



<b>Title</b>	<b>Turning mobile phones into a mobile quiz platform to challenge players' knowledge: An experience report</b>
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<b>Citation</b>	<b>The 8th IEEE International Conference on Advanced Learning Technologies (ICALT 2008), Santander, Cantabria, Spain, 1-5 July 2008. In Proceedings of the 8th ICALT, 2008, p. 943-945</b>
<b>Issued Date</b>	<b>2008</b>
<b>URL</b>	<b><a href="http://hdl.handle.net/10722/126068">http://hdl.handle.net/10722/126068</a></b>
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# Turning Mobile Phones into A Mobile Quiz Platform to Challenge Players' Knowledge: An Experience Report

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## Abstract

*In the past few years, many new mobile technologies including the 3G, WiFi or mobileTV have created unprecedented learning opportunities on mobile devices. Furthermore, such technologies continuously fuel the rapid growth of new fields of research like the edutainment for educational entertainment. In a recent project awarded by the Hong Kong Wireless Development Center, we have developed a mobile quiz game system on 3G mobile phone networks in China, Hong Kong or other countries to facilitate learning anytime and anywhere. Our developed mobile quiz system is so generic that it can be readily extended to any wireless network. In this paper, we discuss about the design and possible uses of our quiz system in mobile learning, and also share the relevant experience in system development with the evaluation strategies carefully examined. After all, our work shed light on many interesting directions for future exploration.*

## 1. Introduction

Undoubtedly, new telecommunication technologies or services including the High-Speed Downlink Packet Access (HSDPA), namely the 3.5G, the IEEE 802.11, namely the WiFi for Wireless Fidelity, based products, or lately the mobileTV, have been continuously reshaping our modern living. With the availability of powerful mobile devices connected to a high-speed wireless network, with the maximum data rate as several to tens of mega-bits per seconds nowadays, many attractive mobile learning applications realizing the concept of learning *anytime and anywhere* have been developed in recent years, and actively sought the world-wide attention of educators, students, lifelong

learners or professionals in various disciplines. Among many successful applications, the Cellphedia [1] is a Mobile Social Software (MoSoSo) developed in the United States to promote the sharing of knowledge, in which users can send and receive encyclopedia-type inquiries between specific, pre-defined groups of users through text messaging on mobile phones. In Europe, there are many exciting mobile learning projects including the MOBIlearn [3], the Mobile Learning Framework 5 project and the Kaleidoscope mobile learning initiative [2]. Essentially, the Mobile Learning Special Interest Group (SIG) provides a forum for researchers to share new findings and technology in mobile, contextual and ambient learning across and beyond Europe. In Hong Kong, there was a mobile learning project conducted in a primary school in which around 40 GPS-enabled 3G PDA phones were used for data acquisition, conducting live interviews or surveys in the Hong Kong International Airport with the aid of GPS and video-recording functions, and also the uploading of captured data via the Internet to the back-end server for real-time analysis to support learning activities outside their classroom. In addition to the uses of mobile devices for learning or assessment, new technologies continue to fuel the blending and rapid development of new fields of research such as the edutainment for educational entertainment. An example is the digital game based learning (DGBL) approach advocated by M. Prensky, that combines serious learning and interactive entertainment in a fun, engaging and highly exciting medium.

In response to a call for applications on the China's 3G network, namely the TD-SCDMA, by the Hong Kong Wireless Development Center in the last May, we developed a mobile quiz game platform based on the concept of game rooms with real-time synchronization and the client-server model targeted for a mass of thousands of players participating in any

specific event of the Beijing Olympic Games 2008. Our system design is reliant against any possible system or network failure. Besides, our mobile quiz system is so generic that it is transparent to the underlying network architecture, and can be easily extended to the WiFi or other wireless network. Here, we discuss in detail about the design and possible uses of our quiz system in mobile learning, and also share the relevant experience in system development with the evaluation strategies carefully examined. After all, our project shed light on many interesting directions for future exploration.

This paper is organized as follows. Section 2 reviews some previous work relevant to our proposal including the use of mobile devices for mobile learning. Section 3 details the system architecture design of our mobile quiz system to enhance learners' experience on 3G mobile phones. We consider various evaluation strategies on our developed quiz system based on different criteria in Section 4. Lastly, we summarize our work and shed lights on future directions in Section 5.

## 2. Related Work

### 2.1 Mobile Learning

Due to the advance in mobile devices and communication technologies, mobile and contextual learning is a fast developing research field all over the world. Europe has led the way through the MOBIlearn [3] and Mobile Learning Framework 5 projects and the Kaleidoscope mobile learning initiative [2]. The MOBIlearn project explores new ways including a new m-learning architecture to use mobile environments so as to meet the needs of learners who are working by themselves with others. Besides, the Kaleidoscope Mobile Learning Special Interest Group (SIG) provides a forum for researchers with interests in mobile, contextual and ambient learning to exchange new findings and technology, and develop joint methods and initiatives across Europe and beyond. Furthermore, there are many interesting mobile learning projects including the POSIT by the MIT and the SENSE project conducted in the Universities of Nottingham and Sussex.

### 2.2 Mobile Social Encyclopedia

Cellphedia [1] is the first ubiquitous social encyclopedia or Mobile Social Software (MoSoSo) that promotes the sharing of knowledge. It allows users to send and receive encyclopedia-type questions between specific, pre-defined groups of users, through Text messaging. Users can register on a specific website and

then start building quick reference entries, or ask questions or answer ones wherever cell phones is available. Similarly, our mobile quiz system also aims to facilitate the sharing of knowledge through quiz challenges posted on 3G mobile phones of pre-registered users in a specific community, for instance the registered audience of a specific Olympic event or a selected course in tertiary institution. However, due to the higher communication bandwidth available on 3G networks, our mobile quiz system is not restricted to text messaging. The quiz questions stored in our mobile system may contain image, sound, text or video.

### 2.3 An Adaptive Mobile Learning System

Goh *et al.* [5] proposed an architecture and prototype quiz system based on XML/XSLT, Document Object Model (DOM) and Active Server Pages (ASP) technologies to work on both PC and mobile platform. Their system performed adaptation based on the device and user profiles and then chose the appropriate content for display to suit the specific client's need. XML files are used to store the content (questions), directions for multimedia presentation of revision material, and the user model. For example, when the user is using a mobile phone, the system adapts to display a text based context. On the other hand, when the user is using a PDA, the system adapts to a video clip to flexibly provide the context. In a similar fashion, our mobile quiz system also adapts to different device profiles, and flexibly adjusts the image sizes, resolutions and frame rates for the *best* display of the image, text or video under different screen sizes.

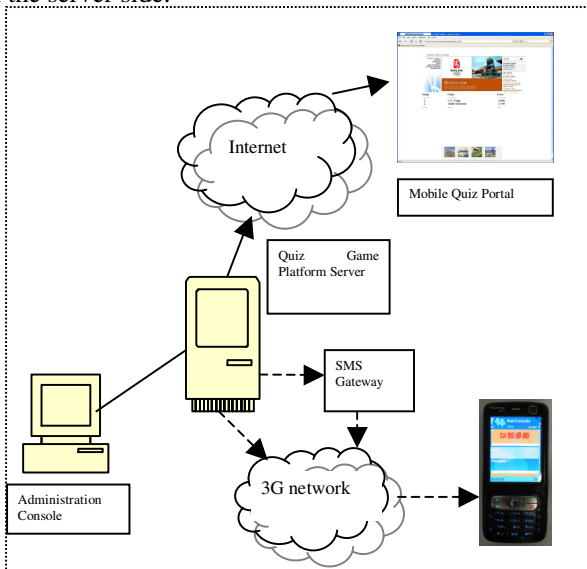
## 3. System Architecture and Services

The system architecture of our mobile quiz system is shown in Fig. 1. Basically, our mobile quiz system includes the following components:

- a) the Mobile Quiz Game Portal;
- b) 3G based Mobile Quiz Game Platform Server;
- c) Administration Console Portal;
- d) SMS Gateway (a hardware gateway for sending SMS).

After registration, each user logs in our Quiz Game Platform Server via the 3G network through the client interface already loaded onto their mobile phone. During the schedule time, the Quiz Game Server will push some relevant questions, possibly embedded with some video clips, for the user to answer. Each user will be given with 3 options, namely "Skipping 1 question", "50:50" – that is to remove 50% of the options that are incorrect, and "Prolonging the Time Limit" – that will instantly double the amount of time (10 sec.) allowed

for the current question. In each round, those users who had given the incorrect answers for 3 times would be required to exit from the current game session. The server will only display the correct answer for each round only when all the answers are received from the registered mobile phone or timeout. Thus, our 3G based mobile quiz game platform is essentially a round-based game that requires data synchronization on the server side.



**Fig. 1: The System Architecture of our Mobile Quiz System**

As the small-sized data packet for the client's returned answers, our game server can be easily extended to handle hundreds or thousands of pre-registered users' requests in an efficient manner without suffering as the performance bottleneck. This can help to demonstrate the timely performance of the 3G network to transfer a large number of clients' data requests for our mobile quiz game system.

#### 4. Prototype Implementation & Evaluation Strategies

To demonstrate the feasibility of our proposal on different platforms, we used the Java 2 Micro Edition (J2ME) technology to build our mobile quiz system containing various game rooms running on a Mac server that can be accessed through any J2ME-enabled 3G mobile phones. We spent around 4 man-months to complete the implementation and testing of our mobile quiz system. A project website [4] was set up to allow the downloading of a client program (.jar) for installation on any mobile phones to access our mobile quiz system as shown in the picture below.



As our mobile quiz system is generally applicable to any selected event or course, a detailed evaluation will be conducted in 2008/09 to analyze the effectiveness of the mobile quiz system on motivating and/or enhancing our students' experience in relevant Engineering courses including the Human-Computer Interaction or Distributed Computing Systems.

#### 5. Concluding Remarks

In this paper, we reported an on-going project in which we have successfully developed a 3G based mobile quiz system to facilitate learning/revision anytime and anywhere. Our developed mobile quiz system is so generic that it can be readily extended to any wireless network. The design and possible uses of our quiz system in mobile learning, and also share the relevant experience in system development have been considered. After all, our work shed light on many interesting directions for future exploration.

#### 6. References

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