DEMO
Classroom7: Please, Make Sure Your Phones Are Switched On!

Moustafa Alzantot, Muhammad Hataba, and Moustafa Youssef

Egypt-Japan University of Science and Technology (E-JUST),
Alexandria, Egypt
{moustafa.alzantot,mohamed.hataba,moustafa.youssef}@ejust.edu.eg

Abstract. Nowadays, mobile phones are becoming ubiquitous computing devices. They are widely used by people with different ages and in virtually all places on Earth, even in developing countries. However, there are still some concerns about performing heavy computations on mobile devices due to their limited resources. The emerging growth of cloud computing and wireless communication offers a chance for creating a new generation of mobile applications that benefit from both mobile phones and cloud computing. In this demo, we present Classroom7 as an example of cloud-empowered feature-rich mobile applications that can be used to ameliorate the education process. Classroom7 attempts to increase the interaction between students and their teacher and to allow them to create and access educational contents in a new attractive way. We utilize the sensors, e.g. cameras and microphones embedded in the phone, as a method for data input, where the required heavy computations, e.g. optical character recognition, speech-to-text and other processing algorithms, are offloaded to the cloud. Moreover, we show how mobile phones can help a teacher to easily track and assess the skills of each individual student with minimal effort.

We foresee that instead of considering mobile phones a source of distraction in classrooms, it will be considered an important tool in the education process in the near future. Teachers would ask their students to make sure that their mobile phones are switched on during a lecture.

1 Introduction

Classrooms are typically crowded with a large number of students. This hinders the interaction between students and their teacher and presents a challenge for the teacher to assess and evaluate the skills of each individual student adequately. Also, due to financial limitations, it may not be possible to provide modern digital interactive learning tools like smart boards, interactive response systems, or even provide a computer for each student. Therefore, many schools, especially in developing countries, depend only on classic white-boards and traditional textbooks to provide the learning materials to students. However, those tools are becoming less effective for teaching and learning, as they do not offer a

A. Puiatti et al. (Eds.): MobiQuitous 2011, LNICST 104, pp. 243–247, 2012.

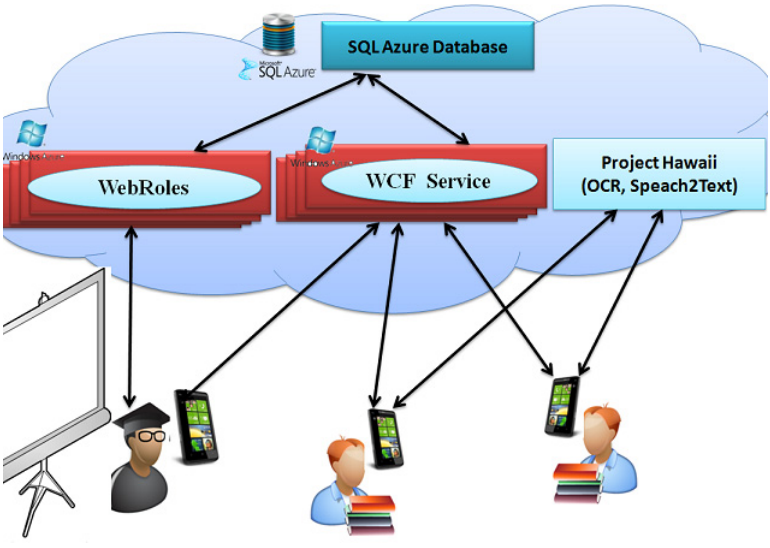

Fig. 1. Different components of Classroom7

method for interaction between students and their teacher and also they can only provide static contents which falls a step behind in the current rich-media revolution era.

With mobile phones becoming truly ubiquitous computing devices, they offer an opportunity for providing an affordable and highly effective learning system. However, major limitations of mobile phones are their processing speed, small storage, and limited battery power. Hence, there is a great benefit from offloading the storage and computationally intensive parts of the system to the cloud. This way the amount of processing required to run on the phone Cpu can be dramatically reduced to increase the battery lifetime.

In this demo, we introduce Classroom7 as an example of cloud-empowered mobile applications that makes use of both mobile phones and cloud computing to provide a number of functionalities aiming for enhancing the education process in classrooms.

Classroom7 can be used from anywhere by students to access the learning contents and so it satisfies the mobility needs of students who spend much of their time traveling [3]. Also, Classroom7 does not require any dedicated infrastructure to be installed in classrooms for its operation. Moreover, it can be used with a minimal administration effort. Figure 1 gives an overview of the different components of Classroom7.

With Classroom7, we envision that rather than asking students to switch their phones off at the beginning of a lecture, the teacher might start a lecture with saying:“ Please make sure your phones are switched on!”.

Fig. 2. Using Classroom7 to review the virtually stuck notes

2 Goals

In this demo, we present the different functionalities offered by Classroom7 as an example of a cloud empowered mobile application. The offered functionalities include: virtual sticky notes, mobile interactive book, and students lounge. Those functionalities are covered in details in sections 2.1, 2.2, and 2.3 respectively. The operation of those functions depend on a number of cloud-hosted services like OCR, Speech-to-Text, and cloud storage.

2.1 Virtual Sticky Notes

Typically students like to take notes or transcribe a lecture. Usually, those notes are written in the margins of the textbook or in a notebook. Classroom7 allows students to take notes or perform lectures transcription in an annotative way using their mobile phones. A student may type a note on his/her mobile or alternatively record a section of the lecture using the microphone of his/her mobile. The recorded part will be converted into text using the Microsoft Project Hawaii Speech-to-Text service running on the cloud [1]. The student will also have a chance to edit the converted text. The notes generated either by typing or recording will be virtually stuck to a page in the text book using the camera of the mobile phone. The student can specify which page he wants the note to be stuck onto by taking a camera shot of that page. An algorithm for identifying the page based on OCR is run on the cloud. Both the note and a page identifier are saved on the cloud.Reviewing previously taken notes can be easily done just by taking a camera shot for the same page. The page identification algorithm will identify the page and all previously stuck notes associated with this page will be displayed on the students mobile. The action of using Classroom7 to review notes virtually stuck to page in the textbook is shown in Figure 2. The student will also be able to share his/her notes with other colleagues.

2.2 Mobile Interactive Book

The “Mobile Interactive Book” feature offered by Classroom7 is a method for linking the static contents in the traditional textbooks to their corresponding

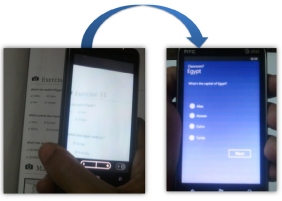

Fig. 3. Using Classroom7 to convert an exercise in the book to an interactive exercise on the phone

Fig. 4. Using Classroom7 to convert a static figure in the textbook to a video on the phone

more interactive versions. Classic textbooks are limited to contain only static contents (e.g. text, figures, and images). Those type of contents do not interact with a student actions (for example: the user cannot submit his/her answer to an exercise by pressing one of the answer choices in his/her textbook). Also the contents offered in textbooks are limited in terms of the information they can present compared to currently available rich contents media (like videos and interactive maps).

Classroom7 allows a student to view an interactive version related to the static content he/she might find in his/her textbook. The student can ask for the interactive content corresponding to certain annotated in the textbook by using the camera of his mobile to take a shot of this part. The image taken by the camera will be then submitted to our cloud service, where a content identification algorithm using the OCR service is run. Based on the identified content, a more interactive version will be displayed on the mobile phone of the student. The current version of Classroom7 prototype supports three types of interactive contents: exercises, videos, and maps.

Interactive Exercises. If a student takes a camera shot of a page in his/her textbook containing an exercise, he/she will be provided with an electronic version of the same exercise on his/her mobile phone. The questions and answer choices will be rendered in a randomly shuffled order for each student. The student can submit his/her answers to the exercise trough his/her phone. The submitted answers will be saved in the cloud, and automatically graded. Both the teacher and the student are able to have an instantaneous access to the score report (Figure 3).

Interactive Maps. If a student takes a camera shot of a map drawn in his textbook, he/she will be able to view an interactive map of the same region on his/her mobile phone. This map can be zoomed in/out, and may contain landmarks and annotations.

Educational Videos. If a student takes a camera shot of a static figure drawn in his textbook, he/she will be able to view an educational video corresponding to that figure. The action of using Classroom7 to convert a static figure in the textbook to a video on the user's mobile is shown in Figure 4.

2.3 Students' Lounge

Classroom7 offers the "Students' Lounge" feature which is a virtual place where students and their teachers can be engaged into discussions. This service aims at encouraging students to be more collaborative and socially active with each other. Students can share announcements and discussions with each other and also with their teacher.

More demonstration scenarios and videos can be found on our Classroom7 web site [2].

3 Implementation

The current prototype of Classroom7 is implemented using C# and Microsoft SilverLight for Windows Phone 7 devices and depends on Microsoft Windows Azure and SQLAzure as the cloud backend for computation and storage respectively. We employed a number of cloud hosted services like Optical Character Recognition (OCR), Speech-to-Text and Storage on the cloud offered as a part of Microsoft Research Project Hawaii [1]. The demo uses the following equipment:

- HTC HD7 mobile phones.
- Lenovo ThinkPad T41 laptop used to access the management portal.

4 Conclusion

The Classroom7 demo shows how mobile applications can be empowered by using cloud services. As an example, we show how the modern mobile phones can be leveraged in a number of attractive and innovative scenarios to increase the interaction between students and their teacher and how they can be used to augment the classic textbooks by allowing students to stick virtual notes and extract more interactive relevant learning materials. We believe that such an application can be utilized in enhancing the education process.

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