

APPROACHES TO BUILDING WEBSITES FOR TRAINING PEOPLE WITH SPECIAL EDUCATION NEEDS

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***Abstract.** This work discusses several approaches to building websites for training and facilitating people with special education needs (SEN), implemented over the last four years with the authors' involvement. Achievements are credited and avenues for improvement are suggested, as emphasis is given to technologies and resources of key importance in providing the required level of accessibility. Two instances of learning management systems are considered as tools for developing websites dedicated to training and working with people with SEN. A summary of the recommendations and requirements of developers of such sites is made in view of improving the degree of accessibility.*

Keywords: hypertext navigation, interfaces, accessible web, accessibility, special education needs

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Introduction

The term “e-learning” covers all forms of electronically assisted learning, while “distance learning” stands for “a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both.”[1]

In recent years, the issue of social adaptation of people with special education needs (SEN) has become especially topical. One of the paramount tasks of social adaptation is to provide these people with opportunities for comprehensive and high-quality education. Information and computer technologies play a crucial role in the life and education of such people today.

The common and most extensively used learning management systems do not always secure sufficient and adequate means for training people with SEN. The key issue, therefore, that has to be resolved to that effect and which has not found an effective theoretical, technological, and technical solution, is how learning content can be modeled and presented in such a way that an e-course be automatically synthesized and adapted to the particular learner depending on their physical and psychological specificity, performance, learning style, etc.

General principles for building accessible webpages

Design and development of websites meant to be accessible to people with SEN, call for a set of 14 key principles that must be observed. Full details are provided in [2].

General principle 1. Equivalent alternatives for aural and visual content are to be provided and offer the same functions and objectives as the audio/visual content when presented to the user.

General principle 2. Color and text are not the only ones to be counted on, but graphics must be understandable when viewed with disabled colors. For example, if designers rely only on color, people who are unable to distinguish certain colors, as well as the users of devices which do not support colors or have non-visual displays, cannot have access to this information.

General principle 3. ‘Markup’ of proper structural elements is to be used or presentation is to be controlled in terms of styles rather than by means of presentation elements and attributes. Improper use of markup, i.e. not complying with specifications, impedes accessibility.

General principle 4. Marking the natural shifts in a document language must allow speech synthesizers and Brail devices to automatically switch to the new language making the document accessible to multilingual users.

General principle 5. Tables are to be created in such a way to allow their elegant transformation and they are to have the required markup in order to be transformed by the access browsers and other user agents.

General principle 6. The pages that utilize new technologies are to be transformed elegantly and be accessible even when new technologies are not supported or are disabled.

General principle 7. User control is to be provided for time-dependent changes in content to enable providing pauses or halting of movement, blinking, scrolling or auto-updating objects or pages.

General principle 8. Direct access to embedded user interfaces and accessible design of the user interface (access to functionality regardless of the particular devices, handling the keyboard, self-voicing, etc..

General principle 9. Design for independence of devices and using facilities that allow activation of page elements through various input devices.

General principle 10. Using temporary solutions in such a way that assistive technologies and legacy browsers can operate properly.

General principle 11. Use of W3C-technologies and guidelines, as well as providing an alternative accessible version of the content.

General principle 12. Provision of context-specific and orientation information in order to assist the users to comprehend more sophisticated pages or elements (complex interrelations between page sections may be hard to grasp for people with cognitive or visual impairments).

General principle 13. Clear navigation mechanisms (orientation information, navigation bars, site maps, etc.). Unambiguous and meaningful navigation mechanisms are paramount for people with cognition or sight challenged.

General principle 14. Simplicity and clarity of documents. Images are also to have text equivalents (for people who are completely or partially blind, as well as for users who cannot or have opted to not see the graphics).

Validation tools

Code validation is mostly implemented through HTML Validator - an add-on for the FireFox browser, which shows the location and type of mistakes made and is based on two validation algorithms: Tidy and OpenSP (SGML Parser), developed by W3C. This instrument checks the validity of the XHTML/HTML and CSS code (without requiring access to an online server) and shows which accessibility guidelines are met and gives advice on how page accessibility can be improved.

The following online instruments are used in addition:

- The Web Accessibility Toolbar – to check the validity of web pages for different aspects of accessibility;
- W3C HTML Validator, HTML Tidy Validator and WDG HTML Validator to check the validity of the HTML code;
- W3C CSS Validator to verify the CSS;
- W3C Link checker and WDG Link Valet to check HTML/XHTML documents for broken links.

Testing the systems: results and conclusions

We will consider five web sites meant for training and facilitating people with SEN and implemented over the last four years by teams led by the authors and with cooperation from Prof. DMSc. G. Totkov and Assoc. Prof. D. Levterova-Gadzhhalova; as well as two free learning management systems (ATutor and eFront). We examined them in the summer of 2010.

Website 1: Portal site meant to provide information for people with SEN, implemented by using Joomla 1.0.4 (2007) by P. Garova and E. Asyova–<http://www.disabilityBG.org>.

It is used for news and materials by our colleagues from the Department of Education at Plovdiv University “Paisiy Hilendarski”. It also features a section for contact with councilors and a forum so that users with SEN can receive real help from qualified pedagogues and psychologists with the Department of Education and with other organizations.

At the time it was created, the two options on the developers’ shortlist were Drupal and Joomla. The latter was selected as the largest project featuring a content management system (CMS) and complete Bulgarian localization. A suitable template was chosen and adapted which was inherently based on accessibility standards as set out by W3C.

Some of the key features of the template are the JavaScript code used to change the font size, the good navigation using a keyboard and the options to skip certain materials in order to reach the most important parts of the portal, the use of alternative text for the graphics and the lack of blank graphics called dummies.

Scripts and templates added by the developers allow compliance with priority levels AA and AAA. A virtual keyboard and hot keys have been integrated and suitable color schemes have been selected. A drawback is that the backend is not adapted to make it usable by persons with SEN, which obstructs the publishing of materials by such authors; full accessibility allowing the use of hot keys to reach the menus has not been achieved; the virtual keyboard does not operate in the search fields of the Joomla modules.

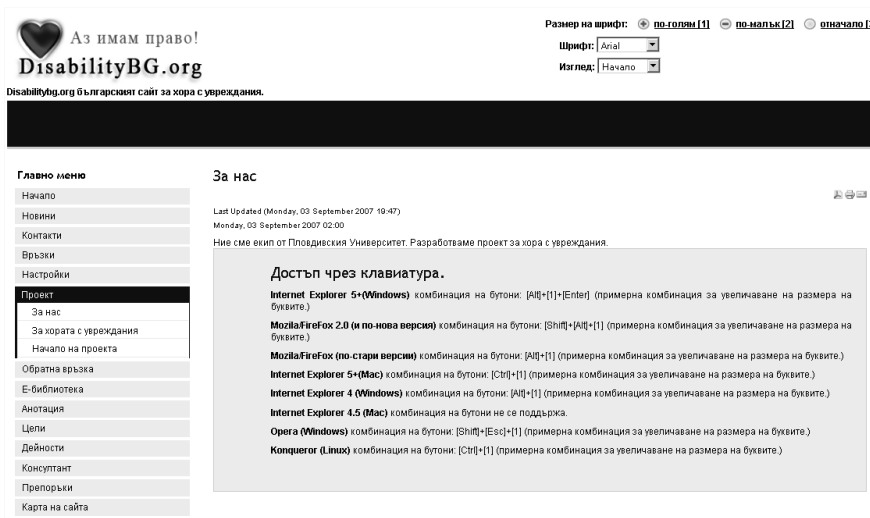


Fig. 1. DisabilityBG.org

Website 2: This is a portal site for people with SEN created by H. Hristov (2008). Joomla 1.5.7 is used, enhanced with scripts and modules developed by the first author of this paper and based on PHP, MySQL and JavaScript. The site is no longer active today.

At the time it was set up, the Beez template was chosen because it was found to be most clear in terms of graphics and photos and has a feature allowing font size adjustment. Accesskey attributes were added to the HTML tags in order to provide fast access to the most important elements of the menu. The virtual keyboard was implemented by <http://www.codeproject.com/jscript/jvk.asp> - the version with a popup window. The design and development of this portal website has served as foundation for *Website 3*.

Website 3: This website was created by H. Hristov in 2009 and was based on Joomla 1.5 enhanced with an add-on designed to add accessibility. The demo site is no longer supported.

The module adds some features to the chosen template such as text size adjustment, adding a virtual keyboard, changes in the color scheme and modifications of the icons to allow better readability by persons with SEN.

Website 4: This is the version 1.0 of a portal site meant to provide e-learning to people with SEN by S. Gospodinov and V. Kireva (2009). It uses a framework

based on PHP, MySQL and JavaScript and designed by the first author of this paper. The demo site is no longer active because it has been replaced by the current version 2.0, discussed below as Website 5.

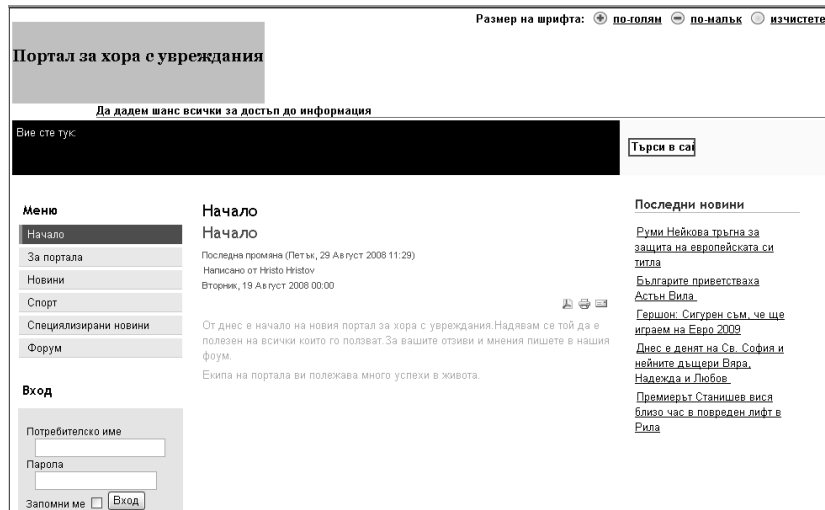


Fig. 2. People with disabilities portal site

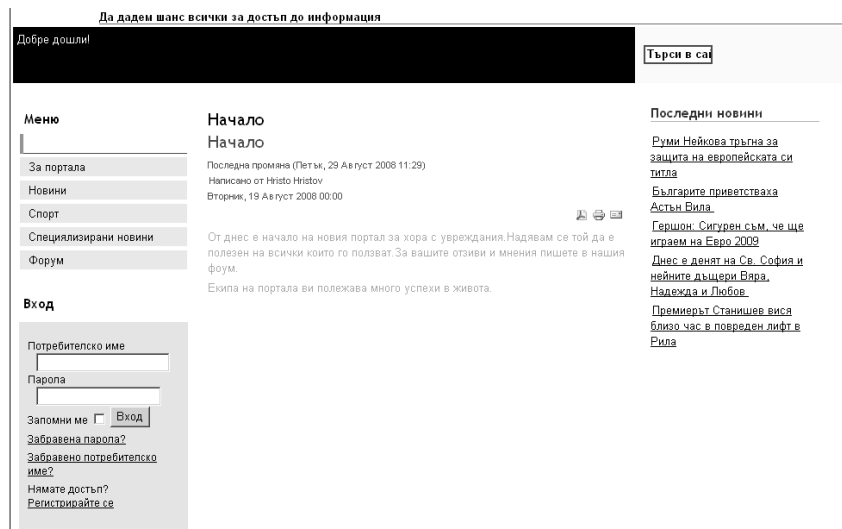


Fig. 3. People with disabilities portal site update

Based on our tests, we can say that the accessibility of this website meant to offer training for people with SEN meets the requirements for compliance with priorities from AA to AAA [2]. Improved versions of the virtual keyboard ([3], [4]) and a text editor suitable to be used by people with SEN have been implemented in all three modules (user, moderator and administrator), which makes possible for the system to be used not only by learners, but also by trainers with SEN.

Standardized key combinations have been implemented [4], and the color schemes have been chosen using two solutions offered by [5] and [6].



Fig. 4. Accessibility-bg portal site

Website 5: This site, <http://www.accessibility-bg.com>, is a follow-up of Website 4 implemented by S. Gospodinov and V. Kireva (2010).

This is actually a completely new website using a new framework – CodeIgnition. The major advantage is the greater flexibility and support for mobile devices. The site passed all tests for accessibility and validation. It was also tested with most mobile devices available in the summer of 2010. It uses the TinyMCE text editor, which allows accessibility at the back-end, too, i.e. in creating lessons and administering the system. An accessible version of the Captcha code is applied. Tab indexing is implemented where possible in order to facilitate the movement from one element to another while skipping the elements of little importance. The virtual keyboard (<http://www.greywyvern.com/>) supports 31 languages and was adapted to incorporate elements in Bulgarian.

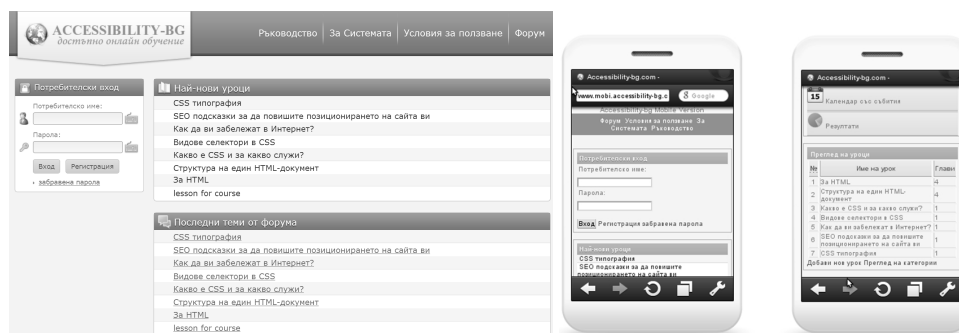


Fig. 5. Accessibility-bg portal site, rebuild

Learning management systems

ATutor (University of Toronto) – offers a very large set of functions:

It includes Social Networking; offering courses – creating open and for-fee learning courses; email notification system through which users can communicate

and exchange information; user profiles where learners can upload photos and provide personal information; workgroups where users can collaborate in solving a certain task; file depository allowing users to upload files and share them with other users, to name a few. However, this LMS has some disadvantages, too. The application interface is not simplified and some of the functions are not visually highlighted; it does not support resolutions of less than 1,100 pixels in width unless part of the content remains hidden; it does not support mobile devices, not even ones with large displays, e.g. 320 pixels in width by 240 pixels in height – the side bar takes almost the whole display and thus navigation of the site is obstructed. As a whole, we tested this system and found that it offers quite good accessibility and complies with the accessibility criteria with very few exceptions.

eFront by EPIGNOSIS Ltd. offers functionality that is similar to that of ATutor, but varies depending on the particular version. It comes in three versions, one of which is free is used for non-commercial purposes.



Fig. 6. ATutor LMS

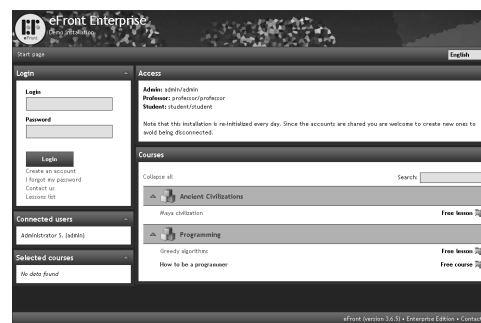


Fig. 7. eFront LMS

The system interface is intuitive and all functions are well laid out. Among the additional features are the option to create a custom language file – this would facilitate the translation of the interface into the Bulgarian; an option for integrating personal email in the notification system eFront. We tested the system at low resolution under 800 pixels in width, 600 pixels in height and disabled Java script and found no issues that would obstruct users as far as the main functionality is concerned. The system does not support a mobile version and is not optimized for screen readers. Our tests on v.3.6.3 showed that although the system offers a variety of functions, it does not comply with all accessibility guidelines and therefore would inhibit users with disabilities.

Conclusion

According to statistics from the National Statistical Institute for the year 2001, 263,143 people in Bulgaria had a medically certified degree of disability, as 92% were aged 16-64. It was found that 51% of disabled males and 49% disabled females had a low level of formal education (primary-school) [8]. All of them are current or prospective users who could benefit from sites meant for training, awareness raising, and otherwise facilitating people with SEN. Building such

websites, however, must comply with some general principles as formulated in the W3C guidelines. When such an approach is valid for the backend, this will empower teachers with SEN to design their own online materials. Good practices apply such an approach to all three modules: user, moderator and administrator and support mobile devices whose popularity has been bursting with young people and will continue to grow. Available LMS and CMS products can be modified to become powerful tools for building such sites. Future developments by the authors may focus on people with motor disabilities and support for related devices.

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