TOWARDS A VIRTUAL ACADEMIC ADVISER

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ABSTRACT

One of the major administrative processes at the Institute of Informatics – the term enrollment, starts few weeks before the start of each following term and ends a week after the start of the courses. The students have to submit an enrollment application for the academic term with a selection of courses which then has to be approved by the academic adviser.

The latest changes of the legislation allow that only 50-60% of the courses for each program can be mandatory, whereas the rest of the courses can be chosen from other programs in the same institution or even from any program active at the university. The role of the academic adviser is to help the students with their choices and prevent them of making costly mistakes that could prolong their studying. The approval process is already done on-line [1], and the proposal is to introduce a virtual academic adviser component that will further ease this process by helping the majority of students, leaving only the truly problematic to be dealt off-line.

The virtual adviser is a component that presents a visual map of all of the previously enrolled terms and the courses selections in each term to a student. It gives the student measures of his success in comparison to other students. The student can see his speed in acquiring and passing credits and compare it with the average of his generation. Further, the future academic terms of the student are mapped according to his average speed and his graduation date is forecasted. The component will enable the student to perform what-if scenarios and change his load, change plan/program, rearrange courses in order to come up with the best plan until graduation.

This component will also enable future addition of intelligent recommendation system modules that may evaluate the capability of each student and his academic performance parameters, compare them to a historical database and suggest an optimally achievable adapted study plan to the student that may lead him to faster completion and/or higher GPA.

INTRODUCTION

The process of term enrollment at the Institute of Informatics is a major administrative process that starts few weeks before the start of each following term and ends a week after the start of the courses. During this process the students have to submit an enrollment application for the academic term where they declare their courses selection. This application has to be approved by the academic adviser and then registered at the students' administration offices. Each student can choose a list of courses to enroll and is free to decide on the number of courses and thus the total work load for the following academic term.

The latest changes of legislation mandate a certain amount of free choice to be present in the study program. In fact, the study program can only mandate 50-60% of the courses for each program. The rest of the courses can be chosen from other programs in the same institution or even from any program active at the university. At the Institute of Informatics an average student is taking a total of 39 courses during the 4 year studies with total 240 credits wheres each course is usually between 6 and 8 credits. So on average, there will be 19 mandated courses that constitute the core of the program, and 20 elective courses (at least 4 of them from another institution). In such situation the students can be confused with the abundance of choice and the question stands if their choice will be the most productive one.

In order to guide the students and make the selection less confusing and easier to make there are groups of several courses each called modules (majors) that are interrelated. Each module leads the student towards a specialization and a diploma of certain kind. No student is allowed to graduate without the completion of at least one module, despite having passed the 240 credits limit.

THE ROLE OF THE ACADEMIC ADVISER

The role of the academic adviser is to help and guide the student to make the most adequate course selection and in that way lead the student to a successful completion of the studies. Different courses have different requirements and can have interdependencies on other courses, so it is not always possible to enroll in all of the courses. It is obvious that certain selections can be made by a student that can hinder the pace of studying. Sometimes bad choice might lead the student into a dead-end – he will not have the right amount of pre-requisites and will not be able to continue in the desired direction. Because of missing requirements, the student will have to enroll additional courses and in the long run, this can even lead to prolonged total duration of the studies.

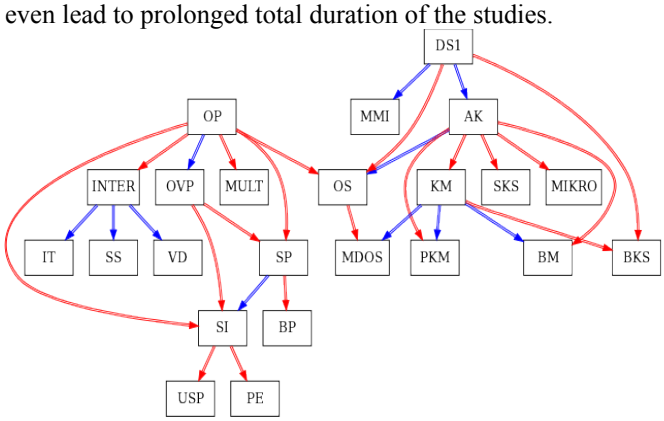

Figure 1: Course interdependencies

Figure 1 presents a graph of dependencies between courses. Is is an oriented graphs and on this picture there are two colour markers for each branch. One type of dependencies mandates that a student must already have

acquired a passing grade on one course to be able to take the following course. The other type of dependencies loosens this prerequisite a bit, and allows the student a time period of up to one term to acquire the passing grade. Until that time he will be able to follow classes on the following course, but will not be able to take exams and will not be allowed to get a final grade. There are in fact 6 various types of dependencies and prerequisites.

So, despite the fixed duration and relative administrative simplicity of the whole term enrollment process, the course selection can have serious implications and the future of each student. This is why special attention has to be given to each and every student. Unfortunately, since the academic adviser has to be a person with knowledge of the intricacies of the whole process and the requirements for most of the courses, it has to be a person from the academic staff, that also has other academic duties. The fact that there can't be many academic advisers and there are a dozen hundreds of students, makes it nearly impossible to pay special attention and give full guidance to every student.

It has to be mentioned that jus tlike all the other institutions, the Institute of Informatics too gives guidelines to students relevant to each diploma type. These guidelines set a pace of studying and a selection of courses that should enable the average student to finish the required 240 credits and graduate in 4 years or even less.

INTRODUCE A VIRTUAL ACADEMIC ADVISER

In reality, it is rare that students strictly follow the guidelines and it is evident that for many students it takes (or may take) a much longer period to finish the studies – ranging on average between 4 and 6 years.

The real reason for this trend varies from case to case – sometimes it is even due to personal choice. Many students are working part-time and intentionally enroll to fewer courses per term. Lack of academic performance and inability to pass the exams of certain mandatory courses is another factor. It also has to be taken into account that students have to re-enroll each course that they did not pass within the required time frame.

There are many other factors that influence the total duration of studies and such investigation is not part of the effort presented here. But still, it can be argued that the academic adviser can do so much to enable each student to take care in advance of possible problems and inform the student with as much detail as possible on the risks and consequences.

I believe that with enough effort the academic adviser could help the student predict the possible future problems and can help every student to find his own pace that would lead to faster completion of the studies with lesser number of drop-outs or re-enrollments. Unfortunately, it can take up to 1 hour to fully understand the situation of each student and propose a somewhat adequate course selection just for the following term. And were it be up to the academic adviser to inform the student of each imlication of the choice that was made, it could take few hours per student.

In order to understand fully the complexity of the issues at hand, one has to be aware that the full graph of interdependencies has in fact (just for our small department) numbers a total of 2000 branches. An adviser can memorize most of them for the most often and problematic cases, but as programs are renovated and improved every couple of years this is futile. Even if the whole department worked it would take them many days to finish with all the students. To better depict the problem one can view the graph of just the two basic types of dependencies, for just one study program, that is shown of Figure 2. It is up to the imagination to envision the whole graph for all of the 16 study programs and 4 more (not represented) dependency types.

One can easily understand that is not it is not objectively feasible to do this manually without involving many teachers and keeping them apart of their research and teaching objectives.

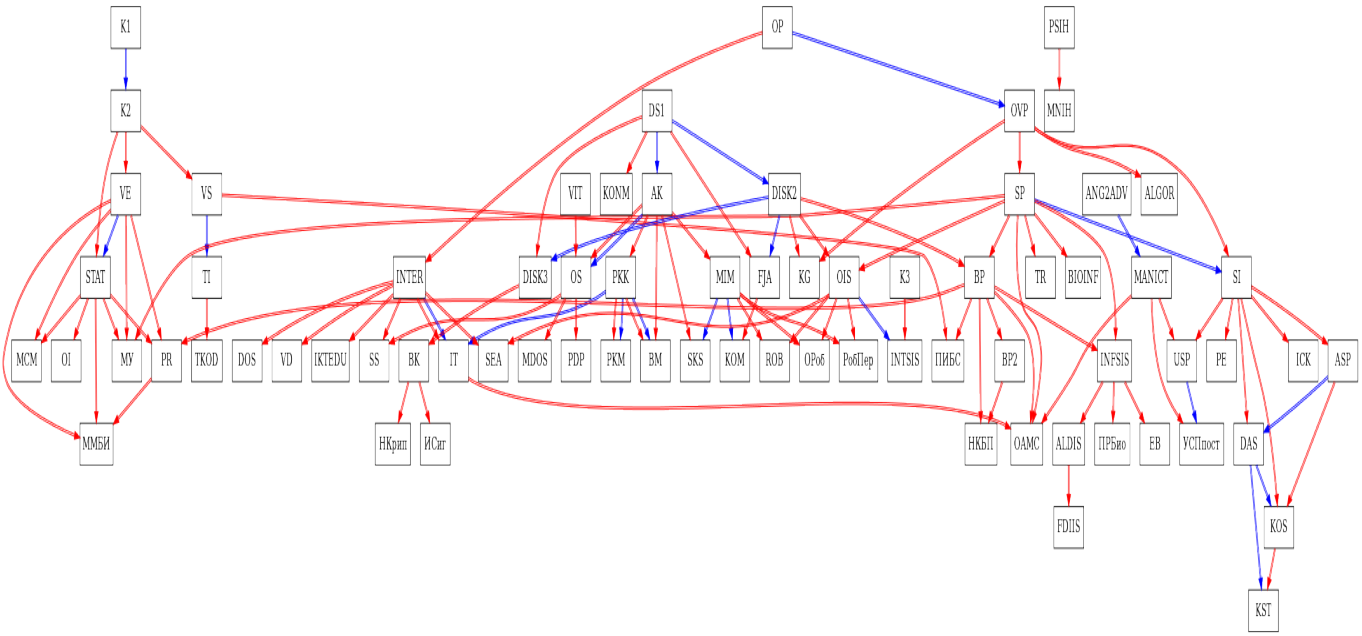

Figure 2: Full tree of the basic two types of dependencies of one study program

That's why I propose the introduction of a **virtual academic adviser** in the process of term enrollments. Despite being only a virtual adviser, such component will still be able to give the student more personal guidance in the process, than any real adviser. Unlike people, software components can spare all their time waiting for their users to decide.

IMPLEMENTATION

The virtual academic adviser component in its current state uses a visually enhanced display of the success of each student. This is in fact a dashboard, showing a map of all of the previously enrolled terms and the courses selections in each term - visually distinguishing the successful courses from unsuccessful ones.

Figure 3 shows a typical map of all term enrollments of a regular student. Each row represents a term, and each box in the row is a course enrolled in that term. The terms are ordered in such a way that the last or active one is on the top, and downward follow earlier enrollments.

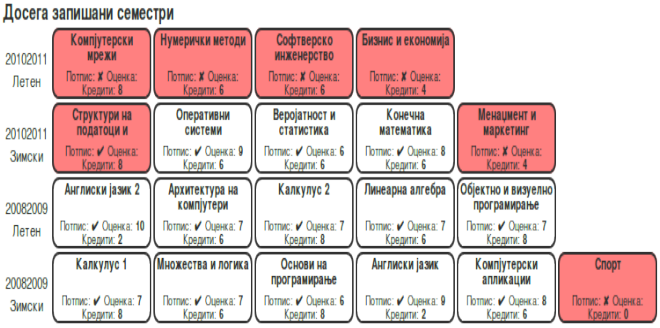

Figure 3: Map of term enrollments of a regular student

Each box shows

- the name of the course,
- whether the lecturer has given a signature to the student (which means that the student has been present on all lectures and has submitted enough coursework to be able to attend an exam)
- the final grade of the student
- how many ECTS credits is the course worth if successfully finished

The boxes are colour coded:

- green boxes represent currenly active courses (classes still take place)
- white boxes represent courses that were finished with success (passed with a grade 6 or above),
- red boxes represent courses that were finished but the student has not passed the course,
- orange boxes represent courses that is not active any more (classes have finished), the student acquired a signature for the lecturer and is allowed to take exame, he has not yet passed the exam, but it is still within the deadlines for finishing.

In this way, the student can have an overview of hes success with just a short glimpse at the map.

As can be seen of Fig. 3 the student has still one course left to deal with from the last term, besides the newly enrolled courses in the last term. All of the other courses are passed with success. This is a typical situation for many successful students.

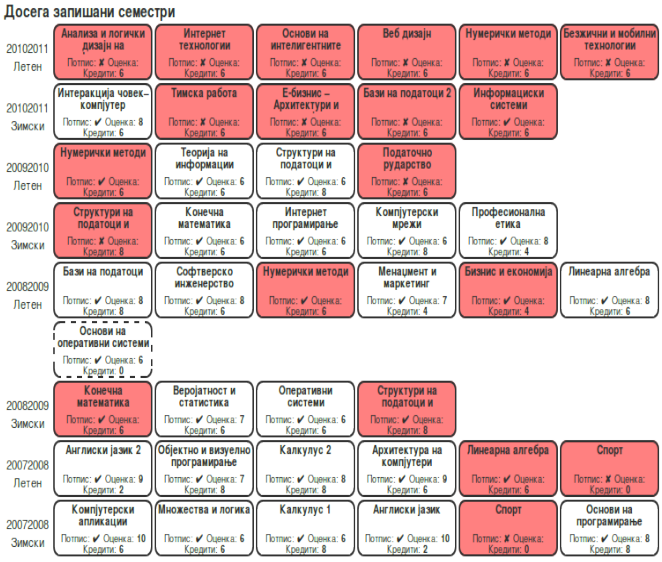

Figure 4: Map of term enrollments of an irregular student

On the other hand Figure 4 depicts a map of a student that was not very successful during his studies up to date. There are several courses that he was not successful at. It can also be seen that he is behind the pace as not being able to pass most of the courses in the last term. This will require huge effort from him in the current term if he is not willing to fall behind indefinitely.

Figure 5 gives emphasis on one of the problematic courses, that the student was not really successful with. It can be seen that the student has enrolled that course for the third time. This is due to the fact that it is a core course and it is mandatory to all students, so if a student fails all deadlines to pass the course, he is obliged to enroll it once again.

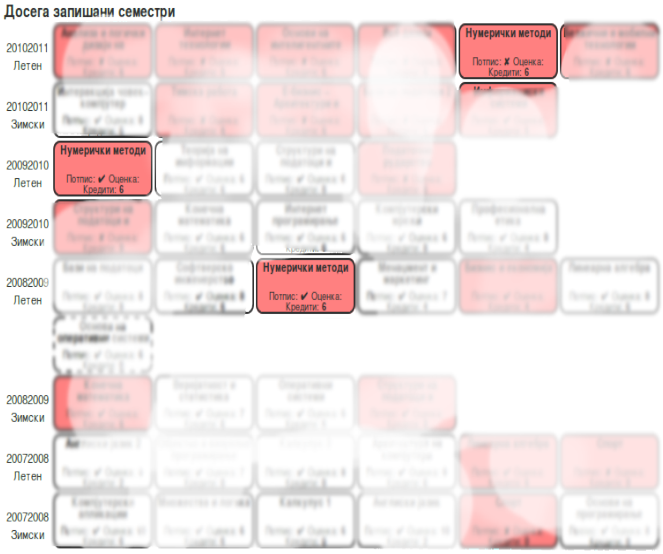

Figure 5: Emphasis on problematic courses

The dashboard also gives the student several measures of his success in comparison to other students. The student can see his speed in acquiring and passing credits and compare it

with the average of his generation and with the historical average of previous students at the same number of terms into the process.

The academic terms the student will have to enroll in the future are mapped according to the average speed of other students up to the forecasted graduation of the students, as shown on Figure 6. The lower part are the past terms and the upper part with yellow boxes shows an estimate of the future.

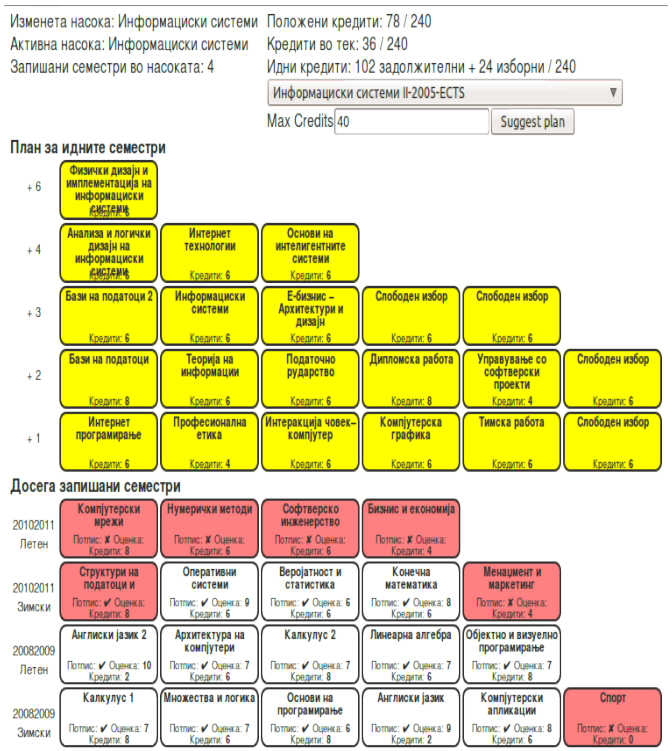

Figure 6: A Future scenario – student continues the same pace

The screen gives several controls to the student so he can change the plan/program and pace of studying. The system immediately recomputes the new total length of studying and accommodates with the new future pace the student will like to take and according to that makes a forecast of the possible graduation date.

The system takes into account interdependencies and course prerequisites and will propose a realistic plan. Of course whether this plan will succeed depends only on the ability of the student to follow and stay through exactly to the new plan. If he decides that the load is too high (or too low) he can experiment with another number of credits per term and see what will happen with the plan. Sometimes the full duration of studying will not change if the students drops the load for few credits.

The system also visually indicates courses that are critical in the future – courses where there was a significant amount of failing grades and where students had to re-enroll in the future term.

The usefullness of this approach is immediately visible. The student shown on Fig. 6, will have to spend at least 6 more terms until graduation with a total duration 5 years of studying instead of the regular 4. Even with the maximum load of 40 credits per term. But on the other hand if he decides to switch to another study program and still keep the same load of 40 credits per term, he might be able to finish in just 4 additional terms (total of 4 years of studying) – Fig. 7.

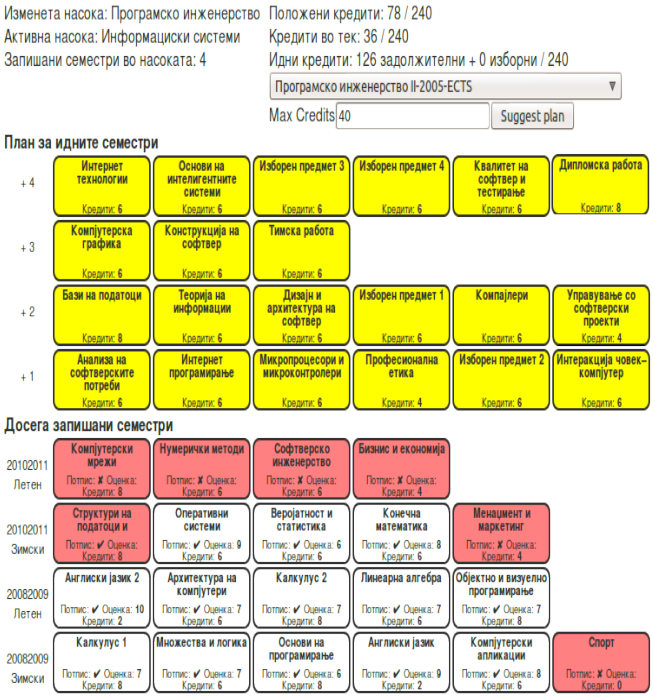

Figure 7: A Future scenario – switch to another program

Conclusion and Future Work

The first implementation of this system uses only simple indicators of various performance factors and only in their absolute form (average length of the studying overall, average percentage of students having to re-enroll a course no matter the time period, whether the course belongs to a certain module or whether it is mandatory) and does not even try to fully model the context of each student and his academic performance. At this moment there is not even sufficient data to fully analyze the true situation.

Yet, this model enables the inclusion of scientifically sound analyses and forecasts in the whole process if and when such become available, see [2]. In such circumstances this component will enable addition of intelligent recommendation system modules that may evaluate the capability of each student and his academic performance parameters, compare them to a historical database and suggest an optimally achievable adapted study plan to the student that may lead him to faster completion and/or higher GPA.

References

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[2] K. Kiroski, M. Kostovska, "Using Classification on UPISI Database," *Proceedings of the 7th International Conference for Informatics and Information Technology, CIIT 2010, February 24-27, 2010, Bitola, Macedonia,* pp 59, ISBN 978-9989-668-88-3