# Improved Data Visualisation in the "e-Management" System

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*Abstract* – **This paper describes the newly developed functions for improved visualisation of data which have been introduced in the "e-Management" system. Since the system started to archive more and more data, the necessity to implement such kind of enhancements appeared. The FusionCharts Free v2.1 package is used.**

*Keywords* – **Education, Data visualisation, Charts, Statistics**

## I. INTRODUCTION

The electronic means, which support the education, came practically in all grades. They can be used in distance courses [1, 2], and in the audience education [3, 4]. The electronic means are applied in different aspects of training. In recent years multimedia is widely used for presentation of the educational material [5]. The use of electronic tools to develop web-based courses [6] is widely spread. The ability to store various data from the educational process in electronic form allows easy processing by computers [7].

In the Faculty of Electronics at the Technical University of Sofia, a system named "e-Management is implemented. It is aimed at archiving data from the educational process [8]. In the latest versions the system allows the application of distance learning methods. Elements of the system are oriented towards processing of the results of the educational process.

## II. THE E-MANAGEMENT SYSTEM

The environment represents a system and procedure for setting up sites related to different subjects. After the installation of the site some basic information about the subject has to be loaded. It is related to the summary of the subject, number of lectures, number laboratory and seminar exercises, the main lecturer, etc. The basic elements related to the syllabus, safety instructions, attendance control type, method of assessment are also loaded.

Three different areas are defined in the site – login, common area and administrative area.

The login area is subdivided in two parts – public and user. The public one gives information, without supplying username and password, about. This information is related to the name of the course, main lecturer, team of teachers, syllabus and educational schedule. The educational

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schedule shows the classes by date, topics, teachers and places. The logo of the site is configurable. A typical login page is shown in fig. 1.



Fig. 1. Login page.

Access to the site get only registered users. After a successful identification the user gets access to navigation and work areas. The system can get lists of students from a centralised university database. Students have one and the same username and password for all subjects.

The common area gives access to lecturer's and students' directories (divided according to the type of classes), tests, statistics for visits to the directory, forum, private messaging and others.

The leading teacher and assistant teachers set up data for the educational process using different levels of access. The leading teacher assigns different exercise rights, introduces the topics and forms the schedule of classes. He/she also sets the tests and assessment of the results for the course. The assistant teachers set deadlines for submission of task reports (for the classes they are responsible), prepare their electronic report templates and assess the results.

There are some other functions in the administrative area, which are related to the documentation of the process and statistics.

## III. STATISTICAL DATA PROCESSING

The results that are being archived in the system can be divided in a couple of basic groups:

- current data of the process:
  - class attendance;
  - results from the accomplishment of educational tasks;

o   trial tests;
•   assessment:
   o   tests;
   o   marks and tasks;

The results can be presented as direct database values or preliminarily processed. For example, a table of assessments and data for its completion is shown in fig. 2.



Fig. 2. Table data.

## IV. Data Visualisation

The results of the educational process can be presented in tabular or graphical form. In previous versions both methods have been used. It is convenient, especially in distance courses, to process the results in the system itself and presented it graphically to the user. This facilitates the assimilation of information and trends in the process.

Experience has shown that part of the graphical results require better visualisation and synchronization of data. A new version of the graphical representation of results of trial tests and training is shown in fig. 3. In this version the colours of trial and real tests are synchronized. A data matching in both graphics is performed regardless of the presence or absence of trial or real tests results.
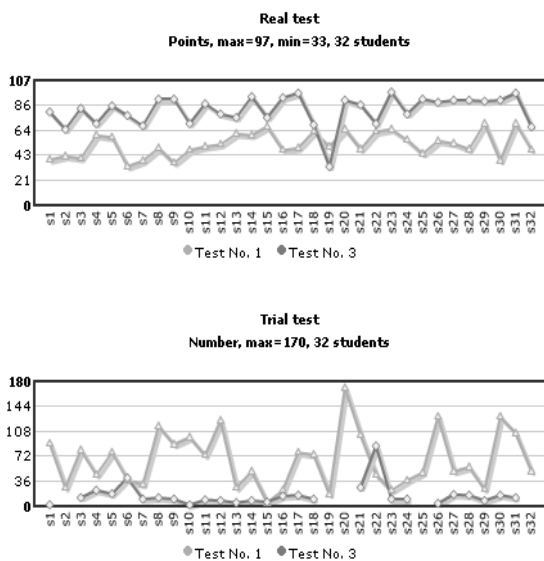


Fig. 3. Synchronised graphics.

In practice, many processes and values are perceived better by giving histogram for their distribution. In this regard, an additional function representing the distribution of group points and basic statistical processing was introduced as shown in figure 4.
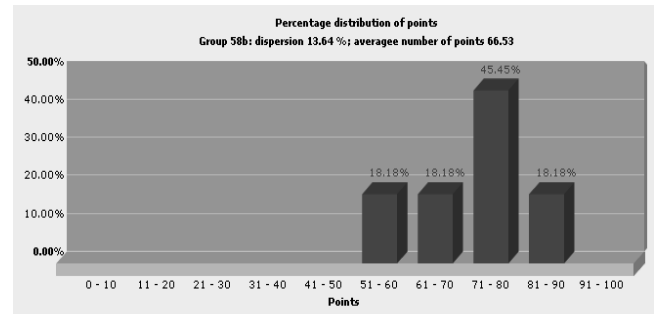


Fig. 4. Distribution of points, mean value and dispersion.

The opportunity to compare the scores of certain groups is also interesting. In order to achieve that, a function, which compares the distribution of scores for two groups, was introduced. Tabular data for the assessment of the groups is shown in fig. 5, and a visual comparison of the distribution is shown in fig. 6.

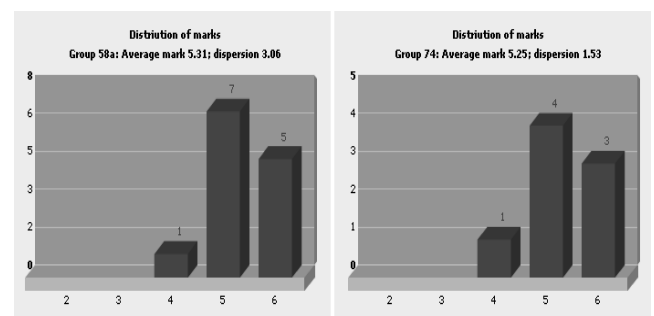| Final mark | Groups | | |
|---|---|---|---|
| | 58a | 58b | 74 |
| 2 | | | |
| 3 | | 36.36 % | |
| 4 | 7.69 % | 45.45 % | 12.50 % |
| 5 | 53.85 % | 18.18 % | 50.00 % |
| 6 | 38.46 % | | 37.50 % |
| Group average mark | 5.31 | 3.82 | 5.25 |
| Average mark | 4.78 | | |

Fig. 5. Final marks.



Fig. 6. Distribution of marks and their correlation.

All new graphics are based on the freely available XML FusionCharts Free v2.1 [9]. FusionCharts Free is a flash charting component that can be used to render data-driven and animated charts for web applications and presentations.

It is a cross-browser and cross-platform solution that can be used with PHP, Python, Ruby on Rails, ASP,

ASP.NET, JSP, ColdFusion, simple HTML pages or even PowerPoint Presentations to deliver interactive and powerful flash charts. There is no need to know anything about Flash to use FusionCharts.

## V. CONCLUSIONS

The newly developed graphical interfaces in the "e-Management" system allow better synchronous presentation of graphical data. The charts that have been introduced for distribution of points and assessments, together with the mathematical processing give a more precise view of the overall group condition.

## VI. ACKNOWLEDGEMENT

### REFERENCES

[1] Shoikova E., M. Ivanova, *Learning Design Module in SCORM E-learning Environment*, 14th International Scientific and Applied Sciences Conference Electronics, 21-23 September 2005, Sozopol, Bulgaria, book 2, pp. 109-114.

[2] Smrikarov A. *Virtual laboratories – basic mean for electronic education in technical specialties* (in Bulgarian), National seminar on electronics, Federation of scientific and technical unions, Sofia, 14 November 2006.

[3] Radonov R., *Education in Microelectronics Design Using a Web Environment*, Proceedings of ICEST 2008 – the XLIII International Scientific Conference on Information, Communication and Energy Systems and Technologies, Serbia, Niš, 25 – 27 June, 2008, ISBN 978-86-85195-61-7.

[4] Trochanová H., D. Chudá, *Specify of making electronic tests for economics informatics*, 9th International conference Virtual University, 11 – 12 December 2008, Bratislava, Slovak republic.

[5] Jesshope, C.R. (2001) *Easy-to-use multimedia tools and scalable distributed architectures for web-based teaching and learning*, Proceedings DCABES, Wuhan, China: HubeiSci. And Tech. Press, pp. 52-60.

[6] http://telearn.tu-sofia.bg

[7] http://www.postgresql.org

[8] Radonov R., V. Videkov. *Some Peculiarities of the E-Management Environment, Version 6*, Proceedings of the Technical University – Sofia, Volume 57, book 2, 2007, pp. 61 – 66, ISSN 1311-0829.

[9] http://www.fusioncharts.com/free