Preface:

Joint Conferences on Pervasive Computing
Welcome Message

On behalf of the organizing committee, I would like to welcome you to Tamsui and Tamkang University. Thank you for your participation in the 2009 Joint Conferences on Pervasive Computing (JCPC2009) held in these three days. The trends of Pervasive Computing developments are diverse and speedy in recent years. Pervasive and U-media Computing, as it is bravely defined, brings together technologies for location/context adaptation, inter-device interaction/reaction, and media/data communication. In JCPC2009, we combine two major international conferences, U-Media and ICPCA, which focus on professional Ubiquitous Media Computing and Pervasive Computing research issues. Moreover, three workshops focus on applications of ubiquitous and pervasive computing are also included.

JCPC2009 includes a wide spectrum of research topics in various tracks/workshops. This year, we received totally 327 submissions, from 15 countries and areas. After the strictly review process, we select finally 139 papers. The average accepted rate is 48.6%. The keynote speeches and presentation tracks include the most recent hot research topics in the international IT societies. These newly proposed directions of technology integration not only provide a base for research discussions, the potential contributions can also help the industry in realizing many killer applications. It is our honor that the conference proceedings will be published by IEEE, with best papers recommended for publication in special issues of international journals.

Tamkang University is a beautiful and historical university in Taiwan. The department of Computer Science and Information Engineering was established in 1969. In addition to teaching, our faculties publish research contributions in top international and domestic journals. We also organize international conferences to welcome both overseas and domestic scholars to see our success and to exchange research ideas with us. Especially, JCPC2009 brings together the collaboration of colleagues from not only department of Computer Science and Information Engineering, but also department of Electrical Engineering and department of Educational Technology. Meanwhile, we are collaborating with the University of Aizu, Japan. Through hosting JCPC2009, we are proud of our collaboration among our faculty members and friends.

Tamsui is a famous and historical town in Taipei and in Taiwan. There are many beautiful and famous nearby sightseeing spots such as Yang-Ming Mountain, Northern Seashore of Taiwan, Tamsui Wharf, and the National Palace Museum. I wish you will be able to stay for a few days after the conference to see the beautiful scenic spots and to experience the historical culture of Tamsui. Finally, I would like to address my appreciation to the National Science Council and Ministry of Education, especially to Professor Lou-Chuang Lee, the Minister of National Science Council, and Professor Han-Chieh Chao, the Director of Computer Center of MOE for their support to the conference. I also like to thank the conference organizing committee members and student helpers for their time and contributions. The success of this event would not be possible without their great contributions.

General Co-Chair & Conference Co-Chairs
Flora Chia-I Chang, Ying-Hong Wang, Tamkang University, Taiwan
Preface:

International Conference on

Ubi-media Computing
Welcome Message

U-Media is an annual international conference series on ubiquitous multimedia computing technologies. The aim of the U-Media focuses on providing an open-minded discussion forum for researchers to share their ideas. The first U-Media conference was held in Lanzhou, China, in summer 2008. U-Media 2009, the second conference in this series, will be held in Tamkang University in Taipei, Taiwan. The U-Media 2009 is part of the Joint Conferences on Pervasive Computing (JCPC) 2009 and is scheduled as one of the main conferences. This year, we received 105 high-quality papers and it was very difficult to make final decisions. After the expert reviews, we only selected 40 papers to be published in the proceedings. These papers are organized into 8 sessions for further oral presentations.

We would like to take this opportunity to thank those who worked hard to make this annual event successful, especially Prof. Timothy K. Shih, one of the founders of U-Media, who contributed significant amounts of efforts and invaluable suggestions.

We are pleased to welcome you to join this event in Tamsui which is a beautiful college town 15 miles from the downtown Taipei. Wish you have fun during your stay in Taiwan.

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Preface:

International Workshop on

Pervasive Computing and Application
Welcome Message

On behalf of the Organising, Programme, and Steering Committees of the International Conference on Pervasive Computing and Applications (ICPCA), it is a great honor to welcome you to ICPCA09 in Tamsui, Taiwan, a sea-side town close to Taipei. It will be fun!

ICPCA is an annual international conference series on Pervasive Computing and its applications. In the past few years, ICPCA has provided a forum for spirited exchange of ideas among interested scientists, researchers, practitioners, developers, and end users. ICPCA2009 was the fourth in this series, presenting the latest contributions in the field of Pervasive Computing. The conference following a series of three successful international events previously held in Urumqi China (2006), Birmingham UK (2007), and Alexandria Egypt (2008), presented to you 7 special tracks focusing on collaboration, learning, health care, security, and emergency response.

This year, an impressive scientific and educational program, coupled with some very entertaining social events, was brought to you by ICPCA and JCPC organizing teams. None of this would have been possible without the devoted, able assistance of our local host. Therefore, a special thank first goes to Tamkang University.

Since October last year, there have been many people who participated in the organisation of ICPCA2009. We would like to take this opportunity to thank those who worked behind the scene to make this conference successful. First, we would like to thank Flora Chia-I Chang (Tamkang University), Shigeaki Tsunoyama (University of Aizu) and Marwan Al-Akaidi (De Montford University) - the General Co-Chairs who had the initiative to propose JCPC2009 as the joint effort across ICPCA and UMedia. Hani Hagras, Robert C. Hsu, Xiaodong Lu, Chris Nugent, Michael Sheng, Sherali Zeadally, Alexander Vazhenin, and Kuan-Ching Li have done a marvelous job to ensure the quality of ICPCA papers; we thank them all. We would also like to extend thanks to chairs of ICPCA special tracks, the entire program committee and additional reviewers who are the stars of ICPCA09 community. This year, the paper submission and reviewing process are supported by EasyChair.org. We would like to express our gratitude to the EasyChair development and maintenance team.

The ICPCA steering committee plays an important role in the continuity of this conference series and we also thank them for their continued efforts.

Last but not least, to all the authors – those whose papers were accepted and those whose papers we were not able to include due to space limitations – we owe a special debt of gratitude. To those who are unable to join us this year, we hope to meet you next year in Slovenia.

December 2009

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Preface:

International Workshop on

Advanced Distance Education Technologies
Welcome Message

ADET is an annual international workshop series on distance education and technologies. The first and second ADET workshops were held in XiAn, China, 2007 and Lanzhou, China, 2008. ADET 2009 is the third workshop in the series and it is held in Tamkang University in Taipei, Taiwan. ADET 2009 is part of the Joint Conferences on Pervasive Computing (JCPC) 2009 and it is scheduled as a half-day workshop. We have selected a total of nine papers and divided them into two sessions for presentation.

We would like to take this opportunity to thank those who worked behind the scene to make this workshop successful. First, we would like to thank Timothy Shih, the main organizer of JCPC 2009, who contributed a significant amount of effort and useful suggestions to the workshop. We would also like to thank all the authors for the submitted papers, whether accepted or not, we do appreciate and sincerely thank for your contributions.

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Preface:

International Workshop on Mobile System, E-commerce and Agent Technology
Welcome Message

MSEA T’2009 aims to establishing a responsive, active and valuable world-class academic forum for executives, managers, practitioners and academicians from multi-agents, mobile agents, software agents, mobile environment, ubiquitous or pervasive environment, virtual organizations and e-commerce, in particular their crisscrosses. MSEA T’2009 was the sixth workshop in the series. It was held in Tamkang University in Taipei, Taiwan. Since MSEA T’2009 was part of the Joint Conferences on Pervasive Computing (JCPC) 2009 and was only scheduled as one-day workshop, we had only selected a total of twenty papers for presentation in the workshop. These twenty papers were divided into four sessions.

We would like to take this opportunity to thank those who worked behind the scene to make this workshop successful. First, we would like to thank Timothy Shih, the main organizer of JCPC 2009, who contributed a significant amount of effort and useful suggestions to the workshop. We would also like to thank all the authors of the submitted papers, whether accepted or not, for their contributions.

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Preface:

International Workshop on

Interactive Digital
Entertainment Technologies
Welcome Message

IDET is an annual international workshop series on digital entertainment technologies. The first IDET workshop was held in Lanzhou, China, in 2008. IDET 2009 was the second workshop in the series. It was held in Tamkang University in Taipei, Taiwan. Since IDET 2009 was part of the Joint Conferences on Pervasive Computing (JCPC) 2009 and was only scheduled as a half-day workshop, we had only selected a total of five papers for presentation in the workshop. These six papers were divided into sessions.

We would like to take this opportunity to thank those who worked behind the scene to make this workshop successful. First, we would like to thank Timothy Shih, the main organizer of JCPC 2009, who contributed a significant amount of effort and useful suggestions to the workshop. We would also like to thank all the authors of the submitted papers, whether accepted or not, for their contributions.

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Hierarchical Role-Specific Task-Based User Interfaces for the Mobile Phone

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Abstract

A mobile phone contains an increasingly large set of functions (tasks) that one can perform. We focus on the issue of task based interfaces for the mobile phone. We apply the paradigm of task computing to mobile phone user interface design in order to enable the mobile phone functionalities to be accessed in a more efficient way that meet the needs of different users.

1. Introduction

The mobile phone is one of the most commonly used device in the world, but many users have found difficulties with the general mobile phone interface, especially due to size restrictions [1]. The increasing functionality of mobile phones does not correspond to or help in decreasing the complexity of the mobile phone user interface – in fact, the interface may need to be more complex to allow all such functionalities to be accessed. Usability studies have shown that “users prefer a less extensive menu structure on a small screen device”, and that both length and breadth of menu structures need to be reduced [2] – a difficulty is then how one can have smaller menu structures to represent increasing functionalities? We address this question in this paper. Indeed, alternatives to the mobile phone hierarchical menu interfaces have been explored [8].

Also, to note is that mobile phones have applications that the user has no knowledge of due to the ineffective use of hierarchical interfaces. According to [3] the elderly finds the interfaces of many existing mobile phone devices difficult to learn and to use. For example, the study shows that 22%-25% of the elderly in a 2005 UK survey of 3200 adults could not confidently either store a new contact or send a text message. In addition, the proportion of older mobile phone users, compared to all surveyed mobile phone owners, who could perform these two tasks was much lower (51% and 29% compared to 88% and 81%, respectively). Many studies have found that learning computer applications takes significantly longer and is harder for older adults than young adults. For example, a recent study comparing older (age 50-64) and younger (age 20-35) learners of mobile phones found that the older adults perform over 40% more pointless steps than the young ones [4]. Others have commented on the difficulty of using mobile phones to perform specific tasks in mind.\(^1\)

One task computing project created the Task Computing Environment (TCE) [5]. Sasajima et. al. [6] presents a new type of menu which has been developed called “task-oriented menu” which enables more efficient mobile service navigation. However, it might be too complex for some users to create the models or users may get lost while navigating a too complex model. In [7] is described the InterPlay system where instead of picking up different remote controls, the user specifies a task to perform. Ranganathan [9] describes a framework that uses a high-level task specification model and an autonomic task execution framework for ubiquitous computing.

The aim of this paper is to discuss how the idea of task computing can be applied to mobile phones in order to design more efficient user interfaces that meet the end user requirements. Most mobile phones contain a large number of functionalities, some users may not be conscious about. Also, the mobile user interface tends to support a large range of tasks, in a wide selection of contexts, and accessible through many ways or paths through menus.

2. Designing Task-Based Mobile Phone Interfaces

The design of our mobile phone user interface is based on organizing a task hierarchy which can meet end users requirements. The design philosophy considers the user’s needs by identifying different tasks depending on the user situation or age. Recent studies have begun to look at segmenting users in order with the aim that perhaps phones can be customized to serve

\(^1\)For example,
http://www.jnd.org/dn.mss/minimizing_the.html
User Categorization. The design of the task-based mobile phone interface is prearranged to meet different prospective users. Three levels of menu structure are considered in our approach. The top level allows the user to select the language in which task phrases will be explained. For example, the user can choose one of the following languages: “English”, “Arabic” and “Chinese”. The next level is to recognize the user category of the mobile phone interface. The first set of categories is defined by age which includes normal user, elderly and children. The other set of categories is defined by the purpose or role of the mobile phone user which includes: Businessman, Athlete, Student and Lecturer. The last level of the menu structure is a hierarchy of task phrases which map to specific invocations of applications and the requirements of users in a chosen category.

Our current design uses different user categories, for example:
- Age which includes general tasks that people in an age group would perform—Normal user (age 13-59), Child (age 6-12), Elderly (age over 60).
- Activity on role which involves identification of relevant tasks: businessman, student, athlete and lecturer.

Task Hierarchies. A task hierarchy of the task-based mobile phone interface is designed to flow from more general tasks to more specific tasks which effectively help to identify or scope the user’s requirements. The task hierarchy of the mobile phone interface is structured as follows (non-exhaustively):  
- Choose the most convenient language among the three selected languages: English, Arabic and Chinese (selected only by example, there can be others).
- Choose User Category: Normal User, Child, Elderly, Businessman, Athlete, Student, Lecturer.

We illustrate the following hierarchies. Figure 1 shows the child task hierarchy which includes simple tasks for the child such as “Call Mother”. We have also developed task hierarchies for students, athletes, businessmen, and lecturers. The above presented an analysis and design of task based interfaces for the mobile phone tailored to different roles. Our task-based interface considers three main factors to improve the design of the mobile phone task based interface which are learnability, usability and the ontology for the task models. Figure 2 shows the elderly task hierarchy which includes some quick options such as “Inform Emergency”. The idea is that a user of a given user category can choose to access the mobile phone functionality by browsing such a tailored task hierarchy (corresponding to the user’s category) rather than the traditional phone menu. Because the task hierarchy seeks to capture common tasks tailored for a category, learnability and usability would be facilitated. Also, each hierarchy can be seen as describing an ontology of tasks user of a certain category do using the mobile phone. A user can use the task hierarchy for key tasks but for less common or
specific tasks, simply default to the traditional phone navigational menu. A task hierarchy is in a way a “structured collection of short-cuts”. We note that task hierarchies are independent of the specific mobile phone- the same task hierarchy can be used with almost any “standard” mobile phone. However, we aim to complement rather than replace, as certain features (hopefully, less often used) are still accessed using the original phone interface.

Figure 1: Child task hierarchy.

3. Implementation and Evaluation

We show a prototype of the design using J2ME (JavaME) which provides standard application programming interfaces (APIs) for a mobile platform. In addition, we compare the normal (traditional) phone navigational menu and our task-based user interface. We also map the “leaf” node task phrases of a task hierarchy to the J2ME API calls representing the way each low level task can be programmed.

Our analysis of mobile phone applications (menus) suggests that most mobile phones are built to provide many applications without consideration of the way that actual tasks are or are not being represented – the menu structure is application-oriented rather than task-oriented. Moreover, most users may not even be aware of all those applications. Our study analysed several mobile phones structures including the Nokia 6270, and Motorola V3 mobile phones and abstracted out the main menu structure. The relative importance of some of tasks done with the phone is different from one user to another.

Moreover, the learnability of the user for all those applications is limited. As a result, our approach is to build the mobile phone interface which has the ability to let the user find the task that he or she wants to perform in an easier way with concern for the user category. Also, observe that the traditional (normal) phone menus (as above) is structured according to categories of applications while our approach emphasizes user categories and tasks (and sub tasks) represented as “verb-noun” phrases within each user category. Below, we show a comparative performance of tasks using our approach and the normal mobile phone menu structure. The tasks in our approach can be programmed and run using J2ME. Table 1 and 2 show actions to perform example tasks that the user might need to do. Child age (6 – 12) use their phones for family, friend and entertainment purposes. Table 1 will present tasks the child might perform often using our approach compared to accessing the same functionality using the normal (as is typical in the three mobile phones we considered) mobile phone navigational menu.

Most elderly found mobile phones hard to deal with. They used their phones for family, friend and
entertainment purposes that meet their activity, such as, “View the news”, “play music” [4]. Table 2 will present tasks the elderly might use often using our approach compared to the normal (traditional) mobile phone navigational menu.

<table>
<thead>
<tr>
<th>Task of Child</th>
<th>Using Our Task hierarchy</th>
<th>Using normal mobile phone navigation menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Mother</td>
<td>The user has to select “Make call” then “Call Mother”. (2 steps)</td>
<td>The user has to select “menu” then “Phonebook” then select “Family Group” to search for “Mother Number” in the “Phonebook” then “Call”. (4 steps)</td>
</tr>
<tr>
<td>Call Father</td>
<td>The user has to select “Make call” then “Call Father”.</td>
<td></td>
</tr>
<tr>
<td>Send Msg to Mother to pick you up from a place</td>
<td>“Send Message” then “Send Message to Mother” folder should appear with listed expected men to send or write msn direct. (2-3 steps)</td>
<td>“Menu” then “Message” then “Write message” the Select the number which take you to the “Phonebook” to search then “Send the msn”. (3-4 steps)</td>
</tr>
<tr>
<td>Play Games</td>
<td>Select “Play Games”. (1step)</td>
<td>“Menu” then “Application” then “Games”. (2-3 steps)</td>
</tr>
<tr>
<td>Play Music</td>
<td>Select “Play Music”. (1 step)</td>
<td>“Menu” then “Media” then “Media player” or “Music file”. (2-3 steps)</td>
</tr>
</tbody>
</table>

Table 1: Child menu compared with normal mobile phone navigational menu

<table>
<thead>
<tr>
<th>Task of Elderly</th>
<th>Using Our Task hierarchy</th>
<th>Using normal mobile phone navigation menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Family Doctor</td>
<td>Select “Make call” then “Call Family Doctor”. (2 steps)</td>
<td>Select “Phone book” then “Search for the doctor number” then “Call”. (3-4 steps)</td>
</tr>
<tr>
<td>Call Children</td>
<td>Select “Make call” then “Call Children”.</td>
<td>Like above.</td>
</tr>
<tr>
<td>View the</td>
<td>Select “View News Option” (connect to the news website that has been provided through internet). (1 step)</td>
<td>Select “Menus” then “Internet Option” then “Check the news of the website”. (3 steps)</td>
</tr>
<tr>
<td>Inform Emergency</td>
<td>Click into the “Inform Emergency” or “Inform Family Member” or “Inform Family Doctor”. (2 steps)</td>
<td>The user has to select “Make Call” or “Send a message” then “Inform Emergency” by looking for the number first. (3-4 steps)</td>
</tr>
</tbody>
</table>

Table 2: Elderly menu compared with normal mobile phone navigational menu.

4. Conclusion

We have designed an example of a mobile phone interface using the concept of task computing. One can view our idea as using structured shortcuts (tailored to various user groups) as alternative interfaces (complementing the existing phone interfaces) to help people complete certain tasks more efficiently. In the future, we hope to add to our set of task hierarchies and trial our interfaces on specific user groups.

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