

SOFTWARE APPLICATION FOR QUALITY CONTROL PROTOCOL OF MAMMOGRAPHY SYSTEMS

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Abstract – Considering the fact that the Quality Control of the technological process of the mammographic system involves testing of a large number of parameters, it is clearly evident that there is a need for using the information technology for gathering, processing and storing of all the parameters that are result of this process. The main goal of this software application is facilitation and automation of the gathering, processing, storing and presenting process of the data related to the qualification of the physical and technical parameters during the quality control of the technological process of the mammographic system.

The software application along with its user interface and database has been made with the Microsoft Access 2003 application which is part of the Microsoft Office 2003 software packet and has been chosen as a platform for developing because it is the most commonly used office application today among the computer users in the country. This is important because it will provide the end users a familiar environment to work in, without the need for additional training and improving the computer skills that they possess.

Most importantly, the software application is easy to use, fast in calculating the parameters needed and it is an excellent way to store and display the results. There is a possibility for up scaling this software solution so it can be used by many different users at the same time over the Internet. It is highly recommended that this system is implemented as soon as possible in the quality control process of the mammographic systems due to its many advantages.

Keywords – FTIR software, mammography, Quality Control

1. INTRODUCTION

A prerequisite for a successful screening project is that the mammograms contain sufficient diagnostic information to be able to detect breast cancer, using as low a radiation dose as is reasonably achievable (ALARA). This quality demand holds for every single mammogram. Therefore, Quality Control must ascertain that the equipment performs at a constant high quality level [1-3].

Considering the fact that the quality control process involves testing a great number of parameters, it becomes obvious that there is a need for implementing an IT solution for gathering, processing and storing all the data which come out of this process. Therefore, this software application was developed. It consists of a user interface and a database, both written and developed in Microsoft Access 2003, as a platform (program) that is most

commonly used among computer users in our country today. The goal is to enable all users, even those with limited computer skills, to use the software application without the need for further education and training.

The database is comprised of 16 tables, 6 queries, 4 user interfaces and 2 types of reports. In each table there are data fields in which data are entered through the user interfaces. In the user interfaces, the data fields are organized following a scheme that is needed to run a successful quality control process. The parameters are organized in groups, which are properly marked, easy to understand and that minimizes the risk of writing parameter values at a wrong place. This is done so that the user can quickly adapt to the user interface and follow it just like he/she would follow a paper scheme for entering the gathered data. Throughout the application, there are buttons which offer different functionalities which will be discussed later on.

The queries are used for displaying the data fields on the user interface forms, as well as for storing the inputted data into the database tables.

The following figure displays the main menu of the application.

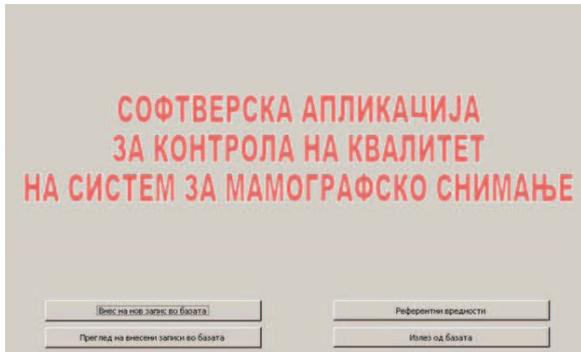


Fig. 1 – Main menu of the application

2. MAIN MENU

As can be seen on Figure 1, there are 4 buttons. By clicking on the first button, the user can start with the gathered data input process. The second button can be used to get into preview / correction mode, meaning that the user can take a look at the previously entered data and make corrections if necessary. Once a value is entered into a field, it automatically gets stored in the database and can be reviewed and/or corrected using the user interface. There is no need for saving the data, which means that if the computer fails, the data won't be lost.

The third button takes the user to the Reference values panel of the application. This part is reserved for parameter values that are constant (according to the European Protocol for Quality Control of the Mammography Systems) [1], but used in different calculations. However, if there is a need to change these fixed values (for example due to a policy or regulation change), the reference values can be changed in this section of the application. Modifying or deleting the reference values in the data input interface is not allowed.

The fourth button is used for exiting the application.

3. DATA INPUT USER INTERFACE

The data input user interface is shown on Figure 2.

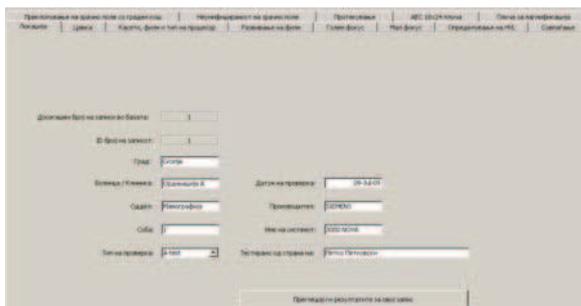


Fig. 2 – Data input user interface

The data input fields are organized in tabs which contribute to better clarity. Each tab contains the testing parameters which fall under specific category. The navigation between the data input fields is very easy by using the Tab key, which leads the user through the scheme in the right order. The button “Прегледај ги резултатите за овој запис” is enabled on the first tab in the data review mode of the application. That button is used to quickly navigate to the results part of the application.

On the last tab, “Плоча за магнификација”, which is shown on figure 3, there are two buttons which lead the user to the next part of the application. The first button is for continuing with the data input process, and the second button is for continuing with the review / correction procedure, depending on the mode in which the user has started the application (data input or data review, respectively). It is important to emphasize that if the application is in data input mode, the second button is disabled and vice versa.

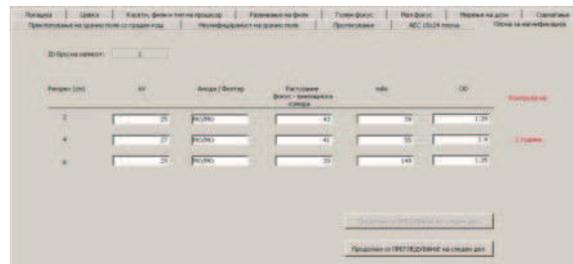


Fig. 3 – “Плоча за магнификација” tab

The second part of the application is displayed on the following figure.

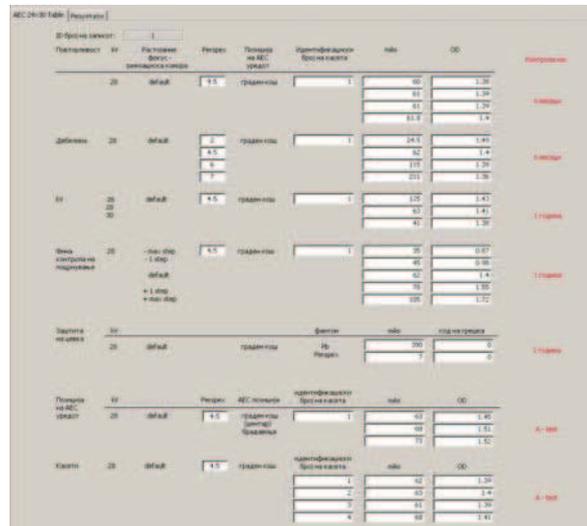


Fig. 4 – Second part of the application

Across all the tabs, on the right side of the user interface, the period after which the tests should be conducted again is shown with red text. The time periods are written according to the European Protocol for Quality Control of the Mammography Process [4, 5].

4. RESULTS SECTION

When the data input process is complete, the user can navigate to the results section of the application, which is shown on the next figure.



Fig. 5 – Results section

As Figure 5 shows, a large number of parameters are being tested. For every parameter or parameter group there is a dedicated button which carries-on the test. Right next to the button, in a label, the result of the calculation (test) is being displayed, followed by the referent (allowed) value of the parameter according to the European Protocol and finally, in the last label the final result is shown, represented by the words “Задоволува” if the calculated parameter is within the given limits, and “Не задоволува” if the value is outside the limits given by the European Protocol.

There is a large text field in the bottom of the form which can be used to write a report or a few remarks considering the testing process by the person who conducted the quality control procedure.

When the testing and calculating process is over, the measured values and received results can be displayed in Reports which are given to the person / organization which ordered the testing of their equipment.

There are two types of reports: brief report and complete report. The brief report, on one page, shows the most important specifications of the equipment tested as well as the most important parameters which are part of the Quality Control process.

The full (complete) report consists of seven pages where all the measured and tested values and parameters are shown. These two reports can be easily printed out and handed over in a hard copy version.

By clicking on the last button on the results page, the data input user interface closes and the user is taken back to the main menu, from where he/she can start over with a new set of measures taken during the Quality Control process, or the user can review and/or correct an already entered set of values.

The following figure describes the structural and functional scheme of the application.

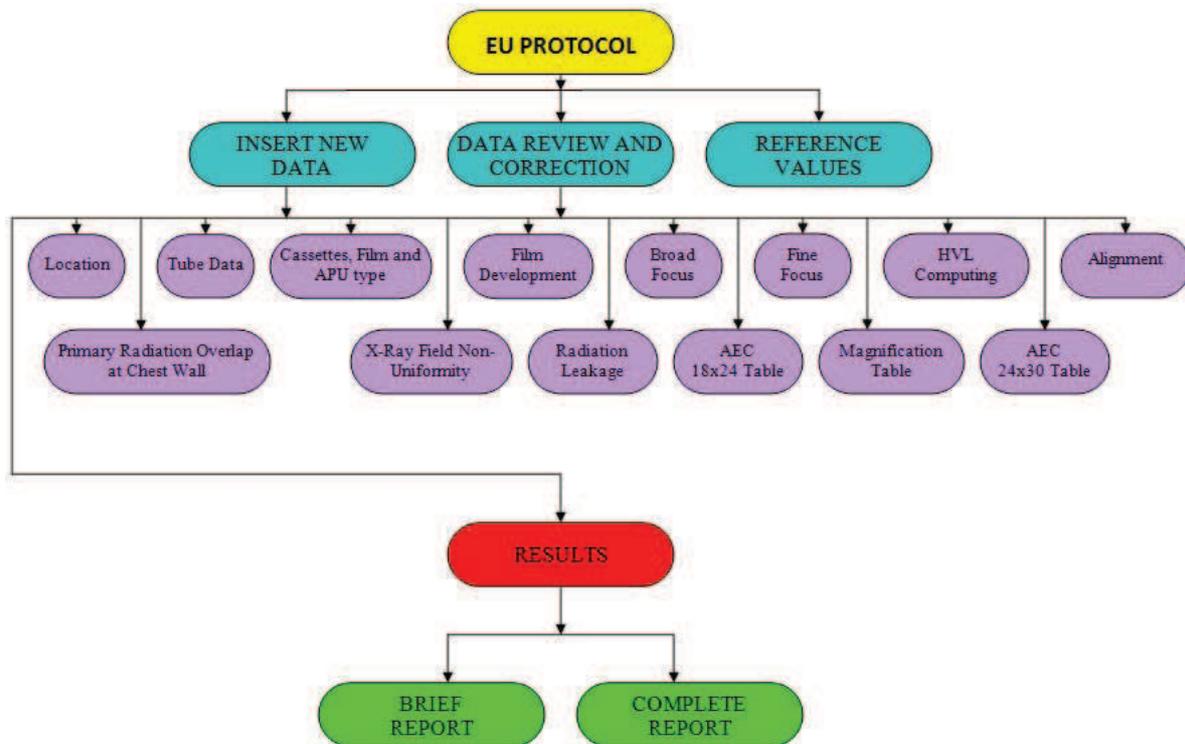


Fig. 6 – Structural scheme of the application

5. CONCLUSION

This application offers an easy, precise and effective way of handling the gathered Quality Control data and it is highly recommended that this system is implemented as soon as possible in the quality control process of the mammographic systems everywhere where this types of tests are conducted.

6. REFERENCES

- [1] European Commission, *European Protocol for the QUALITY CONTROL of the Physical and Technical Aspects of Mammography Screening*, Draft Edition, January 2005.
- [2] International Electrotechnical Commission (IEC), Geneva, Switzerland: *Evaluation and routine testing in medical imaging departments, part 3-2: Acceptance tests – Imaging performance of mammographic X-ray equipment*, 2004, IEC 61223-3-2 Ed. 2.
- [3] *The European Protocol for the Quality Control of the Technical Aspects of Mammography Screening*, 1993, CEC-Report EUR 14821.
- [4] *Technical and Physical Parameters for Quality Assurance in Medical Diagnostic Radiology; Tolerances, Limiting Values and Appropriate Measuring Methods*, 1989, British Institute of Radiology; BIR-Report 18, CEC-Report EUR 11620.
- [5] *European Protocol on Dosimetry in Mammography*, 1996, CEC-Report EUR 16263.