

Functional requirements, architecture and prototype of systems of academic subject studying support

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Abstract

In this paper the basic functional requirements are stated, made for systems for separate educational subject learning process support. It is offered to distribute systems of such type on the developer's server, working places of a teacher and learners. The main concept of the program system is realization of educational means and means of educational process management in the form of program modules with accurate functionality – Electronic Taskbook, Electronic Register etc. The architectural solution of a program system of such type is offered for academic subject, in which practical works play an important role. The results of this work are realized in the prototype of the system, supporting algebra learning in secondary school.

1. Introduction

At the given stage of information of education the general scientific, methodological and technological problems connected with the organization of processes of creation, support and effective use of software of educational purpose during their life cycle are actual.

The research purpose is the analysis of structure and development of methods of designing and realization technologies of pedagogical program environments, (in the further PPE) which are distributed at 3-levels: an Internet-server of the PPE developer, a teacher's workplace in the computer class, equipped by a local network and a pupil's workplace.

Research consists of definition of the general system requirements to the PPE as a whole and components of the PPE which

need to be realized on each of three levels of the system, which are defined as a *methodologist's workplace* (the author of the PPE techniques), a *teacher's workplace*, a *pupil's workplace*.

A methodologist's workplace is a complex of software which provide a user's registration, providing with technical services which consist of operative updating of the PPE (delivery of the new version or the release), supply of methodical services which consist of operative methodical consultations and conducting teleconferences, monitoring of the efficiency of the PPE use in the educational process, operative improvement of components of the educational purpose. The general components of educational purpose, for example, are electronic textbooks on educational subject, electronic guides, testing systems on subjects etc.

The teacher's workplace provides such functions: managements of educational process (electronic register of the class), formation of teaching material for theoretical part of a lesson, formation of educational problems for practical work of pupils and control works, the automated check of solving of educational problems and so on.

The pupil's workplace provides such functions: performance of practical problems, independent work on studying of theoretical material, performance of control works.

2. The basic initial requirements

2.1. Functional requirements to the PPE prototype

2.1.1. Functionality of the system as a whole

As a result of research it is necessary to develop the architecture of such software (in

the further SW) of educational purpose, which functioning provides an effective interaction of the SW developer, a SW user, and a SW pupil-user. This interaction consists in:

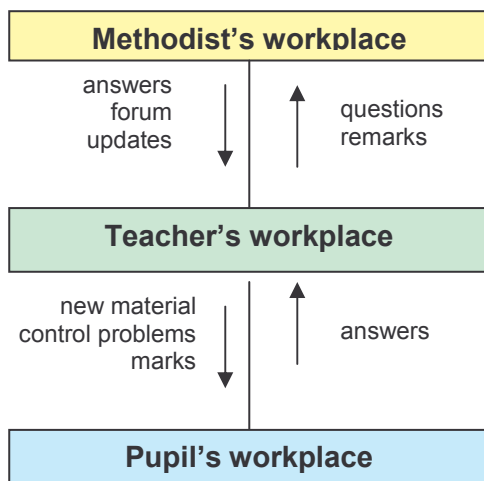
- debugging and conducting by the developer of the account of the SW users, debugging and carrying out of monitoring of the SW quality from teachers-users of the SW, operative management of configuration of SW by the SW developers.
- management by the teacher-user of the SW of educational process by means of specially developed control facilities of educational process of type "electronic class register", "generator of educational problems", "module of check of educational problems".
- reception by the SW users of the operative help both from teachers and from the SW during work on performance of an educational problem.

2.1.2. Requirements to the system architecture

Architecturally the SW on each of three levels can be the operating environment, which functioning does not depend on filling by substantial teaching materials from some group of subject matters.

The SW is focused, first of all, for use from the disciplines, which important part are cycles of practical works, carried out by pupils at a lesson and are subject to checking by the teacher.

The SW can be efficient (with necessary restrictions) and in those variants when it is used only in a class, equipped by a local network or only on (local) workplace of a pupil.



Picture 1. Architectural model of the system

2.1.3. Data requirements

Protocols of data interchange and data formats should be unified and coordinated with the international standards.

2.1.4. Requirements to a methodologist's workplace

Management of the registered users can be realized with the database of users.

Process of monitoring can support such functions:

- account of messages from the registered teachers;
- classification and preservation of messages of the registered users-teachers;
- formation and maillist of answers to the message of users;
- conducting the account of messages and decision-making on changes of the software;
- teleconferences, forum of the SW users.

The process of management of the configuration can support operative updatings of the given SW version through the Teacher's workplace and delivery of new versions of the SW.

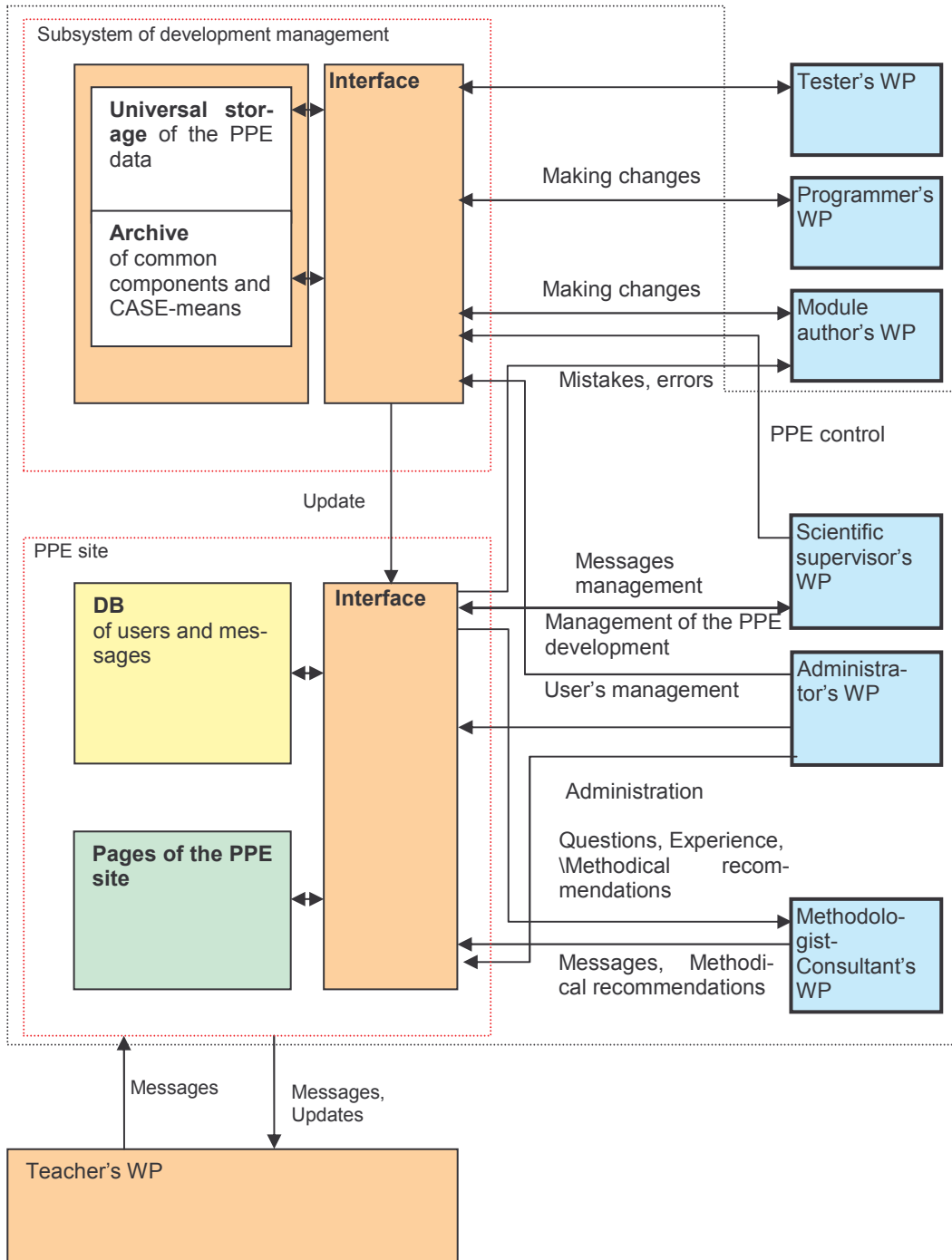
Process of improvement of the system should be supported by system of CaSe means and which incorporates in itself specialized editors of modules of Electronic textbook, Electronic taskbook, Collection of exercises, Collection the tests etc.

2.1.5. Requirements to a Teacher's workplace

Management of educational process should be realized in the form of the module Electronic class register. This module supports:

- formation of teaching material for the theoretical part of a lesson,
- formations of educational problems for practical work of pupils and control works,
- automated checking by the teacher of performance of educational problems,
- saving of the personified educational means of pupils.

Function of the SW monitoring should be realized as the module of remote communication with the Methodologist's workplace.



Picture 2. Architectural model of the PPE subsystem and its environments

This module supports:

- registration of the teacher as the SW user;
- sending by a user to the methodologist of the SW of message (questions of the methodical character, the revealed mistakes, errors, remarks, offers);
- getting answers to messages;
- participation in a teleconference.

Function of management of the PPE configuration should be realized as the module of the remote communication with the Methodologist's workplace. This module supports:

- operative updating of the given version of the PPE through the Methodologist's workplace on workplaces of pupils;
- delivery of new versions of the SW through the Methodologist's workplace on workplaces of pupils

2.1.6. Requirements to the Pupil's workplace

The Module Pupil's workplace should provide

- procedure of personification of the user-pupil before the beginning of work in the SW. The procedure of personification defines the personal complete set of educational means with which the user works.
- performance of educational problems, that is practical work on the SW.
- sending to the teacher of results of educational problems performance and getting from the teacher of an estimation for performance of practical educational problems.

3. Methodologist's workplace

Below we shall consider the architecture on functionality of a Methodologist's workplace in more details.

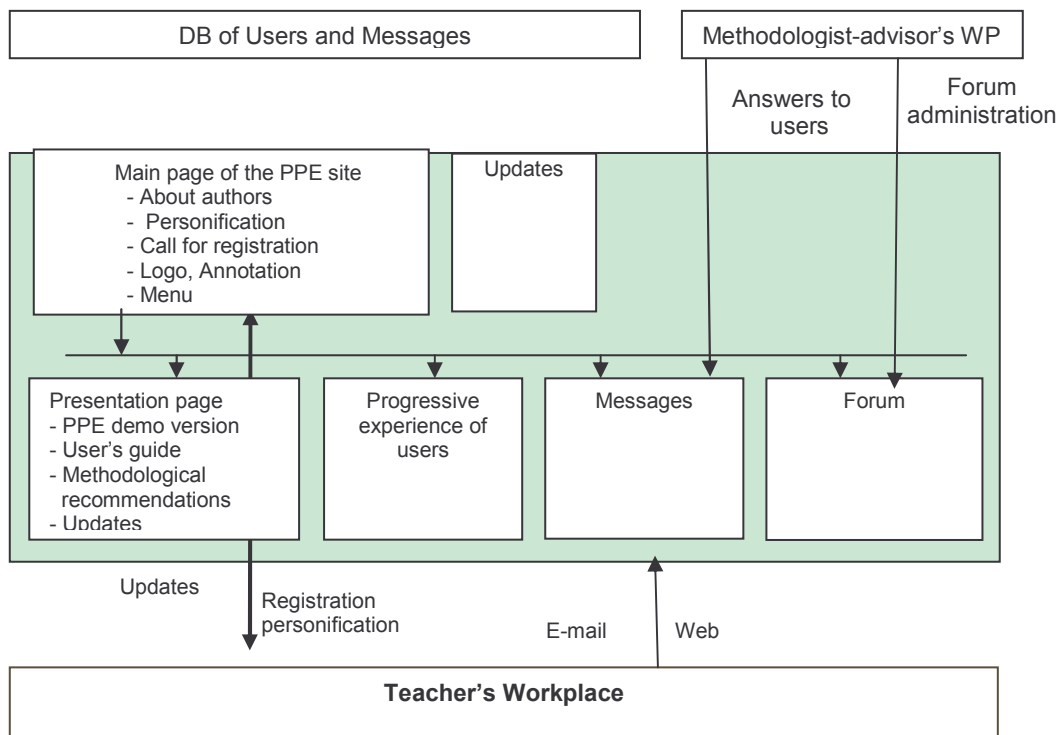
Development of requirements of the user to the subsystem "Methodologist's workplace" was carried out by the method of reference points of sight (VORD). There were allocated and identified the following reference points of sight:

- the point of view of the MWP coordinator;
- the point of view of the MWP research supervisor;
- the point of view of the methodologist-author of the program module;
- the point of view of the methodologist-adviser;
- the point of view of the programmer-developer of the program module;
- the point of view of the programmer-tester of the program modules;
- the point of view of the teacher – the MWP user;
- the point of view of an outside user of the MWP;
- the point of view of the manager of the MWP subsystem;
- the point of view of the system administrator.

The analysis and identification of requirements of the user of the MWP subsystem is used for construction of ascending architectural model of the MWP subsystem and its environment.

3.1. The PPE site

The basic functionality of the PEE, mentioned in requirements to the PPE, is provided by the PPE site.



Picture 3. Structure and interfaces of the PPE site

Interfaces of the PPE site

The PPE site has the following interfaces:

1. The interface of the teacher's (user's) workplace
2. The interface of the Methodologist-adviser
3. The interface of the PPE Administrator.

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