9.com, discussed "Proactive Computing" and Joe Marks, Research Director, MERL, presented "Pervasive Computing: Off the Beaten Path". Following the tradition of earlier Pervasive conferences, Pervasive 2006 also provided a number of other participation categories, including a doctoral colloquium, workshops on topics of special interest, a poster session for presentation of late-breaking results, and videos and demonstrations as interactive contributions.

Several organizations provided financial and logistical assistance, and we are grateful for their support. Special thanks go to the local organizers from several institutions in Ireland. We also thank Karen Dickey and Boston MERL for graciously hosting our Program Committee meeting.

Final thanks goes to all the authors who entrusted their work to Pervasive 2006 and everyone who attended the conference. None of this would have been possible, or worthwhile, if it were not for your research in pervasive computing. Your continued contribution and support of this conference is most gratifying.

March 2006

Ken Fishkin, Bernt Schiele
Paddy Nixon, Aaron Quigley

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A Practical Approach to Recognizing Physical Activities

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Abstract. We are developing a personal activity recognition system that is practical, reliable, and can be incorporated into a variety of health-care related applications ranging from personal fitness to elder care. To make our system appealing and useful, we require it to have the following properties: (i) data only from a single body location needed, and it is not required to be from the same point for every user; (ii) should work out of the box across individuals, with personalization only enhancing its recognition abilities; and (iii) should be effective even with a cost-sensitive subset of the sensors and data features. In this paper, we present an approach to building a system that exhibits these properties and provide evidence based on data for 8 different activities collected from 12 different subjects. Our results indicate that the system has an accuracy rate of approximately 90% while meeting our requirements. We are now developing a fully embedded version of our system based on a cell-phone platform augmented with a Bluetooth-connected sensor board.

1 Introduction

The task of recognizing human activities from body worn sensors has received increasing attention in recent years. With a growing demand for activity recognition systems in the health care domain, especially in elder care support, long-term health/fitness monitoring, and assisting those with cognitive disorders [1, 2, 3]. For an automatic activity recognition system to be useable in these domains it is important for it to be practical as well as accurate.

Current methods for tracking activities in the healthcare field are time and resource consuming manual tasks, relying on either paid observer (i.e. a job coach who periodically monitors a cognitively disabled person performing their job or a nurse monitoring an elderly patient) or on self-reporting, namely, having patients complete an activity report at the end of the day. However, these methods have significant deficiencies in cost, accuracy, scope, coverage, and obtrusiveness. Paid observers like job coaches and nurses must typically split their time among several patients at different locations, or the patients must be clustered together. Self-reporting is often inaccurate and of limited usefulness due to patient forgetfulness and both unintentional and intentional misreporting, such as a patient reporting more fitness activities than they actually completed.

An automatic activity recognition system would not only help reduce the errors that arise from self-reporting and sparse observational sampling, but hopefully also improve the quality of care for patients as caregivers spend less of their time

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