

The Audit of the Application's Management of the Structured Entities Orthogonality

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It is presented the concept of applied informatics systems audit. Types of systems are identified, depending on specialization and location. There are given quality criteria considered when designing and building systems. In this paper are described modules and functions implemented by the ORTOES application. Also, there are applied the quality criteria of informatics systems underlying application ORTOES assessment, determining the ways to improve the application.

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1 Informatics systems audit

An informatics application is built to add a well-defined objective.

All the elements involved in this activity of processing and transmitting data electronically make up a computer system.

An informatics system consists of: computers, data transmission systems, other hardware, software, data processing, personnel/staff exploiting computing, theories underlying processing algorithms [6].

Informatics systems cover various fields. Depending on specialization, they are classified as:

- Specialized systems designed to solve a particular kind of problem in a considered field;
- General purpose systems, designed to solve a wide range of problems in several areas;
- Local systems in which the necessary data processing programs and data are on a single informatics system;
- Network systems, where data and programs are distributed among several workstations that are part of that network.

Growing alternative network systems are currently addressing, the advantages being obvious: quickly data transfer between stations, minimum costs.

Depending on the location where data and processing are performed there are systems:

- With centralized data, the data are on a single calculation system;
- With distributed data, the data are distributed on several computers from the network;
- With centralized processing, data processing is done on a single workstation;
- With distributed processing, multiple

computers process the data coming from one or more computers from the network.

To achieve an effective informatics system must be taken into account some basic rules, derived from practice.

For the system's design should considered its relationship with the outside world, its possibilities of communication with other similar systems, its compatibility with different systems, the possibility of including the system into a more complex system, or the possibility to include other systems [2].

The main criterion behind the achievement of a system is the economic reason. For this, the design should consider that the direct or indirect results obtained by implementing and using the economic system and all the execution costs to be the best. Another criterion is improving efficiency of activities carried out manually by the user [8]. In this case it must be implemented a process to ensure the processes' automation by implementing programs that take specific human activities.

In the system achievement should be considered user's requirements and preferences. For that, in the process of designing the system must identify the requirements and quality criteria that ensure the automation of everyday processes within an organization.

An important criterion implemented within the informatics systems is the control of redundancy data [5]. This involves a very strict control of the introduced data, throughout the entire acquisition - processing - data storage processes.

During the implementation processes should be assured a large number of portability features in order to ensure the system's independence related to the technical equipment that will be used. It

should also be considered that the system should further be easily improved.

The informatics system should provide control of the input data and their processing by establishing a structure to grant access to modules and functions by prohibiting unauthorized persons' access to data and programs [3].

The input data control includes techniques and methodologies able to ensure the completeness, accuracy and timeliness of the accounting data. Since the data are obtained through manual input or automatic reception the control system must be adapted to various encountered situations.

Regarding the processing's control, through the quality indicator is assured the protection of the data in use, and the efficiency of the implemented algorithms, in terms of time needed to run them and in terms of implementing the proper operations and directly related to the organization's needs.

The data input certification requires applications oriented towards the data processing in a context and identifying linkages and dependencies between data to ensure the identification of data that don't meet the conditions of affiliation to the

classes of data [5].

The redundantly data character is highlighted by the implementation of software indicators that certify the data repeatability level. Imposing a threshold of redundancy helps to improve distributed application performance by decreasing the time identification and processing. Also, by eliminating redundancy it's ensured the updating of all data processing and avoiding situations in which it is treated only the first entry in the string of repeating data [7].

The role of the informatics systems' audit is to identify components that are not working as specified and that are the source of errors or of the system's malfunction.

2 Evaluation of structured entities' orthogonality - ORTOES

The ORTOES application is implemented to allow to a number of users to establish the orthogonality of generated structured entities.

The software product is structured in several modules, as shown in figure 1.

Each module makes arrangements on the different kind of entities.

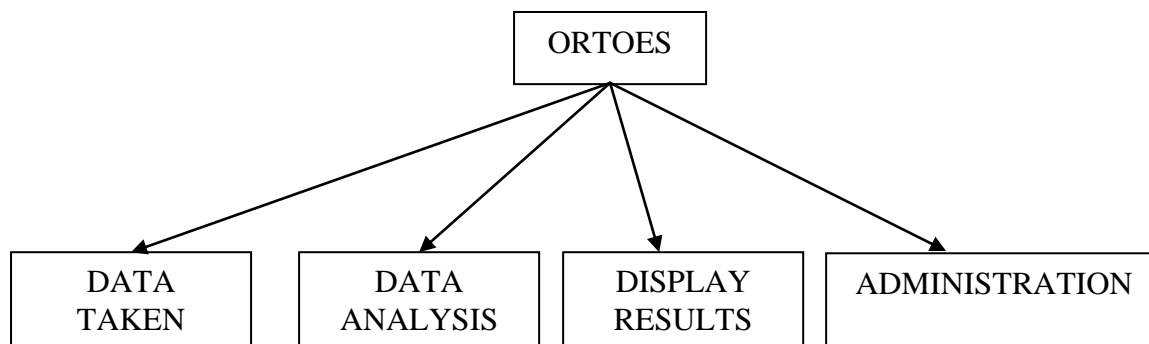


Fig. 1. ORTOES structure

The modules are composed of several functions, implemented to ensure processing and analysis of texts stored differently, using several models.

The software product determines a number of indicators based on which concludes on the entities' original character.

Text processing is done by filtering words considered common and affecting the indicators' value. Words resulting from filtering vectors are stored using queues. Dynamic structures are used as each text contains a variable number of terms. The software product processes text entities using several criteria:

- Identification of common words that are found in the texts;
- Identification of the degree of diversity of

words used;

- Identification of the frequency of terms' occurrence in the text.

In order to achieve superior text processing have been implemented functions which compare texts or take source files and transfer text components in the dynamic structures.

The functions of texts over taking take into consideration the category of symbols that separates the terms of texts. These symbols are stored in text files which are downloaded and stored by the product program. The source texts are processed character by character and depending on the character's value is made the loading of words in the dynamic structures or continues the process of forming the word.

The modules are implemented using the programming environment Visual C++, PHP language, and for building and accessing the database it is used MySQL management system.

The modules are functional in nature, consisting of functions with general character, which are called for acquisition and processing of various source files containing structures complying arrangement of information retrieval criteria specified in the file.

The user has the possibility to treat any problem that involves processing information in structured text files in order to allow the contained organized data taking.

3 Auditing ORTOES application

Data entry must be complete and correct.

Software products certification is achieved through [1]:

- Verification of the correlation between the real and recorded levels;
- existence of verification keys (in community elements and in various articles);
- identifying the errors from the data and erroneous data;
- determining duplicate data;
- performing validations on data collected from the users;
- Verifying the accuracy of processed data and identifying situations where initial data are changed.

To enhance the product interoperability, data is taken directly from text files and the results are displayed also with the help of text files.

During the application designing shall be defined the mechanisms for generating file names so that they are identical to the unique code attached to each member of the community.

The program takes data from a text file in a queue-type structure, and using the implemented functions results a series of working out:

- Determining the number of distinct words;
- Determine the number of words which are repeating;
- Determining the total words that appear in the article;
- Determining the frequency of the words' occurrence;
- Calculating orthogonality indicators.

Application functions are:

- Building list of users;
- Building access data assigned to each user (username and password);
- Acquisition of texts generated by each user;

- Measurement of orthogonality on the categories of data;
- Determining the aggregate level of the orthogonality;
- Determination of average orthogonality for each user based on aggregated data calculated for each data category;
- Displaying the partial, final, individual and general results;
- Re-detention of entities generated by saving the last entity created, because the product program aims to increase the generated orthogonality in a period of time, are merely to assist the process of generating entities.

Application's administration requires:

- Placing the list of users;
- Introduction of accounts and passwords associated to the list of users, each user chooses an account and password for accessing the application;
- Assignment of unique numeric codes for each user, the allocation is made when entering data about users, not when he creates his account;
- Taking txt files containing structured entities;
- Execution of procedures to analyze the level of entity's orthogonality;
- Displaying structured entities and their orthogonality levels so that users whose establishment does not respect the criterion of orthogonality to be able to reintroduce the modified entities;
- Displaying conditions to be met for loading txt files containing structured entities;
- Managing different versions of the corresponding ranges in which users' access the application to send generated entities;
- Managing messages sent by the users and displaying them either individual or in the form of lists containing the final results;
- Managing files placed by users and train them to be accessed by the module that analyzes the entities' orthogonality; in this respect the files are renamed and receive as names the code associated with the user that loads them;
- Storing results relating to the structured entities' orthogonality and ensure their compatibility with the module that displays them;
- Storing information about entities orthogonality level below the threshold limit;
- Generating results related to the average orthogonality, aggregated orthogonality,

results provided for each user or for all users;

- Managing the user's accounts;
- Generating new passwords where desired;
- Deleting a user's account;
- Identifying entities introduced by an user and viewing them.

User's managing requires:

- Defining user's account and password;
- Loading files containing structured entities;
- Viewing individual and final results.

To ensure the security of online application that provides the facility to establish the orthogonality of structured entities generated by users, were used facilities offered implicitly by the MySQL used database (creation of users with unique credits, store their passwords in an encrypted format) and secondly the use of working sessions.

For each user who opens the online application starts a separate session, this provides protection from the unauthorized attempts to access the application resources. Thus, the session is terminated when the user leaves the current account or when an elapsed time greater than 5 minutes (configurable) past without the user using the personal project.

Another method implemented to ensure the application's security is the function `mysql_real_escape_string` (string `unescape_string [, resource link_identifier]`). It is used to assure data before being sent as a request to the MySQL server by eliminating potentially dangerous character of the string.

Removal is done by adding backslashes (`\ x00, \ n \ r \, ', "`and `\ x1a`), which forces MySQL to

interpret the characters as characters with a single apostrophe only as part of SQL statement.

The ORTOES application is built to analyze the degree of differentiation of structured text entities. The application is composed of a number of four modules, designed to ensure interaction with users, processing data entered by them, displaying the results, both individual and general and managing the application functionality.

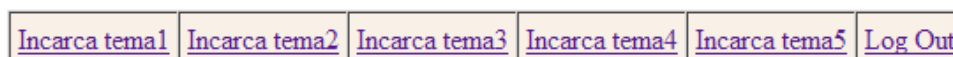
The ORTO module ensures data acquisition and is built using the PHP programming language, data being stored by the managing system of the MySQL databases.

To access an account, the user's data must be loaded using the management module. Based on data processed by the administrator, the user creates his account.

Data acquisition module provides validation. In this respect there is searched the user into the table that holds people with the right to access the application. Also, there is checked the information entered by the user, in order not to use obscene words. This is done by comparing the information entered by users with a list of predefined words. If the user uses the term considered obscene is warned about this.

After creating his account, the user is authenticated to access the options related to loading data.

Regarding uploading files containing the required information, the application validates the user uploaded file type and where it does not meet specifications the user is warned about this:



Se vor incarca numai fisiere cu extensia .txt

Fig. 2. Message displayed for files that does not meet specifications

After loading the txt file that contains the text entity, the user receives a validation load message, message informing the user about the loaded theme. Also, the user receives a code to validate data loaded. The code is randomly generated and is unique and based on it the student prove that meet the criteria set by the application to take over the entity.

When loading the file, the retrieval module rewrites the old file's name, new name consisting

of the corresponding unique user and the file extension. Was implemented this option so that after copying files to local station, the processing module takes over the files, analyzes them, compares and stores the orthogonality level for each file using a txt file output, which is subsequently acquired by the results displaying modules, implemented using PHP language.

Data analyzing module is built using Visual C development environment running, the module

requests the path where txt files are stored containing analyzed entities, figure 3:

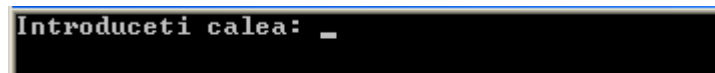


Fig. 3. Data analyses module

The program examines whether it is provide a valid path and that the files contained are of type txt. Figure 4 presents some content of a directory

which stores the files corresponding to text entities.

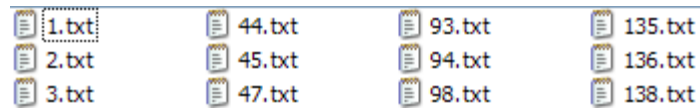


Fig. 4. Directory content corresponding to analyzed entities

After running, the module generates two txt files containing the average orthogonality level of stored entities, and information on the contents of files: number of common words, entities with orthogonality values bigger than 0.75, and the size of analyzed files.

Processing and analysis module takes txt files, stores them using dynamic variables, analyze their content, calculate the average level of orthogonality and saves the results in txt files.

The display results module takes over the data supplied by data analysis module, store them into tables and displays them, both individually, after user authentication and overall.

Users and their data are stored using the MySQL tables. Each user is identified using a unique key, associated with it.

Links between tables are made using unique user key.

Management module is accessed by completing the manager identification data.

User search options, display the user account, the orthogonality data, the orthogonality comparative data, deleting users and modifying user details are based on search function using the user name or first name. The search is carried out after at least one component letter, and where there are several results that correspond to the criteria, the administrator must enter the unique key to select user which information is requested.

It is not permitted the user data modification because it affects the orthogonality level.

For taking the results regarding the level of entities orthogonality, establishing averages related to each user and loading the results tables were created PHP scripts that are run at different times, especially after the deadlines established for loading entities.

ORTOES application was written in the latest version of PHP, PHP5 using the MySQL for data

storage. As web server is used Apache, version 2.2. Users must have installed a browser that accesses the application options. During tests, the application was hosted on the Academy of Economic Studies server at www.ortogonalitate.milodin.com.

4 Ways for increasing ORTOES quality

During application use by the community of users were identified a number of deficiencies caused by:

- Building an incomplete list of community members;
- Inaccurate data entry of persons who access the application;
- Completing fields with incorrect or invalid by users;
- Failure to respect terms for establishing the accounts by visitors;
- Poor management of passwords and account name created by users;
- Construction of files that do not meet the criteria required for application;
- Construction of entities with low levels of orthogonality;
- Acquisition related files with structured entities using email, which involves downloading them, renaming files with a unique code for the user who sent them and save them in correspondent file for that entity;
- Failure to obtain write access to users on the server where is hosted application;
- Increasing the number of attempts to load data, this led to the creation of new tables to store intermediate results;
- Ignorance of the coding system for collectivities, which led to the impossibility of finding their records in the tables;
- Use of obscene words;

- Failure to comply the completing condition required by the application.

In order to administrate the problems encountered and for efficient dialogue, community members have been provided the account manager e-mail, all discussions taking place via email.

The ORTOES application is built for automation the interaction with user. First, the manager of the application loads the users which have access to application functions. Based on these records users create their accounts, charging their solutions, see the levels of orthogonality. Passwords are generated automatically by the application and transmitted to the e-mail users.

The three modules of the application are built by parameterization, each module taking txt files provided by the previous module. ORTO module for data acquisition provides ORTOC module source files containing structured entities. The connection between username and orthogonality levels is achieved through the unique code attached to users, source file names consisting of the code assigned to the user. The results display module takes txt file containing the results and identifies users based on codes assigned into the table and into the results list.

There was a problem of application administration regarding the lost passwords or account access by users. Settlement was made by querying the database, finding that the user account and generate a new password.

Passwords are protected by encryption, so that the application administrator can't view the text password, the only solution in this case is rewriting passwords.

Establish a system of programs to analyze and process structured entities to determine the degree of orthogonality is based on the identification of the processes performed on entities.

On the basis of processing and operations carried out, are designed and implemented the necessary functions, all being found in the software ORTOES (Structured Entities Ortogonality). The application is used to working with structured entities and to determine their degree of orthogonality.

Is implemented in order to allow users to establish the levels of orthogonality for their generated entities.

ORTOES application ensures processing the data source of applications in order to establish their degree of orthogonality. Building applications with a high level of orthogonality and setting

restrictions regarding the scope of their domain of reference, and respect the precise specifications established to develop computer applications contribute to the improvement of uniformity of application, in order to be better for citizens' use.

5 Conclusions

Auditing is required primarily for applications involving on-line maintenance. They provide and ensure the quality of processing.

Only highly reliable computing applications must be auditing.

Quality products program is addressed mainly in the research areas and by large firms producing software.

Main concerns of quality products program were targeted in the following directions:

- defining a methodology for specifying and determining product quality throughout the software life cycle;
- developing quantitative methods and tools for measuring and evaluating program quality products;
- creating nomenclature and indicators classification for software products;
- definition and implementation of statistical, mathematical methods in validating quality indicators;
- testing quality indicators in concrete projects, with emphasis on reliability and maintainability characteristics.

By constructing methodologies needed for auditing the informatics systems are insured premises for building IT applications that meet the quality criteria required for being use by the people without an additional qualification in working with computer products.

Entering into the auditing process of issues related to data redundancy contributes to higher quality informatics systems by increasing speed data processing and quality certification of results.

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Ion IVAN has graduated the Faculty of Economic Computation and Economic Cybernetics in 1970. He holds a PhD diploma in Economics from 1978 and he had gone through all didactic positions since 1970 when he joined the staff of the Bucharest Academy of Economic Studies, teaching assistant in 1970, senior lecturer in 1978, assistant professor in 1991 and full professor in 1993. Currently he is full Professor of Economic Informatics within the Department of Computer Science in Economics at Faculty of Cybernetics, Statistics and Economic Informatics from the Academy of Economic Studies. He is the author of more than 25 books and over 75 journal articles in the field of software quality management, software metrics and informatics audit. His work focuses on the analysis of quality of software applications. He has participated in the scientific committee of more than 20 Conferences on Informatics and he has coordinated the appearance of 3 proceedings volumes for International Conferences. From 1994 he is PhD coordinator in the field of Economic Informatics. His main interest fields are: software metrics, optimization of informatics applications, developments and assessment of the text entities, efficiency implementation analysis of the ethical codes in informatics field, software quality management and data quality management.



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