

Mobile Learning Web Portal

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Abstract: In this paper is presented web-portal for mobile learning, which is developed in the University of Ruse, Bulgaria. Among the typical characteristics for web-portal as a point of intersection for useful information on one place and users authentication, the Mobile Learning Web Portal includes also modules for mobile devices recognition, content adaptation and visualization.

Key words: m-Learning, Portal, Content Adaptation, Mobile Device.

INTRODUCTION

Today the information on the Internet changes very frequently and for the users is more difficult to find the last developments in the specific field. The web-based portals are very commonly used to facilitate this task.

Portal – this is a term which is widely spread on the Internet. Portal represents a community of sites and information resources, as well as a set of services, access to which can be implemented through a single point of entry.

According to the information which the portals contain they can be divided into horizontal and vertical portals [5]. Horizontal portals are focusing on providing users the full range of services available. They are popular on the Internet and give users an opportunity to navigate through Internet resources, which are internal or external to the portal. Vertical portals are highly specialized and contain resources for a concrete area of interest.

The mobile portal is a set of services and information resources, access to which may be exercised through mobile devices. According to [3] mobile portal is web-based application that is essentially a simpler and smaller version of a portal, but specifically targeted at mobile devices. Mobile portals deliver information anytime and anyplace [4]. They also can be divided into horizontal and vertical mobile portals, as well centralised or decentralized [2]. The comparison of the most popular mobile learning portals in the Internet is given in the Table 1.

Table 1. Comparison of the most popular mobile learning portals

Name of the portal	Supported resources	Content adaptation	Supported languages
m-learning Portal [7]	Theory, case studies, m-learning solutions, news and events. <i>Tools for development of mobile applications require registration.</i>	Supports adaptation of content.	Only English language.
mLearning [8]	Articles, links, videos, interviews. <i>Free use.</i>	Supports adaptation, but the content is not adapted precisely.	Only English language.
M-learning [9]	Theory, resources, links. <i>Free use.</i>	Supports adaptation, but the content is not adapted precisely.	13 languages.
Mobile Learning [10]	News, resources, events, projects, links. <i>Requires registration for access to resources.</i>	Adaptation of content is not supported.	Only English language.
Mobile Learning Portal [11]	Articles, books, journals, societies & conferences, initiatives. <i>Free use.</i>	Supports adaptation, but the content is not adapted precisely.	Only English language.
Orthovita Mobile Learning Portal [12]	Course materials, events. <i>Requires registration.</i>	Adaptation of content is not supported.	Only English language.

The comparative analysis (Table 1) shows that the types of resources that are most commonly supported by the mobile learning portals are: theory, articles, news, events and links. Three of the portals are free for use while the other three require registration for access to some resources.

One of the important features which makes use of the mobile portals from mobile devices is the support of technology for adapting content, i.e. portal must have built-in ability to detect the type of user's device and then, if necessary properly to adapt content so that it can be visualized on the small screen of the mobile device. Four of the six examined portals support content adaptation, but it is not displayed precisely on the mobile devices. The other two do not support adaptation of the portal content.

The other disadvantage of these mobile portals is that the information is mainly in English. Only Wikipedia based portal [9] supports more than one language while other portals support only English language.

Therefore, the purpose of this study was to create a bilingual (English and Bulgarian) portal for mobile learning, which not only to provide actual information in this area, but also to allow its use from mobile devices through appropriate adaptation of the content. Thus enables users to receive, add and update information not only via personal computers, but also through mobile devices.

LAYOUT

1. Portal Architecture

The architecture of Mobile Learning Web Portal (MLWP) uses three-layer architecture: Data layer, Business layer and Presentation layer (Fig.1).

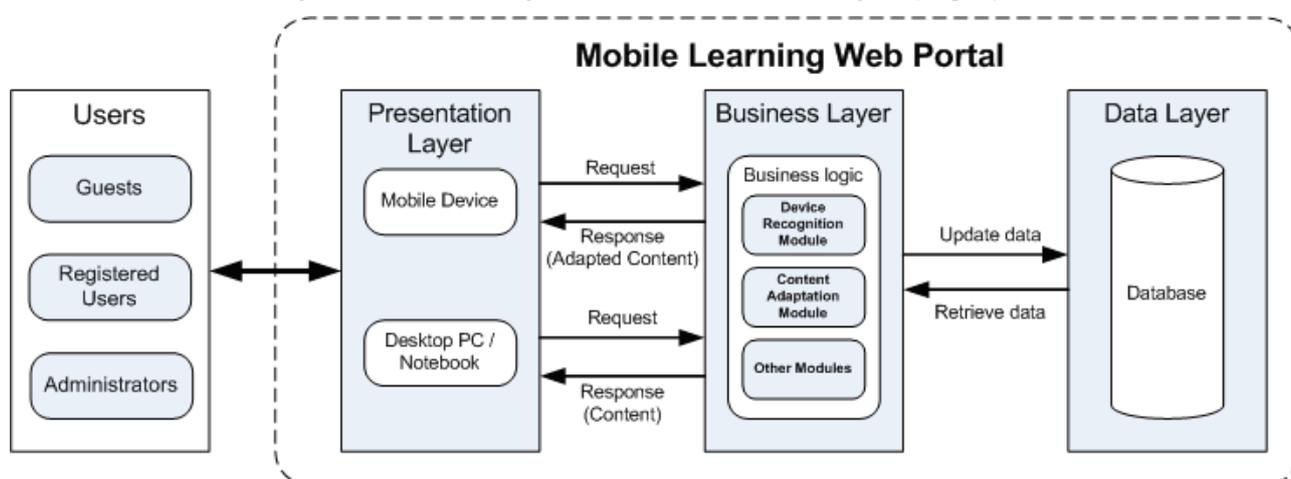


Fig.1. Architecture of the Mobile Learning Web Portal

The Data layer contains the data base management system (DBMS). For the realization of the portal the DBMS MySQL is used. This is the layer where all data necessary for implementation of services provided by the portal as well as those necessary for its functioning.

The Business layer consists of web servers on which are deployed software modules, realizing the functionality of the system. For portal implementation the Apache Server is used. The business logic is programmed in PHP. As mobile learning portal should be able to work on mobile devices with limited screen size, the business logic has two special modules: module for the device recognition and module for content adaptation (Fig.1). For realization of the adaptation of the content the methodology described in [1] is used. The determination the type of device is based on the HTTP User-Agent Header which is part of the web browser's request.

The Presentation layer is implemented using web browsers (on PCs or on mobile devices). It is used to add interactivity between the users and the portal and also to visualize the content.

The process of content adaptation completed by the modules in the Business Layer (Fig.1) works using the following algorithm:

- After receiving the request from the web browser of the user's device the Device Recognition Module using the HTTP User-Agent Header recognizes the type of the device (mobile or desktop/notebook).
- The information is updated and/or retrieved from the database;
- After receiving the information from database the Content Adaptation Module creates response to the request combining this information with appropriate visualization template for the recognized device;
- A response with appropriate adapted content is send to the device.
- The content is visualized on the user's device.

2. Portal Functionality

The MLWP supports three types of users:

- Guests – these are users which are not registered in the system;
- Users – these are users which have registration in the system;
- Administrators – these are users which have access to the main system tools and abilities to publish and edit information in the system's database and to present information to the guests and users of the portal.

The developed portal gives to these types of users the following abilities:

For the guests (Fig.2):

- Gives ability to select language (Bulgarian or English);
- Gives systematized actual information about the mobile learning;
- Includes detailed information about the future conferences in the area of mobile learning;
- Introduces users with different projects (finished or under development) which are part of so called European Mobile Learning Community;
- Gives abilities to free speak and comment the mobile learning using forum tool;
- Includes links to other mobile portals and web sites which include information about mobile learning;
- Gives ability to register in the portal.

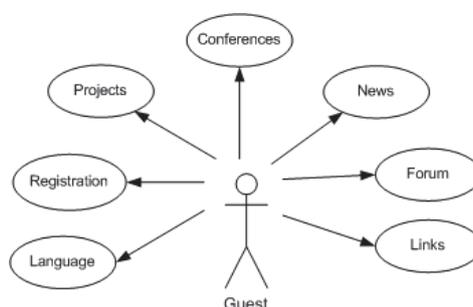


Fig.2. Use Case diagram for user type "Guest"

For the registered users MLWP gives additional abilities (Fig.3):

- Authentication in the portal;
- Reading and uploading of resources;
- Viewing and editing of the user's account;

- Link to the FLAGMAN Mobile Learning System [6], developed in the University of Ruse.

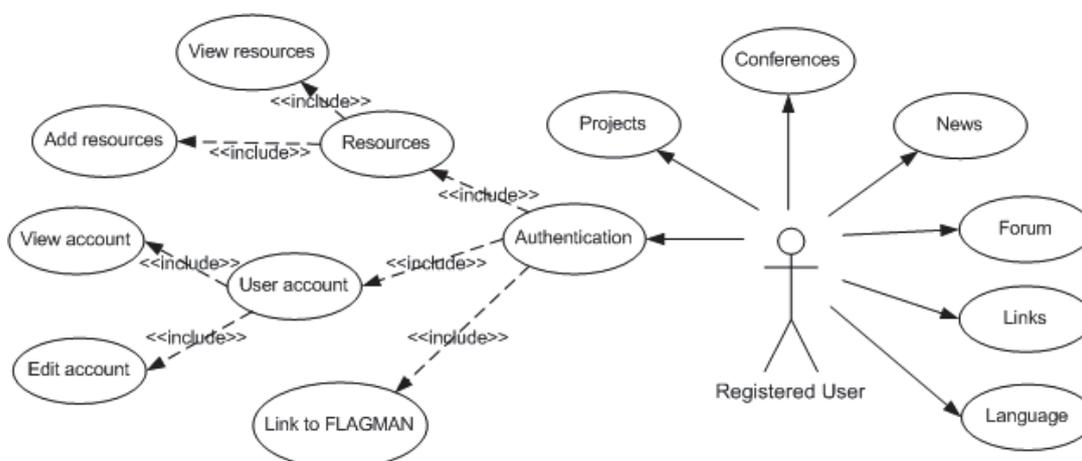


Fig.3. Use Case diagram for user type “Registered User”



Fig.4. Use Case diagram for user type “Administrator”

For the administrator MLWP dives additional abilities also (Fig.4):

- Publishing and deleting of news from the system’s database;
- Publishing and deleting information about conferences from system’s database;
- Publishing and deleting information about mobile learning projects from system’s database;
- Determining the user’s access level;

- Deleting a user;
- Deleting all users which are inactive for certain period of time;
- Temporary banning a user;
- Deleting a user with temporary banning.

3. Testing

The developed portal for mobile learning is tested using PC and a mobile device type PDA, which is running under the operating system Windows Mobile 5.0.

During the testing of the portal on PC are used two web browsers – Mozilla Firefox and Internet Explorer. On Fig.5 are given screenshots for initial screen of the portal in English and Bulgarian. The users can switch between these two languages using the buttons Bulgarian or English in the bottom of the menu (Fig.5). After that all information and interface are presented on the selected language.

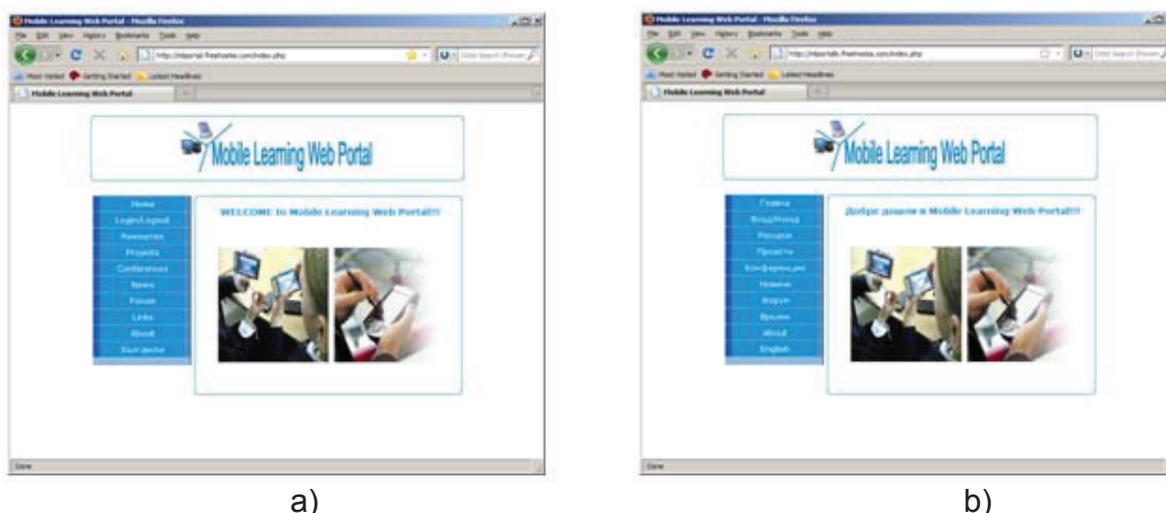


Fig.5. The screenshots of the initial screen of Mobile Learning Web Portal in English (a) and in Bulgarian (b)

During the testing of the portal on a mobile device HP iPAQ hx 2790 (Fig.6) three different mobile web browsers - Internet Explorer, Minimo and Opera Mobile are used.

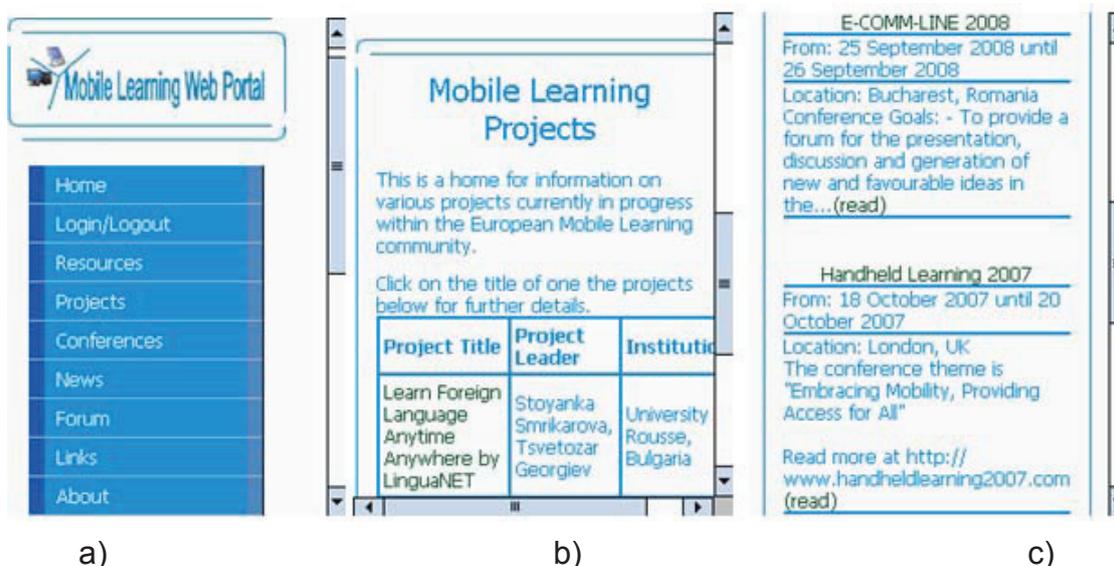


Fig.6. The mobile device screenshots for main menu of the portal (a), information about mobile learning projects (b) and conferences (c)

The test results show that the mobile portal functions correctly, the mobile devices and mobile browsers are correctly recognised and the content adaptation is accurately applied.

CONCLUSIONS AND FUTURE WORK

The developed portal for mobile learning is used in the University of Ruse to support the mobile learning platform FLAGMAN with additional information in this area - resources, news, conferences and projects. It allows different levels of access and information update as well as its administration by a system administrator. Through simple and systematic design is achieved maximum facilitation of the user to perform the desired action.

The portal provides access for the registered users to files containing information about mobile learning and gives abilities to upload new ones. It supports recognition of different types of devices (PCs, PDAs and cell phones) and adaptation of the content to their capabilities.

The portal is widely usable and other educational institutions or users working in the mobile learning area can add information in it.

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