

LEARNING OBJECTS PREPARED FOR MOBILE DEVICES

Catalin Bujdei

Automatics Department, "Transilvania" University of Brasov, M.Viteazu Street, no.5, 500174, Brasov, Romania, phone/fax: +40 0268 418836, cbujdei@vision-systems.ro

The paper presents one solution for creation the learning objects (LOs) in the scope for being used together with mobile devices compatible Java, especially with the mobile phones. Because of the low capabilities of the mobile devices (e.g. power processing, memory available for data storing, and screen size) the content and the structure of these learning objects have been very well analyzed. These objects can not be simple used with the mobile devices, but, it is developed an application which to permit the user interaction with them. The technology chosen for implementing is Java. It has been taken this choice because of the fact that almost all the mobile phones from nowadays are compatible with this platform.

Keywords: LO, learn, mobile, mLearning, Java

1. INTRODUCTION

The idea to use, into the learning process, the mobile phones appeared because of the continuous evolution of this devices and the level of use, of this devices, by the students. In this paper are presented the main points which should be treated in the creation of the learning objects and also some aspects about the application used for interact with them.

2. PROBLEM STATEMENT

The learning objects dedicated for eLearning (electronic learning) [3] cannot be reused in this case, since they are not compatible, because of the different content types which they may include.

We can say that the mobile phones are still at the beginning of their evolution. They have evolved and still they do, from the stage of simple device for voice transmission to small computers with a very high power of processing. The advantage is that they have already screen with resolutions big enough for assure a good utilization of the material for learning. Nowadays, the most of the mobile phones recognize only a small part of the files which can be used on a normal PC. This is the reason why we have to impose a lot of restriction in the creation of the learning objects dedicated for these devices. The most advantage of the mobile phones is the possibility to connect them to the Internet, and so, it is possible to a mobile phone to communicate with any computer from the Internet network using a special protocol for communication as HTTP or TCP/IP.

The using of the mobile devices into the educational process is called mLearning (mobile Learning) [1][2]. It's a very new domain which is starting to evolve more and more.

In this paper is presented one possibility (solution) to use and develop the learning objects (LOs) into the learning process dedicated for the mobile phones

compatible Java. The structure presented for the LOs could be also used and with another types of application (not only Java applications). The main idea is to permit the students to learn different types of lessons by using their mobile phones. Because of the characteristic of this kind of devices, which are limited from the point of view of the resources, the learning objects should have a special format, which have been established during the analyze and test process.

3. LO REQUIREMENTS AND RESTRICTIONS

The learning objects proposed should have the possibility to allow: text content, image content, audio content, and video content. These are the main types of content which have been developed and used on the computers. Every type of content is dedicated for a different type of information. Some of them are fully compatible with the mobile phones, but others are only in a small part compatible. This compatibility is different from one type of mobile phone to another. We have to assure the minimum requirements needed.

The learning objects could have any combination of these types of content. The structure of any learning object should be also very well determined.

Because the content could have large size, more than the storing capacity of a medium mobile phone, it was chosen the solution to store the content of all learning objects on a special computer called Server. On the Server computer it is installed a database which will be used for the configuration and for data storing. It is permitted multiple and simultaneously access to the information stored on the Server. The application designed and developed for being used with the learning objects have only the role of interfaces with the users, it doesn't contains data, all the data is loaded from the Server computer through an Internet connection.

The different types of content are stored in specific files: the text content in text files, the images should be only in PNG format (the single image format recognized by all mobile devices compatible Java), the audio content in WAV files, and the video content in MPEG files.

4. SOFTWARE APPLICATION

For the mobile phone compatible Java, it was developed a software application [4][5] which permits to the students to choose from a list of lessons, the lesson which they wish. The software application will take all the data needed from the Server computer. The data loading will be done through a HTTP or TCP/IP communication process. The communication is opened as long it is needed (the cost of the communication was taken also into consideration). The software application will load from the Server pieces of content for the chosen lesson (represented by a learning object), not the entire content of the lesson, depending by the structure of the lesson, in the moment when it needs them for display or play. The lesson has to be divided in small size pieces in function of the content type.

The structure of every learning object will be stored into the database or into a specific file (with a characteristic format). For the audio content, because of the large

size of the WAV files, was proposed a special solution for loading the audio content on the mobile phone: to develop a special module of the software application which to permits audio streaming. Because of the complexity of the video files, the solution to use a video streaming was rejected. The single solution was to use small size video files and to reduce the quality of the image at the video files which are too big in size.

An example of page from the mobile application (developed as a MIDlet) is presented in figure 1.

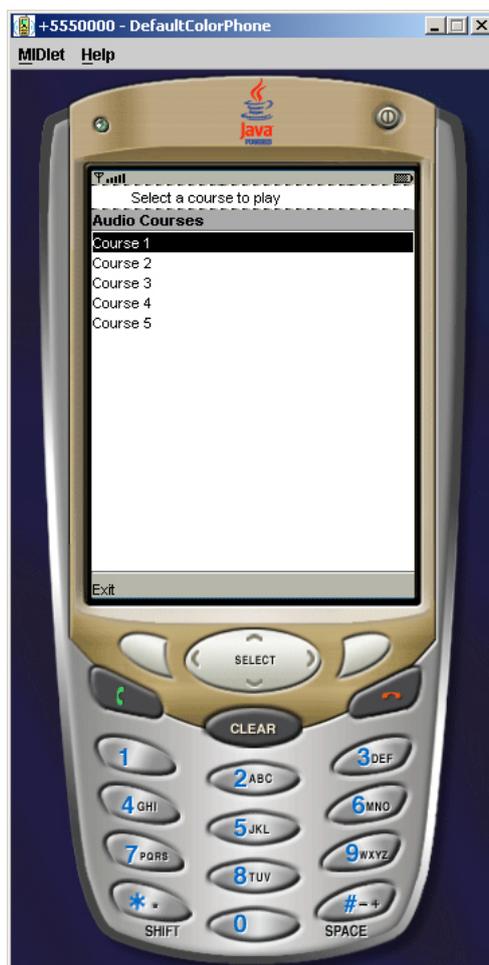


Fig. 1. Application tested with the emulator

5. LO'S STRUCTURE

For establishing the LO's structure it's necessarily to have a corresponding XML file for every learning objects. It was chosen this solution reason the fact that the XML files are easy to create, analyze and use. The XML file is created in such way that it is possible to add, when it is need, new information, very easy. It's enough to know the structure of the file and then the learning object is easy to develop. It was chosen this solution, and not the solution which supposed to keep structure information into the database, because of the simplicity. Another advantage of the XML file is the possibility for easy parsing content of the file and links the information together.

Every content type has a specific defined XML structure. The structures corresponding to the different parts of the learning object are inserted into the XML file and organized into a tree format. A specific structure may contain other structures inside or may contain links to them (if they have been defined in another part of the XML file).

One example of structure is presented below (XML file content):

```
<?xml version="1.0" encoding="UTF-8"?>
<lo name="Course 1">

<page id = "1" title="Menu options">
  <menu>
    <link page="2">Option 1</link>
    <link page="3">Option 2</link>
    <link page="4">Option 3</link>
  </menu>
</page>

<page id="2" title="Option 1">
  <text>
    This is a text section.
  </text>
  <image file-path="c:\image.png">
  </image>
  <text>
    This is the second text section.
  </text>
</page>

<page id="3" title="Option 2">
  <audio file-path="c:\audio.wav">
  </audio>
</page>

<page id="4" title="Option 3">
  <video file-path="c:\video.mpeg">
  </video>
</page>

</lo>
```

In this example it is defined a learning object called “Course 1” which contains all types of content. When the application is loading the corresponding LO, the first page displayed on the mobile phone screen is represented by the first structure of tags `<page></page>`. The title of this page is “Menu options” and it contains a menu with three options; every option is a link to another page (the connection is done by using the *page* and *id* attributes). When the first link is pressed the page with *id*=2 (which contains a combination of text and image content) is opened, when the second link is pressed the page with *id*=3 (which contains an audio file which can be played using audio streaming functionality) is opened and when the last link is pressed the page with *id*=4 (which contains a video file) is opened.

The files corresponding to the image, audio and video files can be stored on the Server hard disk or their content can be recorded into the database.

It is possible to add, for every type of content compatible, different types of

functionalities. These functionalities must be determined from the first stage of analyze or they can be implemented after the mobile application tests (but it will require more modification to be done at the structure of the XML file and also at the application).

The best way is to determine, from the analyze stage, all the possible situations which could appear and to solve them from that point.

Another advantage of this type of defining the learning object is the possibility to reuse different content parts in many learning objects. This is very easy to be done since the content is separated into small pieces.

6. CONCLUSIONS

It was presented only a simple example of using the learning objects together with the mobile phones. The advantage of using the XML files for defining their structures is obviously. In this way can be defined very complex learning objects, with much information, and with different types of content put together.

7. REFERENCES

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