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Psychological Computer Testing Based on Multitest Portal

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Abstract: The article devoted to the problem of creating a universal tool for computer psychological testing based on portal MultiTest. The portal is a WEB-server with multi-user access to ensure privacy and security of information received. The description of the portal structure, potential user groups (anonymous, tested, teachers, editors, analysts, administrators, super administrators) and their capabilities is given. Particular attention is given to the "test editor", developed by authors, with the help of which creating and adding new psychological tests is available even for users without programming experience. Tools used by the user with an editor rights are editing modules arranged in a database. The paper presents two applications developed on the portal basis: 1) a vocational guidance test for applicants of the Tomsk Polytechnic University and 2) assessing the IT-specialists competence.

Key words: Multi-user portal · Computer psychological testing · Editor of psychological tests · Applicants career guidance

INTRODUCTION

With the advent of the first tests most commonly used term by which the designated measuring individual psychological characteristics, has become the term "psychological testing." Originally, the term "psychological testing" has been used broadly, including any measure in psychological science. With the tests development, the scope of psychological testing is narrowed, to measure personality and cognitive features. Psychological testing is a foreign psychology term, indicating the procedure for establishing and measuring individual psychological differences. In Russian psychology we often use the term "psychodiagnostic examination." Psychological testing is used in various areas: career counseling, professional selection, psychological counseling, psycho-planning work, etc. [1]. Most of the current psychodiagnostic instruments is computerized [2-7]. Over the past few years, such computer programs were developing in Tomsk Polytechnic University, including as separate modules within the specialized systems and complexes: psycho-physiological state of pregnant women monitoring [8], psychophysiological assessment for students readiness for future careers [9.10]; assessment for professional competence of separation production staff [11], assessing the quality of training in high school [12,13]; assess the competence of students and IT-specialists [14-16].

The main applications majority for computer psychodiagnosis disadvantage is the inability of centralized access to the testing procedure and the information gathered. To solve this problem in the Institute of Cybernetics of the National Research Tomsk Polytechnic University MultiTest portal was designed with multi-level user access [16], which allows to unify the process of organizing computer psychological testing for all fields of activity.

Multitest Portal Structure: The portal is a WEB-server with multi-user access to ensure privacy and security of information received. Users gain access to the portal using an individual or group account and password. Within the group, each user is identified by an account without a password. Group accounts are only used for tested (they can access the portal using an individual password).

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Fig. 1: Portal user groups

Users are divided by roles (Figure 1):

- anonymous-users who are for informational purposes may undergo some tests, but the information about the tests will not be added to the database;
- tested-users who are tested under the direction of testing and information passed tests is stored in a database for further processing and analysis;
- testers-users that make up the test program, gaining the group test, conduct tests and treated with the test results;
- analysts-carry out a comprehensive analysis of the results;
- Editors-carry out the introduction of new techniques and tests universal tools of the portal;
- Administrators-carry provisioning portal to other users (testers, editors, administrators).
- super administrator-gives administrators the right to use certain testing and analytical methods of the portal.

For testing, you can use an ordinary browser installed on any computer. Tester logs into the portal, using a standard web browser (Internet Explorer v7 and above, Mozilla v3 and above, Opera v9 and above), chooses the role of "tester" After selecting this role he gains access for testing tools, both psychological and pedagogical (knowledge control).

His following action-is to make up the test. To do this, he needs to choose the kinds of tests and procedures and to gather tested for this test. "Testers" are drawn from previously conducted tests on the portal (details of which are already in the portal database), or enter new ones. "Testers" can be grouped. "Tester" may test simultaneously with any number of groups and any number of "tested" not in groups. "Tested" using a standard browser, go to the portal, sign in, choose the appropriate role and see that they can take part in the testing.

"Tester" can gain access to information in real time with the help of AJAX technology (without reloading the page) on which, who has started testing, how many questions he answered and all the "tested" answers.

After the testing information is stored into a database and made available for further processing by "analysts." "Analytic" can process the information with the tools available on the site, or save it to XML-file for further processing with the use of standalone programs. The structure of XML-tags file will be described in the reference section of the portal.

For testing not only browser but specialized client can be used-simple program with additional features, compared to browser-version, web-site for a particular purpose.

The portal provides tools to create new testing algorithms. To users who perform the role of "editors" tools to create new versions of tests on the built-in templates are available. "Editors" create "questions" using text, graphics, video and audio applications. The developed algorithms are used to construct various forms of tests (with questions open and closed), to vary, if necessary, the order asked questions, designed on the basis of available templates "keys" to the tests. If necessary, complex testing algorithms can be created by integrated specialized interpretive programming language scripts.

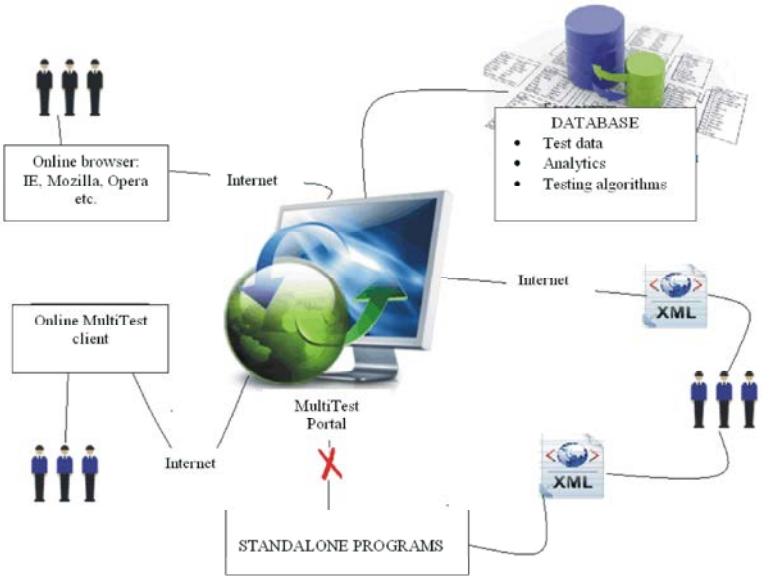

Fig. 2: Software structure

All the algorithms are stored in a database and can be edited and saved to XML-file for later use in standalone client. The processing results and tests analysis are entered into the database.

Technically, the portal is implemented on the WEB-server Apache, so you can connect external modules to provide data to use database to authenticate users, modify, error messages, etc. The core of Apache includes basic functionality, such as the processing of configuration files, the protocol HTTP modules and the system load.

As a client you can use the browser or you can create a single client in the form of a software product.

To store the tests data, information about users, the MySQL database is used. With its open architecture and GPL-licensed, in the MySQL database are always perform new table types. To describe the test the universal data format XML is used, which allows, for example, to create new tests included in the portal, use third-party software, including the usual text editors.

For the data exchange during the test AJAX technology and data format XML is used, which allows, on the one hand, to convinient use the browser as a client and on the other hand to create a customer portal in the form of software (Figure 2).

As you know, AJAX-is not an independent technology and the concept of using multiple related technologies. AJAX is based on two main principles:

- use of sever dynamic access technology "on the fly", without reloading the whole page completely, for example:
- using XMLHttpRequest (main subject);
- through the dynamic creation of child frames;
- through the dynamic creation of tag <script>.
- through the dynamic creation of tag <img>, as implemented in the googleanalytics;
- the use of DHTML to dynamically change the page content.

As the format of the data transfer can be used fragments of plain text, HTML-code, JSON or XML.

Using AJAX can significantly reduce the traffic when working with a Web application because often, instead of loading the entire page you need just download only the changed part that is usually quite small.

The Psychological Testing Organization Based on Portal: Portal MultiTest includes test editor, which allows users who do not have programming skills to create new tests (both psychological and knowledge control). Furthermore, these users can create new sites for testing, without resorting to the programmer and web-designer. MultiTest portal is "a test management system", similar to the known systems of CMS (Content Management System). Members assigned with the portal editor rights, in terms of the CMS are content managers. They have the following features: creating and editing tests, the creation of new interfaces and reporting of test results, the creation and editing of algorithms for analysis of test results, etc.

The portal is a modular, open and extensible system. The ideology of the portal-increased portal functionality is made by users, programmers create a

portal development tools. For users familiar with programming and web-design portal opens up additional opportunities. With built-in interpretive programming language to implement a variety of processing test results and using standard tools (HTML, PHP, JavaScript, XML)-build new types of modules.

Tools used by the user with an editor rights are editing modules arranged in a database. Files with the modules are designed for storing immutable modules, as well as backup and sharing information. Since editing tools modules actually produce editing XML-files according to the rules in accordance with the type of module, the editor of the test may be an autonomously operating program to understand the structure of the module type.

Developing Applications Based on the Portal Multitest: For today there are 2 developed portal-based MultiTest applications: to assess the competence of IT-specialists and for career counseling students of Tomsk Polytechnic University, which are integrated into the portal of the Tomsk Polytechnic University. For each application, implemented a set of psychological tests.

The processing and analysis of the test results is given in the developed applications conclusion on the extent to which one of the IT-specialties or one of the specialties of the Tomsk Polytechnic University

With the final results page the applicant can click on the link and get the details of any interested him specialty.

Currently developed applications being tested at the Institute of Cybernetics and the selection committee of the Tomsk Polytechnic University. There are two applications under development: foreign students adaptation assessment and psychological support of first-year students.

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