# Building an Easy to Use Flexible University Timetabling User Interface

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## ABSTRACT
University timetabling, better known in the community as course timetabling, is a widely studied issue for problem solving and operational research community. For many years, research groups in many universities have been developing possible solutions that, in most cases, solve only a small portion of the problem. In this poster, we propose a way to solve the timetabling issue using the power of a robust algorithm with a user interface which represents a real-world problem. This algorithm and user interface combination allows us to take into consideration that each university has their own constraints such as a large number of students, limited classrooms, common halls and a certain number of university lecturers, which makes necessary the development of a flexible problem constraints definitions and a proper representation. Preliminary tests show that our user interfaces are mostly accepted and they are easy-to-use for the users involved in the timetabling process of our university.

## Categories and Subject Descriptors
H.5 INFORMATION INTERFACES AND PRESENTATION; H.1.2 User/Machine Systems, Human information processing

## General Terms
Algorithms, Human Factors, Design.

## Keywords
Knowledge representation; course timetabling; user-centered design; usability.

## 1. INTRODUCTION
Course timetabling is a major problem encountered in virtually every high school, college and university around the world. Over the years it has been solved through many approaches [2][3][4]. Also, there are many specialized software tools to solve it according to the needs of large institutions [1][3][5], and several competitions have been developed in order to standardize it. However, each school has their own constraints.

That is why, using our university as a measure of change and constraints complexity, we have developed a transformation process for dynamically recovering information from a Web System which interacts with different users involved in the time-tabling problem solving process and then, the solver uses this information (transformed).

Throughout this poster, we show our approach in the context of similar techniques for the same topic. After that, we present the knowledge representation (including data and constraints) as well as the management through a detailed interface. Finally, we present the interface development process and our conclusions so far, and future work.


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## 2. PROBLEM REPRESENTATION
In order to found valid solutions for a problem, a metaheuristic requires having a right description for it, a description capable of representing all the aspects for the problem's domain. This is why, as shown in Figure 1, the basic unit of a solution vector that represents an assignment of course, lecturer, classroom and time to a specific group has been proposed.

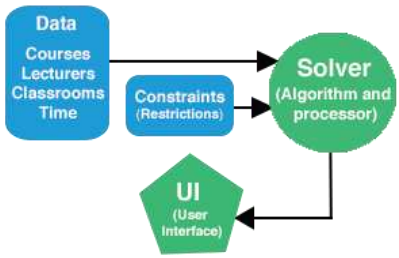


**Figure 1. Block representation between the required data, our solver (algorithm) and the user interface.**

The way in which our university solves this kind of problem is by using really large Microsoft Excel spreadsheet. This file contains all the information from the different majors, classrooms, students and some limitations relating to the facilities. An Administrator tries combinations in order to create a complete, whole timetabling process. This work takes at least one month, and in the Administrator's own words, it is because he has to make a lot of verifications based in the total number of constraints.

## 3. PRELIMINARY EVALUATIONS
The interface development process was carried out following the initial part of the User Centered Design methodology (UCD). As an initial part of the process, interviews were conducted with a significant proportion of users whom would use the system, this taking into account 130 professors, two administrators and nine career advisors. Using this information, the main requirements important for the initial design were raised. The initial design goal

was to present the users just how the final system would look, as well as allowing us to obtain an early evaluation and comparison between this version and the original one.

The system's interfaces were designed to facilitate the way in which information is registered in order to create the general schedule plans of the university. Most of them are user's forms whose information is used by the search algorithm. The resulted interfaces are designed so the user would only see the finished "Term Schedule" which contains the results for different combinations of the main elements, as courses, groups, lecturers, time duration and rooms.

**Fi… …our university with two users at the time.**

## 3.1 Methodology Detailed

Typical users of our system would be the university scheduling administrators, as well as "*Jefes de Carrera*", their secretaries and university lecturers interested in their own schedules. We realized early on that some of them work in pairs with co-workers in order to discover their way into the system. With that in mind, we devised a usability study with real users, using a Cognitive Walkthrough method along with a facilitator from our team; Think Aloud protocol was encouraged with a final questionnaire at the end. Figure 2 shows the arrangement of the testing in our usability laboratory facilities, the UsaLab, in our university.

Finally, the resulted, improved interfaces are as follow: Figures 3 and 4 show two of them:


**Figure 3. Visualizing the Map: the interface presents the user with an interactive campus map in which he/she could refer to detailed information about schedules and facilities.**


**Figure 4. Setting the Constraints: from here, the user can create complex restrictions for the system by simply dragging words and rules into the box, thus creating restrictions.**

Although the interfaces are far from perfect, they are on the right track. The usability testing proved that the users could perform their required activities within a time constraint and with a more than a regular level of satisfaction. User's feedback was taken into consideration for the new iteration of the development of the user's interfaces. Surely, a new evaluation should lead to better values and a higher understanding of the user on a very complex series of tasks. The system's objective is to create a simple, yet powerful tool which could help the users in their work. A user centered design approach is ideal.

# 4. CONCLUSIONS

After the initial research, design and evaluation process, we consider that the proper use of user interface elements creates the entire timetabling process more easily for the administrators so the whole university could benefit from this proposal.

Finally, the evaluations under the mixed initiative Web interfaces, by using a User Centered Design approach, and taking into account the different types of users involved in the timetabling generation have been conducted, with promising results about the usage of the decision support system in our university.

# 5. REFERENCES


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