An Open Source Solution for Education Management - EduXes

V Master on Free Software Projects Development and Management 2011-2012

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Description of the practicum

The main objective of this Master Thesis consist in the development of an mobile application to be used int highschools by teachers. It could allows teachers to carry on control students attendance, their behavior. Also it permits quick assessment by activity. Teachers would read students reports: weekly and daily assessment, by activity assessments and total marks.

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Working times (planned) : 300 hours. From 6th August, to 30 September, on an eight hours day basis.

Technologies involved:

- Java ™language.
- Android ™. The operatig skeleton application.
- PhoneGap ™(alias Cordova) framework to develop multi-platform applications.
- JQuery and JqueryMobile to development of mobile oriented applications.
- JavaScript with Web Databases.
- Git for version control system.
- LaTeX for documentation.

Meetings:

- Technologies to be used were stated, work methodologies, first application windows (pages), Android version to be used (2.3.3) because is the most popular.
- Several emails and gtalk conversations about organization, general problems were written.

Teleworking is carried on

Materials and special equipment used:

- Hardware: Intel Quad, 6GiB RAM, 500GiB HD.
- Software: Debian GNU/Linux Wheezy (testing), Eclipse Juno, JQuery 1.8.1, jQueryMobile 1.1.1, and PhoneGap-Cordova 1.8.1, Android Virtual Manager 2.3.3, Git 1.7.10.4-1.
- Real testing: Sony-Ericsson Xperia V mobile phone, with USB cable and wifi.

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Chapter 1

Introduction

In a high school, there are classes which attendance, assessment and group dynamics is difficult to control. This is especially relevant for the technology workshop, this could be a noisy, annoying, even dangerous place, which requires teacher's supervision. This workshop requires a lightweight, reliable and complete software tool. A simple web solution is not enough, and even use a tablet can be heavy, it requires a new approach.

The development of a multiplatform tool, open source, for smartphones, including tablets, for attendance monitoring and evaluation of students is suggested. To achieve this goal a client-side application will be developed using a multiplataform framework: Phonegap (Cordova) [Pho12]. Phonegap allows you to develop utilizing well-known languages as Javascript and HTML. It permit us to deploy an application for both Android, WebOS, iOS and others.

For data management, a built-in database, SQLite, will be employed.

The tool that enables rapid development of the application and integration of performance tests is Eclipse. It uses the Android virtual machine (AVM).

Chapter 2

Working plan

2.1 Description and objectives

An open source multi-platform management application for high school teachers is developed. It can be run on a smartphone or tablet. The actual objectives of the applications are students management:

- Attendance and punctuality control.
- Misbehaviour control.
- Activities assessment. Each student will have an activity mark.

Application should include these features:

- Data visualization. As table-like format. Attendance and misbehaviour
- Server synchronization with a custom application or Xade [dEXdG12].

The final goal is to develop an application to make teacher's work easier and comfortable. Also an objective is to write extensible, easy to read code, which allows external developers to take part into application development.

Task to be done:

- Study state-of-art solutions:

  Find out other solutions: PDAs and smart-phone or tablet related and web-based applications.

  Download to study and reuse graphical user interfaces, code or/and database structure.

- Develop database structure: tables (field names and type of data), and relationships among tables.

- Preparation for development:

  Build development and staging environment:

  Install Eclipse [Fou01], Android Virtual Machine [**?**], Aptana Plugin for Eclipse, JQuery, JQueryMobile [Mob12] and Phonegap [Pho12] from their respective websites.

  Choose application name and folder's policy.

  Make a simple application: only a blank page.

  Configure a git repository and upload the application: [Aqu12].

Development:

- Populate database with sample data. Firstly data will be hard-coded into source code to stagging. Several tables will be created:

- Groups: Several groups (four) of students will be hard-coded into javascript source code, with three or four students each other.

  Make list of groups window. This will list the four groups.

  Groups management window. Another group could be added, or removed.

- Students:

  Make list of students window per group and complete list of students.

  Students management window: to insert and update data students: name, surname, birthday, address, e-mail, tutor name, landline and cell phone numbers and nationality.

- Sessions. Each lecture has a description (as 'first hour', or 'recreation'), starting and ending time. These sessions will be hard-coded on first version.

- Teacher schedule. For the current teacher, it contains weekly and daily schedule: name of group, session and day of the week. This information will be also hard-coded.

- Attendance. For each student, it contains information about day of the week, attendance, misbehaviour, unpunctuality or excused. Though an interface this information will be set by teacher.

- Activities. Name and description of assessable exercises. Though an adecuate interface this information will be set by teacher.

  Activities group, and activities student

- Timetable for actual date: daily schedule, list of groups for each day.
- e) Add attendance, misbehaviour for each student.
- f) Add error handling.
- g) Retrieve and insert data from and to database
- h) List of attendance, misbehaviour incidents.
- i) Add activities grades for each student.
- j) List students marks and final mark.
- k) Activities management window (add-update-remove activities)
- l) Management of student annotations.
- m) List of student annotations.
- 5. Test into real hardware: Android 2.3.3 mobile phone.
- 6. Save or download data from database to disk.
- 7. Xade web interface.
- a) Study Xade web interface.
- b) Develop an ad-hoc application for retrieve Xade's data.
- 8. Develop an ad-hoc application for store data.
- 9. Synchronization with a custom server or with Xade.
- 10. Test units.
- 11. User documentation. Manual with images.
- 12. Developer's documentation.
- 13. Find out a website to host a forum, a bug report system, documentation and application download.

Tasks: The current list of tasks are: 1. Study state-of-art solutions. a) Find out other solutions: PDAs and smart-phone or tablet related and web-based applications. b) Download to study and reuse graphical user interfaces, code or/and database structure. 2. Develop database structure: tables and relationships. 3. Preparation of development: a) Build development environment: install Eclipse, Android Virtual Machine, Aptana Plugin, JQuery, JQueryMobile and Phonegap. b) Choose application name and folder's policy. c) Make a simple application: only a blank page. d) Upload simple application into a git repository2 4. Development: a) Populate database with sample data. b) Groups: Make list of groups window. Groups management window. c) Students: Make list of students window. Students management window (insert-update-delete students) d) Timetable for actual date: list of groups for each day. e) Add attendance, misbehaviour for each student. f) Add error handling. g) Retrieve and insert data from and to database h) List of attendance, misbehaviour incidents. i) Add activities grades for each student. j) List students marks and final mark. k) Activities management window (add-update-remove activities) l) Management of student notes. m) List of student notes. 5. Test into real hardware: Android 2.3.3 mobile phone. 6. Save or download data from database to disk. 7. Xade web interface. a) Study Xade web interface. b) Develop an ad-hoc application for retrieve Xade's data. 8. Develop an ad-hoc application for store data. 9. Synchronization with a custom server or with Xade. 10. Test units. 11. User documentation. Manual with images. 12. Developer's documentation. 13. Find out a website to host a forum, a bug report system, documentation and application download. In the following table a broad estimation of time spent in each task are shown.

Tasks 1 | 2

Time (hours) State-of-art solutions 10 Develop database 8 Preparation for development 40 Development.

Populate database with sample data. 20 Groups. List and management 50 Students. List and management 30 Timetable for actual date 80 Add attendance, behaviour 50 Add error handling 2 Retrieve and insert data from and to database 30 List of attendance, misbehaviour incidents. 12 Add activities grades for each student. 12 List students marks and final mark. 14 Activities management window 14 Management of student notes. 20 List of student notes. 2 Test into real hardware 20 Save data into disk 10* Total 394

2.2 Motivation

As a Technologies teacher, in my daily work I have to evaluate students work such as working with tools, cooperative work, cooperative work with other classmates etc., besides

usual activities as written exercises. It could used a long sheet, or an awkward long spreadsheet, but a portable device with a custom application should be desirable.

This application tries to increase teacher's productivity because teacher only has to write attendance, or unpunctuality two times (on official report and on application's window), and classroom notes and activity grades on very easy way.

The most important feature is to be as easy, fast and intuitive as possible. It could be desirable to be platform independent (Android, iOS, Windows RT), but Android is preferred because it is open source and has a high market share.

On the other hand, development of this application improves my computer science skills in mobile-phone applications development: JQuery, jQueryMobile, PhoneGap/Cordova, SQLite, Android, git repository management.

2.3 Methodology

This work was carried on building little blocks, also called pages, and make up it into final application. Database structure was separated from interface, and interface was also separated into dynamic and static. Each new functionality was written, tested, and polished. Each new function was written from previous one, and son on. Tools involved were Eclipse IDE (with plug-ins) and Android Virtual Manager (AVM) on Debian GNU/Linux Wheezy. When a new functionality was developed, application was tested on AVM, if it worked, source code was polished, applicable was tested again, if it was satisfactory a new change was committed into git repository.

2.4 Work plan

Several problems were faced: Eclipse environment: A stable, reliable and up-to-date IDE, with several plug-ins is needed. Download vanilla Eclipse Juno from its web-site is chosen because it is more stable, reliable, compatible with newer versions. Aptana Javascript plugin was chosen because Aptana allows source code auto-completion in JQuery. PhoneGap and Android incompatibilities. Android 2.3.3 requires JQuery-1.8.1 and does not work on higher versions. Error handlers. I have had several problems with tx.executeSql(...) function, it confused me with db.transaction(...): tx.executeSql(sql, [parameters], successHandler, errorHandler) and db.transaction(queryFunction, errorHandler, successHandler) have up to four and three parameters respectively, only first one is mandatory. I rather use success and error handlers for tx.executeSql function, atomic error control could be better choice. Passing variables to functions: Only if another solution is not known or feasible, global variables are used: named after global$_*$, *andinblockcapitals.Deadline.Developmentwasde*

Chapter 3

State-of-art solutions

Only an open source application was found for study, Siestta , nevertheless there are a lot of educational software (Sixa2, Unisoft3) but they are privative, Microsoft Windows freeware or both (SAS académico4). Siestta was evaluated. Technically it is an GPL'ed old style PHP-based web application with Ajax, an interactive editor, fckeditor and fpdf to generate reports. From user point-of-view there are online documentation5. This application includes management of students, attendance, marks, tasks, incidents, general queries, letters to parents, interviews with parents, messages, appointments, exams and more. Several screen-shots were taken and will be reused in current application:

3.1 Siestta

This application (Siestta) are also available for PDAs, it could be a valid solution but it is server-side with outdated technologies. Data structure from Siestta is standard and fully functional, and it could be partially reused by EduXes. Source code are also shown: calendario.php. It shows us a PHP application which uses sessions variables and is not Model-View-Controller oriented.

> All parts of this prealgebra textbook are copyrighted © 2009 in the name Department of Mathematics, College of the Redwoods. They are not in the public domain. However, they are being made available free for use in educational institutions. This offer does not extend to any application that is made for profit. Users who have such applications in mind should contact David Arnold or Bruce Wagner at [hidden email] or [hidden email].

text text

```
<?php
session_start();
require('config.php');
require('idioma/'.$idioma.'');
```

```
include('funciones_calendario.php');
$docente = $_SESSION['usuario_sesion'];
//recogemos variables
$mes_actual = $_POST['mes'];
$anyo_actual = $_POST['anyo'];
if($mes_actual || $anyo_actual) {
include('funciones.php');
conecta();
}
//si es la primera vez que entramos, cargamos la fecha actual
if(!isset($mes_actual)) $mes_actual = date('m');
if(!isset($anyo_actual)) $anyo_actual = date('Y');
//presentamos ahora el calendario del mes actual o cargado
//tabla con nombre mes y año y las flechas para navegar
echo '
<br />
<table class="tablacentrada_i">
<tr>
<td>
<a href="#" onclick="navegaMes(\''.$mes_actual.'\',\''.$anyo_actual.
'\',\'menos\')" title="'.$id_anterior.'"><img src="imgs/anterior_peq.png"
class="alin_bajo" alt="'.$id_anterior.'" /></a>
';
$nombre_mes = numero_mes_a_nombre($mes_actual);
```

Develop database structure: tables and relationships. Data base structure looks like Illustration 5: EduXes Database structure

Basándose en artículos, libros, etc. que se os haya facilitado y de otros que estiméis oportuno, se hablará de:

3.2 Descripción del problema

...

3.3 Descripción de los trabajos anteriores que se han dedicado a resolverlo

...

Chapter 4

Objetivo (5%)

4.1 Descripción, en un objetivo general, de la finalidad del proyecto.

...

4.2 Descripción de objetivos parciales que se necesitan cubrir para llegar al objetivo final

...

4.3 Descripción de alto nivel de las etapas que sigues en el desarrollo

...

Chapter 5

Descripción Informática (20-35%)

Para ello describirás:

5.1 La base de datos coleccionada (si tiene sentido).

...

5.2 Los algoritmos para el desarrollo de la solución

...

5.3 qué quieres resolver

...

5.4 cómo lo vas a hacer

...

5.5 herramientas conceptuales necesarias

...

5.6 herramientas utilizadas

...

ASD

FFG

OVAL BOX

OVAL BOX shadowblock

Contenido

, contenido ...

Chapter 6

Results

Application is evolving from list, edit students and groups, to its final goals. These objectives were fulfilled:

6.1 Objectives completed

- Access to any workday, any group and student.
- Management of attendance and misbehaviour of each student. The students information is still hard-coded into source files.
-

6.2 Further objectives

- Links to student and group management. These pages were done but links are not missing into main application window.
- There are several objectives not fulfilled yet, but I am on the way to get those done, those are, in priority order:
- Data visualization. Student attendance and misbehaviour have to be shown in table-like window.
- Test into real hardware. EduXes.apk has to be copied into mobile phone.
- Activities evaluation per student. A window to display activities marks and final mark.
- Timetable management. A window to manage groups timetable. When a group has class with this teacher.

- Server synchronization with a custom application or

These objectives were not fulfilled because time and skills lack.

En este apartado deberán quedar reflejados los experimentos realizados. Para ello se mostrarán:

6.3 Resultados en forma de tablas, gráficas e imágenes donde se describa cuantitativa y cualitativamente el funcionamiento de la aplicación

...

6.4 Análisis crítico de los resultados con el objetivo de decidir si el sistema implementado es válido

...

Chapter 7

Conclusiones y trabajos futuros (5%)

Resumen de los logros principales conseguidos, destacando:

7.1 Implementación

...

7.2 Resultados

...

En futuros trabajos, a partir de una crítica constructiva del trabajo realizado, plantear mejoras y extensiones del mismo.

Bibliography

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Lo relativo al anexo 1 ...

Ejemplos de tratamiento de texto:

Probamos una cita [?]

Citamos un libro[?]

Probamos a poner una nota al pié[1]

Probando: *cursiva* ***negrita*** *subrayada* enfatizar

Tools used: Sqlfairy. Tranforms SQL language into a png image. LibreOffice 3.5.4.2 to write this document. 1 Gimp 2.8.2 to get screen-shots. GNU/ Debian Wheeze October 2012

[1] Mi primera nota al pié