

Automated Timetable Generator

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Abstract

The traditional hand operated method of time table is very time consuming and usually ends up with various classes clashing either at same room or with same teachers having more than one class at a time which is being resolved by Automated time table scheduling. This project introduces a practical timetabling approach capable of taking care of both hard and soft constraints required specially for preparing time table in colleges with large number of students and limited resources like class-rooms or labs. The automated time table scheduling provides easier ways for teachers and student to view their timetable once they are finalized over the application, having individual login id and passwords, and also some staff usually takes the previous year's timetable and modify it but still it is a tedious job to incorporate changes. To overcome all these problems we propose to make an automated system. This paper also presents an evolutionary algorithm (EA) based approach to solving a heavily constrained university timetabling problem which has been used in other projects also.

Keywords: Components, Constraints, Resource scheduling algorithm, optimal solution

I. INTRODUCTION

The manual timetable scheduling demands considerable time and efforts along with lots of paperwork. The timetable scheduling can also be considered as a Constraint satisfaction problem (CSP)[6], which is a unique concept in Artificial Intelligence[4], in which we find a solution that satisfies the given set of constraints. Time table scheduling has been in human requirements since they thought of managing time effectively. It is widely used in schools, colleges and other fields of teaching. In early days, time table scheduling was done manually with a single person or some group involved in task of scheduling it with their hands, which take lot of effort and time. While scheduling[5], even the smallest constraints can take a lot of time and the case is even worse when the number of constraints or the amount of data to deal with increases. Other cases that can cause problem is when the number of Faculties (Teaching Staff) are less, resulting in rescheduling of time table or they need to fill on empty seats urgently. In such cases Automated time table[5], scheduling can be a very convenient method for managing it in computers with algorithms also proving to be eco-friendly for no paperwork.

II. RELATED WORK

In one of our reviewed paper[5] David Abramson and J Abela, Evolutionary techniques have been used to solve the time table scheduling problem. Methodologies like Genetic Algorithms (GAs), Evolutionary Algorithms (EAs) etc have been used with mixed success. We have further solved the problem with a mimetic hybrid algorithm, genetic artificial immune network (GAIN) and compare the result with that obtained from GA. In this paper, we have reviewed the problem of educational time table scheduling and solving it with genetic algorithm. Algorithms (GAs)[14].

In August 1995, an international conference was held on the Practice and Theory of Automated Timetabling (PATAT). The aim of the conference was to align the needs of practitioners and the objectives of researchers through presentation and application of leading edge research techniques. The success of this conference brought about the formation of a committee named EURO (European Conference on Operations Research) Working Group on Automated timetabling[15][16].

III. 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.

IV. SOLUTION

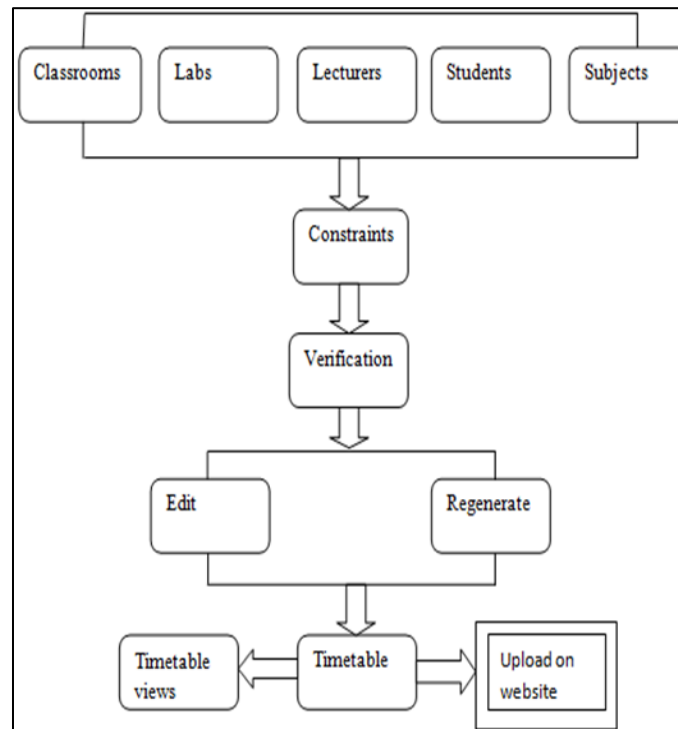


Fig. 1: Solution to above statement

As the previous methods of Timetable generation included a tedious process of assigning each subject to staff manually and scheduling the Timetable as in a way so that no clashes occur. But this process also took great use of time and also us of paper-work which is cost-ineffective. For this approach we decide a solution of using our computing skills and technology to generate the Timetable. It is done using the Automated Timetable generator which contains the involvement of Evolutionary Algorithms (EAs) called Genetic Algorithm. The Genetic Algorithm involves the process of Chromosome Representation to generate the Timetable. The above Solution gives an block model of following processes: The user will enter each of the data as counts of subjects,class-rooms,labs,lectures,students. The admin will assign each subject to their respective staff and assign them classrooms and the students whom they will teach. The Admin will use constraints as given in the algorithm so that no constraints occur. After assigning the Admin will do a verification check so that no anomalies are missed out. If the Admin encounters any mistake or clash that had been gone unnoticed earlier, he/she has the option to edit and then regenerate. After successful reviews the Timetable is uploaded on the college website for the staffs and students to view.

V. QUESTIONNAIRE FOR REQUIREMENT GATHERING

A. The Questions Asked To Teachers Were As Follows:

- 1) In morning sessions what is preferred?
a) Theory teaching b) Practical teaching c) No loads d) any thing
- 2) On a particular day your lecture should be –
a) Prior to other lectures b) in midst of other lectures (c) at end of other lectures
- 3) How many maximum lectures you can deliver comfortably in one day?
a) One b) Two c) Three d) Four e) Any
- 4) How much maximum total work load you prefer in one day?
a) One b) Two c) three d) Four e) Five
- 5) How many different subjects you can deal with comfortably in one semester?
a) One b) Two c) Three d) any
- 6) You prefer to take only those lab sessions for which you take theory session?
a) Yes b) No c) not necessarily
- 7) How much minimum time gap (in hours) you need between two sessions (lectures /labs)?
a) One b) two c) three d) none

B. The Answers To Following Questions Were Requested From Students:

- 1) In morning sessions what is preferred?
a) Theory learning b) Practical learning c) No study d) any thing
- 2) What should be complexity of subject studied at start of schedule?
a) Hard b) Easy c) Moderate d) Any
- 3) You prefer which type of teacher at start of schedule?
a) Senior teacher b) Junior teacher c) Any
- 4) How many different subjects you can study comfortably in one day?
a) One b) Two c) Three d) Four

VI. METHODOLOGY

The methodology used in this application enables us to approach Evolutionary Algorithms. Evolutionary Algorithms are a class of direct, probabilistic search and optimisation algorithms gleaned from the model of organic evolution. A Genetic Algorithm (GA) is a type of EA and is regarded as being the most widely known EA in recent times.

A GA differs from other search techniques in the following ways:

GAs optimises the trade off between exploring new points in the search space and exploring the information discovered thus far. GAs is randomised algorithms, in that they use operators whose results are governed by probability. The results for such operations are based on the value of a random number. This means GAs use probabilistic transition rules, not deterministic rules.

GA was combined with a heuristic specific greedy algorithm to take advantage of the global search of feasible solutions and specific technique efficiency in local solution optimization. This approach resulted in considerably smaller execution times.

Table -1:

List of Hard constraints

Sr.no	Constraints
1	No students can attend more than one lecture at a time.
2	No lecturer can teach more than one subject at a time.
3	No room can occupy more than one lecture at a time.

Table -2:

List of Soft constraints

Sr.no	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	A break for lunch/dinner must be allotted to the instructors.

VII. SYSTEM MODEL

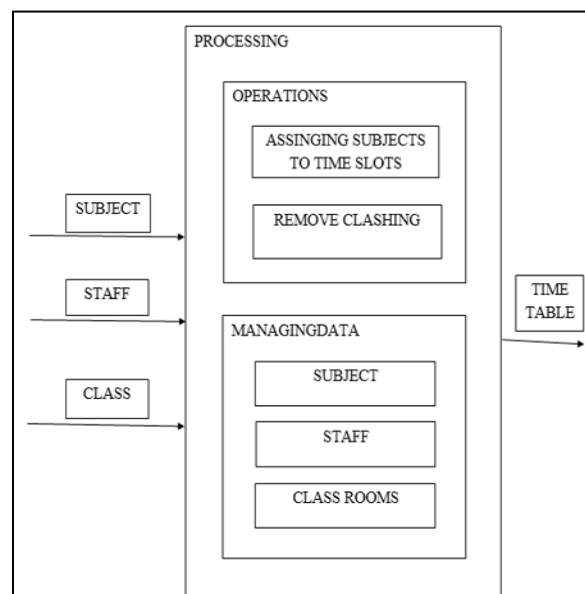


Fig. 2: System Model

The process of Timetable generation using the Automated Timetable generator includes the processing and Managing Data as the two phases in it. These two phases form a block where input will be given to these blocks and optimal output(Timetable) will be generated. The inputs include the details as number of subjects to be allocated, available number of staff(Lecturer) to be given particular subject so that no clashes occur and also available number of class-rooms to be allocated for each subject. The Automated Timetable generator will take into consideration the inputs as subject-wise, staff-wise and class-wise. The inputs entered go through the processing phase first where there are operations like "Assigning subjects to time slots" and "Remove clashes" where the calculations of fitting each data will be done using Automated Timetable generator. Then the Managing Data phase comes where the data of each subject, class and staff is taken to avoid any redundancies and generate the Timetable. There will be a assigned Admin who will take care of entering the inputs and the application will only be under the admins control to do any changes in the Timetable.

VIII. SUMMARY

This paper addresses the Timetabling Problem, which covers a very broad range of real problems faced continually in educational institutions, and we describe how Evolutionary Algorithms (EAs) can be employed to Effectively address arbitrary instances of automated timetabling problem. Automated Timetable Generator application will simplify the process of time table generation smoothly which may otherwise needed to done using spread sheet manually possibly leading to constraints problem that are difficult to determine when time table is generated manually. It helps to provide a optimal solution.

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