

## General Article

## Web Application for Automatic Time Table Generation

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Accepted 27 May 2014, Available online 01 June 2014, Vol.4, No.3 (June 2014)

### Abstract

The hand operated system of time table preparation in colleges is very monotonous and time-consuming which results in either the same teachers ending up with more than one class at a time or a number of classes conflicting at the same classroom. Due to a non-automatic perspective, absolute utilization of resources has proven ineffective. In order to deal with such problems, a mechanized system can be designed with a computer aided timetable generator. The system will take different inputs like number of subjects, teachers, maximum lectures a teacher can conduct, priority of subject and topics to be covered in a week or a lecture, considering which, it will create feasible time tables for working days of the week, making excellent application of all resources in a way which will be best suited for the constraints. A suitable timetable is then chosen from the optimal solutions generated.

**Keywords:** Component, Constraints, Resource Scheduling Algorithm, Time Table generation, Optimal Solution.

### Introduction

The difficulty of making timetables for classrooms is a scheduling algorithm with tremendous curiosity and association in the fields of artificial intelligence and operational research. This problem is being dealt in many organizations manually, i.e. timetables are set using a trial and error procedure. The process of preparing a timetable involves beneficial employment of resources which needs to be confronted each year by every educational institute.

### Basic concepts

A great deal of time is devoted by the teaching personnel in generating and managing timetables. This project aims at the development of a tool which will allow institutes generate timetables for schools and colleges without any hindrance, directly from raw schedule. While generating a timetable, the availability of teachers and other resources is considered by this timetable generation software. Furthermore, timetables can be changed according to our necessity, depending on the availability of students, technicians, teachers, substitutes, classrooms and lessons. The difficulties that arise during the generation of timetables are definite and are concerned mainly with assigning events to timeslots subject to constraints with the resultant solution constituting a timetable. Timetabling as defined by Wren (1996) is, Timetabling is the allocation, subject to constraints, of given resources to objects being placed in space time, in such a way as to satisfy as nearly as possible a set of desirable objectives. The constraints during timetable generation can be

categorized into hard constraints that cannot be violated and soft constraints that are not vital but their satisfaction is highly desirable for a good quality solution to be processed. A common timetabling issue is composed of assignment of events like course, examinations, lectures, lab sessions etc. into a limited number of rooms while reducing the violations in the set of constraints.

### Project statement

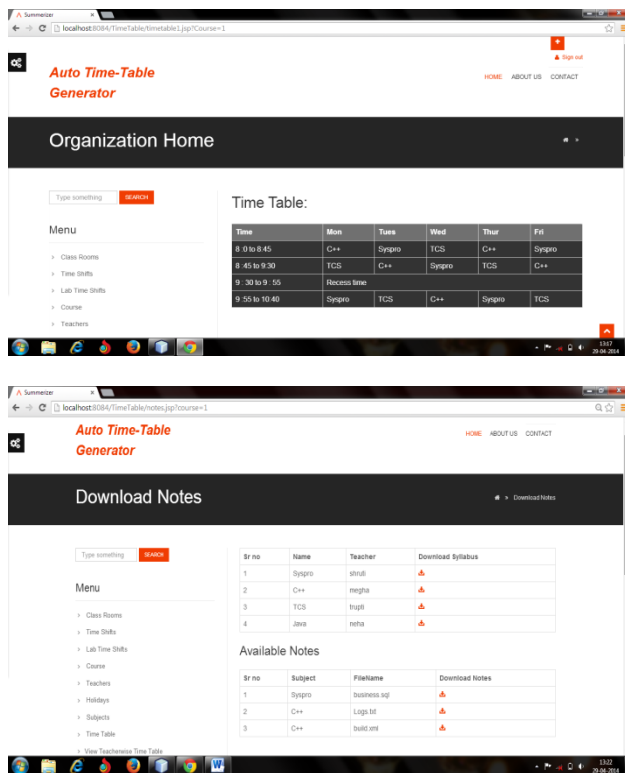
The difficulty faced during timetabling can be represented as a constraint satisfaction problem with loose parameters and many constraints. These constraints can be replicated in a format which can be managed by the scheduling algorithm in an organized manner. The scheduling involves allowing for a many a pair wise constraints using which tasks can be accomplished simultaneously. For example, while scheduling classes in an organization, the same faculty member teaching two courses cannot be assigned the same time slot. On the other hand, two different courses to be attended by the same group of students also should not clash.

### What is to be developed?

In order to deal with the timetabling issue, we are putting forward a system which would mechanically generate timetable for the different courses of the institute. Courses and lectures will be scheduled in accordance with all the possible constraints and the given inputs and thus, a timetable will be generated. The system will allow interaction between the staff and students and at the same time enable them to upload their queries, notes, presentations and e-books. The necessary changes and the

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additional constraints for the next week timetable will also be considered by this timetable generation system.



## Parameters

Different constraints need to be adequately met in order to invoke variables about time slots and classrooms. The constraints can be categorized into strong and weak constraints as follows

### • Strong constraints

1. More than one lecture cannot be allotted to a classroom at the same time.
2. More than one class cannot be taught by a lecturer simultaneously.
3. Courses for the same year-session students of a department should occupy different time slots.
4. The classroom in which a course is to be conducted should be spacious enough to take the students participating in the course.
5. The classrooms should be effectively provided with necessary amenities for the classes.

### • Weak constraints

1. The lectures are not allotted to time slots which come under the lecturer's prohibited time zones.
2. The teaching hours on an instructor should be limited within the allowed maximum hours.
3. The classes should be scheduled in accordance with the lecturer's favoured time zones.
4. A break for lunch/dinner must be allotted to the instructors.
5. The classes must not be scheduled late at nights, if possible.
6. The theory courses are scheduled on Monday and Tuesday, and the practical courses are scheduled on Wednesday, Thursday, and Friday.

7. For daytime students, the cultural subjects courses are scheduled in the morning time slots (1st to 4th time slots on weekdays), and major courses are scheduled in the afternoon time slots (5th to 8th time slots).
8. For night time students, the cultural-subjects courses are scheduled on the 11th to 12<sup>th</sup> slots, and the major courses are scheduled on the 13th to 16th time slots on weekdays.
9. Lectures for the same course should be scheduled consecutively, if possible.
10. As far as possible, classes should be carried out in their respective department's exclusive-use classrooms.
11. The classrooms should be allocated in such assigned in such a manner that the distances between adjoining lecture's classrooms is minimized.

It is desirable for timetables to satisfy all strong and weak constraints. However, it is typically not easy for all these constraints to be satisfied. It is a must for the strong constraints to be met at all times, but the weak constraints can be abandoned in order to find convenient are timetables. Among the weak constraints, constraints from 6 to 14 are compulsory for the assignment of time slots.

On the allotment of classrooms, constraints 15 and 16 are imposed. In order of their importance, constraints are arranged in the scheduling. For instance, if finding schedules that satisfy both 6 and 7 simultaneously is not possible, it does not give preference to the schedule satisfying 7 but 6 and instead chooses the one satisfying 6 but 7. (D. Datta, Kalyanmoy Deb *et al*, Carlos M. Fonseca *et al*, 2005)

Apart from timetable generation we are including additional features like

### • Forum

Forum is a meeting or medium where ideas and views on a particular issue can be exchanged. Students can post their queries in forum and staff members can answer those queries.

### • News And Announcements

News is the communication of selected information on current events. It is shared in various ways among individuals with wider audiences. Important news and announcements for students and staff are flashed on the screen.

### • Different reports

Attendance, result reports are generated.

### • Review

A review is an evaluation of a publication, product, service, or organization. Students and parents can give reviews about organization. Admin has rights to delete reviews which are not appropriate for institution.

Also, we are trying to implement the feature of syllabus mapping in our system which maps the part of the syllabus to be covered in the particular lecture or practical slot of that week. On clicking on the lecture or practical slot, syllabus to be covered in that time slot will be displayed in a pop-up window. But, this feature requires proper distribution of syllabus like unit wise or chapter wise or to be more precise, topic wise according to the number of lectures to be taken in that semester. This feature helps in completing the syllabus properly n

efficiently. Also it helps in keeping the track of the syllabus taught thus accelerating or slowing down the speed of teaching in Institutes.

### Applications and benefits of the system

Timetable is a completely automatic time table scheduling software:

- Allocation of periods to classes and instructors is completely mechanized and does not restrict the user any processing.
- A compatible and accurate timetable is guaranteed and the system is therefore well organized and reliable.
- Enables the collaboration of teachers and students.
- The study material can be used in common with others.
- Time and Labour is saved.

The system also has some other advantages; which are as follows:

#### 1. Security

Security is one of the most important factors as categorized data will be contained in a database. User validation will be performed during login to make sure that the user is valid and his or her access is limited to their respective permission data.

#### 2. Standards compliance

The system will have steady interface formats and button sets for all forms in the application, a form based interface for all data entry and viewing formats and will create reports that are formatted in a table and that should look like the current manual report formats for user friendliness.

#### 3. Maintainability

The system can be maintained without any hindrance by the developer or any other professional and it shall respond as fast as possible in creating reports, thus generating the timetable.

### Conclusion

The application will make the procedure of time table generation easier consistently which may otherwise need to be done using spread sheet manually which might lead to constraints problem that are strenuous to establish when time table is generated physically. The purpose of the algorithm is to generate a timetable schedule mechanically. The algorithm includes many techniques, aimed at improving the efficiency of the search operation. It also addresses the chief hard constraints. Most of the non-rigid soft constraints are also productively handled. Keeping in mind the generality of the algorithm operation, it can further be modified to more particular scenarios, e.g. University, examination scheduling, etc. A number of hours which are spent on creating a fruitful timetable can be reduced ultimately through the mechanization of the timetable issue. The most fascinating future direction in the evolution of the algorithm lies in its addendum to constraint propagation.

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