THE USE OF FUZZY THEORY IN GRADING OF STUDENTS IN MATH

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ABSTRACT

The development of computer science, statistics and other technological fields, give us more opportunities to improve the process of evaluation of degree of knowledge and achievements in a learning process of our students. More and more we are relying on the computer software to guide us in the grading process. An improved way of grading can help overcome some limitations of the educational process, that have caused problems, and had as a consequence a lower degree of success. With the combination of old, traditional way of evaluation of students knowledge and success, and the application of "fuzzy logic" and "the theory of fuzzy sets", "the method of ponderous areas", and other new computer and scientific technologies, we are getting a complex formula , that is also, friendly to constant changes, depending on developments in the schooling process. The new grading system is very user friendly, and can be applied in primary-middle schools as well as in high schools. It takes into account all the students activities and achievements, raises the quality of a teacher's performance and can be updated with new computer technologies. This model is, also, a great support program in grading of students involved in "distance learning"systems.

Keywords: Fuzzy logic and sets, knowledge evaluation, the grading model and e-learning

INTRODUCTION

Computers have an enormous role in all aspects of the educational process. They are an important tools that assist teachers in preparing for the presentations in the class, help students learn trough practice and finally evaluate the degree of success of each students in mastering different tasks in educational process. In the process of evaluation and grading, computer can perform different tasks:

- presents the lectures, instructions and explanations, and other supporting material that help students prepare for the test,
- organizes questions in groups that relate to different parts of the learning material,
- presents the test questions,
- scores the answers and keeps track of the results,
- informs about the results.

The selection of the particular method of computer based evaluation and grading can be a difficult task, since a vast number of different methods are available. It is important to consider the route of the evaluation (e.g. test questions, essay, projects ..), as well as the time that lapses between two evaluations. It is, also, important to determine the purpose of the test:

- **the self-check,**
- **the test questions, checked and evaluated by other than the examine taker,**
- **the partial, module based test,**
- **the complete evaluation , end of the semester examination.**

The use of computers is making the teacher's job easier, since it helps overcome some of the traditional obstacles in objective and accurate grading of students. Even though some of the problems can be eliminated, such as bad handwriting, it is still not completely error-proof. Most commonly and very successfully used are the standardized tests that are the results of experience, research and traditional evaluation.

THE NEW MODEL OF GRADING OF MATH STUDENTS

This project will describe one of many possible models of evaluating and grading students in their knowledge of one of the basic subjects, mathematics. It is taking into consideration all the activities of students during the semester and the school year, including attendance of the lectures, interaction during the class hours, homework, and school projects completion, performance in periodical tests and scores on the midterm and final examinations. Since this model is a complex mosaic of different values, it was necessary to develop a very a modern computer software, that will be accurate in grading, and will give a real picture of the success of the students.

Computer model "GRADING OF STUDENTS IN MATH ", makes the job of a teacher easier, more efficient, and enables both students and their parents to get the right estimate of success and improvement in every moment during the school year. By giving the right input and directions, the teacher is able to recommend measures that will improve the student's chances for a better grade, and, also, predict, what that grade will be at the end of the year.

The major advantage of this model, in comparison to older, traditional way of grading the students, is that it doesn't measure the negative results, but lets students go back to the matter in question, gives them another chance for improvement, and only after acquiring the required knowledge and positive results, records that value. The model keeps record of best accomplishments for each individual student, creating a positive attitude toward the schooling process. The cornerstone of this concept is a good teacher-student relationship. It is a relationship of a modern teacher, who is not only an educator, but also, a mentor, adviser, a friend and a colleague and his or her students.

The teacher is still a person in charge, but the relation between the teacher and the student is based on mutual respect, where both parties will acknowledge each others qualities, and be open and willing to help and be helped. This helps the teacher guide the students through difficult parts of the material and motivates him or her to work harder towards their goals.

This is a very dynamic model, since it follows the student through everyday activities, grades and evaluates their knowledge partially and as a whole, which makes the traditional, "on the schedule", and "with fixed dates for tests" way of grading obsolete. The final tests are very important part of their final grade, but still only one of the factors that create the final grade.

CREATING OF COMPUTER MODEL " GRADING OF STUDENTS IN MATH "

The database for information needed for the process is stored in ACESS- bases, it utilizes the VIRTUAL BASIC, and the program works in WINDOWS. The picture: 1. Will list all the activities that are being evaluated in the process of grading of students in math.

For example, "The attendance and performance in the class ", will measure and record the presence of the students in the class during the school year, their interactions with teacher and other students, performance during the oral or written checks of their math skills and knowledge.

The data is being entered daily, through simple data entering system, and the overall results can be calculated and presented graphically or numerically, at any moment during the school year.

The math teacher, student a parent or parent-teacher can have an estimate of student's success at any given moment. This model gives each student the same treatment, and enables the fair grading of all students in the class.

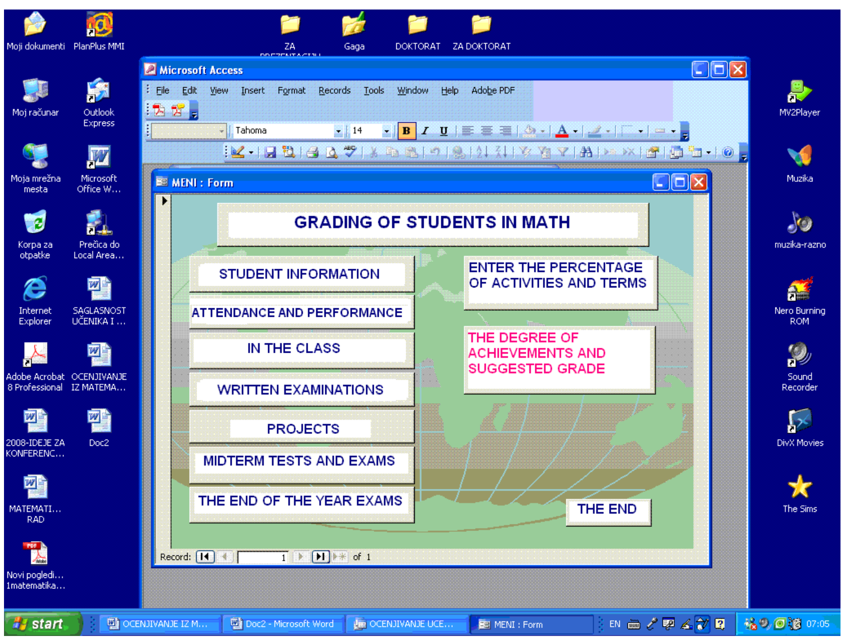

Figure: 1
The list of all activities evaluated during the process of grading the students in math

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	A	B	C	D	E	F	G	H	I	J	K
1	ID	Prezime i Ime	Of Don	Of Semina	vg Of Usme	Kontroln	Pismeni	Of Kolokv	f Godisn	Expr1	Exp2
2	1	Blažić Đorđe	4.12	3.34	2.65	2.45	3.21	2.11	2.13	2.602	3
3	2	Vasić Ana-Marija	1.27	1.9	2.56	1.22	2.34	1.11	1.95	1.775	2
4	3	Vićentijević Lazar	4.95	3.45	3.12	4.14	3.58	3.45	2.18	3.304	3
5	4	Gavrilović Gorica	4.18	3.78	3.78	4.23	3.67	4.36	3.13	3.799	4
6	5	Žujović Mirjana	2.17	2.98	2.16	2.83	3.02	3.67	2.98	2.981	3
7	6	Janković Aleksandra	3.54	3.44	4.4	4.45	3.78	4.23	3.27	3.876	4
8	7	Kujović Irma	1.76	1.87	1.98	2.13	2.67	3.23	2.54	2.514	3
9	8	Lazarević Lj. Jelena	2.76	2.12	2.87	3.22	3.89	2.18	3.18	3.023	3
10	9	Lazarević M. Jelena	4.09	3.87	3.54	4.23	4.45	4.67	4.25	4.273	4
11	10	Lazarević Saša	2.35	3.05	3.08	2.34	3.98	3.78	4.02	3.486	3
12	11	Lukić Andrea	2.37	2.88	2.01	3.04	3.26	3.67	4.02	3.3105	3
13	12	Marković Nikola	2.04	3.75	3.16	3.58	2.67	3.18	3.12	3.0925	3
14	13	Marković Ivan	3.45	4.44	3.32	4.23	4.54	3.78	4.15	4.0625	4
15	14	Mitrović Milena	3.4	3.29	4.56	4.23	4.28	4.44	4.56	4.309	4
16	15	Mijatović Ana	5	5	5	4.98	4.21	5	5	4.839	5
17	16	Mijatović Žiža	4.88	4.89	4.04	3.67	3.98	4.12	3.26	3.878	4
18	17	Nikolić Ana	1.98	2.13	2.34	3.23	2.96	3.11	3.09	2.9105	3
19	18	Obradović Dragana	3.22	3.45	3.12	3.23	2.88	3.98	3.14	3.287	3
20	19	Pavlović Dalibor	4.12	3.87	3.55	4.43	4.58	3.88	3.01	3.8635	4
21	20	Petrić Bojan	2.34	2.37	2.98	2.78	1.97	2.67	3	2.6285	3
22	21	Puljezević Mirjana	3.02	4.56	4.08	4.68	3.03	4.97	3.48	3.959	4
23	22	Simeunović Tatjana	3.98	2.35	2.76	3.24	2.24	2.94	3.01	2.867	3
24	23	Tešić Katarina	4.74	3.67	3.09	4.13	4.76	4.23	3.45	4.0095	4
25	24	Živković Tijana	2.16	3.65	3.77	3.26	2.27	3.05	3.77	3.163	3
26	25	Maksimović Milica	1.23	3.22	2.39	2.77	3.13	2.45	2.24	2.553	3

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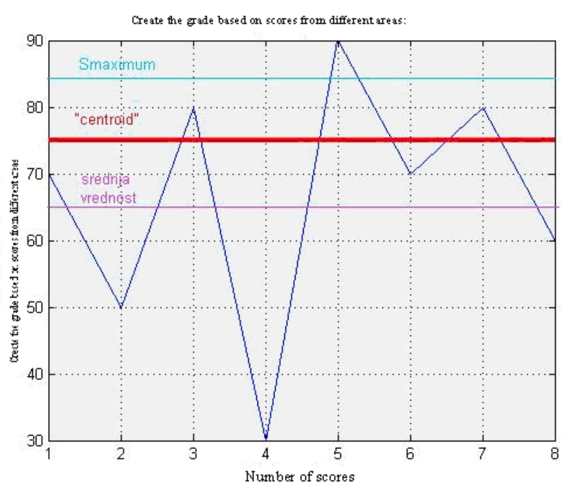
Figure: 2
The form for entering of information for individual Student

Example: Create the grade based on scores from different areas: Attendance: 70 points, Performance in the class: 50 points, homework : 80 points, math projects: 30 points, oral examinations: 90 points, written tests: 70 points, periodical tests: 80 points, term tests: 60 points.



$$S\max = \frac{80+90+80}{3} = 83.3 \approx 83$$

$$Centroid = \frac{0.20\cdot 80 + 0.15\cdot 90 + 0.15\cdot 75 + 0.20\cdot 80 + 0.30\cdot 60}{0.20+0.15+0.15+0.20+0.30} = 74.75 \approx 75$$

$$Averagevalues = \frac{70+50+80+30+90+70+80+60}{8} = 66.25 \approx 66$$

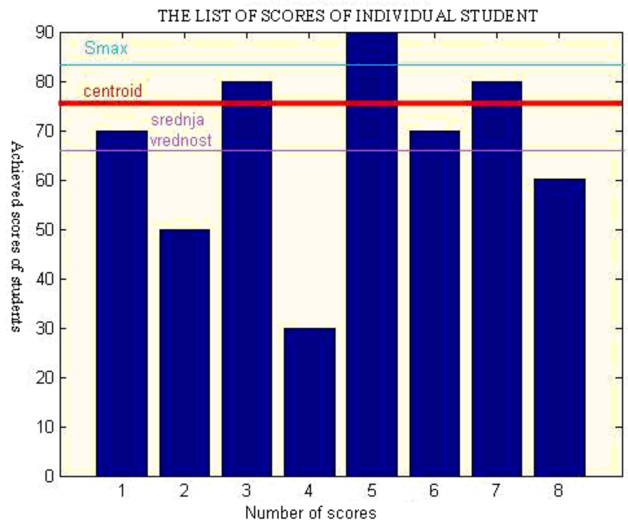


Figure: 3

Comparison of the results in creating the final grade using the new model and old , traditional model for grading of students

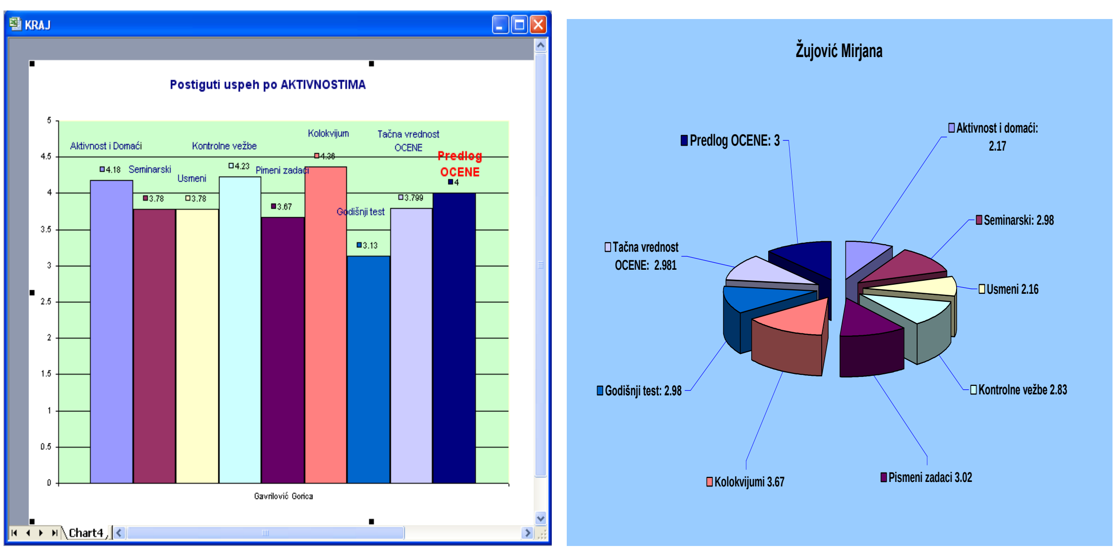


Figure: 4

The level of achievement and the suggested grade

THE CREATION OF THE FINAL GRADE

The application of the "Centroid method "(Centroid clustering).-Centroid is a point in the coordinate system where arithmetic average of scores earned in various activities of the students is used.

When calculating the result from several activities that are being evaluated, the centroid presents a combination, the average of centroid of each category, measured with the value being graded. In this way every activity that is being evaluated influences the final score.

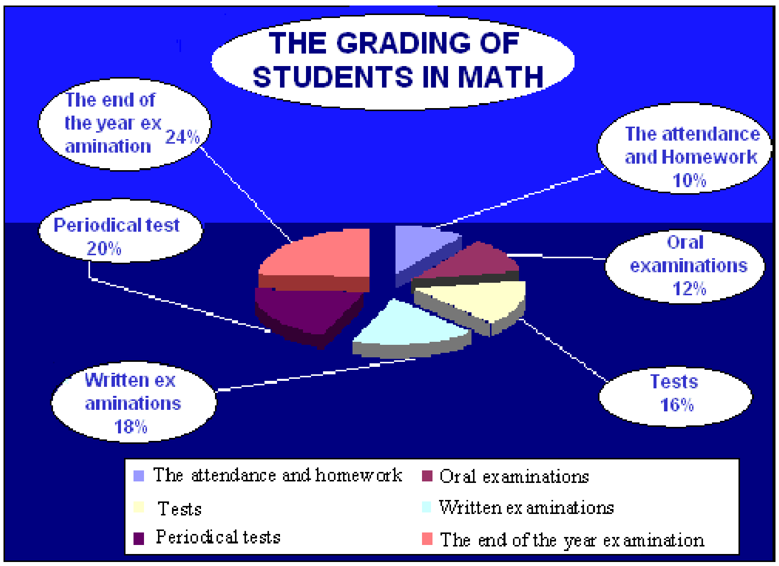


Figure: 5
The percentage of each evaluated activity that is making the final grade of the students from math

CONCLUSION

The presented "Modern model of grading students in math", will make the process of creating the final grade more efficient, objective, fast and accurate. This will improve the overall quality of teaching and studying in the educational system.

Better grading and evaluation will help select the best students, candidates for higher education and help direct them towards the best schools of their choice.

In the future the success of the school will be measured by the number of the students who are being accepted to the schools of higher education, as it is in many countries already, the better way of grading will raise the quality of the schools that are using it.

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