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A Study on Curriculum Scheduling

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ABSTRACT: This document proposes an optimal technique to automate time table system. Generating the time table involves various challenges and constraints of resources including faculties, rooms, students and time slots. This paper helps out by providing various types of algorithms which can help in generating time table. Every solution uses a different technique and gives different results which have different optimality. We basically focus on the best solution we can get by applying various algorithms. This system ensures that various constraints are resolved before the final time table is displayed as an output. The objective of the system is to generate the acceptable using any of the algorithms.

KEYWORDS: Evolutionary Algorithm, Genetic Algorithm, Heuristic Algorithm, Pooling Algorithm, Time Table Generator

I. INTRODUCTION

A timetable is an organized list usually a tabular form, providing information about a series of arranged events and the time duration at which it is planned for these events to take place. There are many versions that have been already designed and implemented, this time table generations system gives you a complete collection of all the features you would need to generate your own time table. It is really helpful for people working in education field like colleges and schools. It just needs a database of students, classrooms and teachers. The main focus of this paper is to design and implement a system in which is cheap and highly efficient suitable for almost every education institute. This is really helpful since every semester needs a new time table and new faculty needs to allotted to every new batch of students. There are two types of constraints hard and soft constraints. Hard constraints are constraints that cannot be violated while a timetable is being computed. For example, if a teacher to be allotted for a timeslot, the teacher must be free and available for that time slot. A solution is perfectly correct and accepted only when no hard constraint is violated. On the other hand soft constraints are those that are desired to be added in the solution as much as possible. For example, as the importance is given to a teacher's scheduling, focus is also on setting a valid timetable and this can lead to a teacher going free for a time slot. Thus, while working on the timetabling problem, hard constraints have to be adhered, at the same time and effort is made to satisfy as many soft constraints as possible.

II. ABOUT THE SYSTEM

This Time Table Generating system will be developed in Java and the database will be in MS Access. While generating a timetable, the major importance is given to effective utilization of resources such as the classroom, the teacher, etc. This becomes a very tricky task which needs to be addressed at least once a year by every academic institute. Most schools and universities deal with this problem manually, i.e. a trial and error method is used to set a timetable. In a common educational timetabling problem, a set of events are assigned into a certain number of timeslots (time periods) subject to a set of constraints, which sometimes make the problem very difficult to solve in real-world circumstances. In fact, time tables which are based on large-scale like university timetables may need a lot of time of qualified people or team in order to produce high quality timetables with constraint satisfaction and optimization of timetable's objectives at the same time.



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III. ALGORITHMS

There are many different types of algorithms which are used by many other systems which are discussed below.

i. Heuristic Algorithm

Due to the complexity of the problem, most of the work done concentrates on heuristic algorithms which try to find good approximate solutions. Heuristic Algorithm is one of the algorithms used. These are considered to be good solutions but not optimal as they search for all possible solutions but don't guarantee that it will be the best found. Generally, two questions arise (i) How fast the solution is computed? (ii) How close the solution is to the optimal one?

The proposed algorithm aids solving the timetabling problem while giving importance to the teacher's availability. This algorithm uses a heuristic approach to give a general solution to university timetabling problem. It takes the user input such as number of subjects, number of teachers, subjects every teacher takes, number of days in a week for which the timetable needs to be set, number of time slots in a day and the maximum lectures a teacher can conduct in a week. It initially uses randomly generated subject sequence to make a temporary time table. While generating this sequence, care is taken to avoid repetition of subjects over a day. After this, the teacher availability for each of the subjects allocated for the respective slot is checked. The teacher should be always available for the subject he is allotted, the subject and the teachers are entered into the output data structure and are marked as final. Before the allocation of this subject to the output data structure, a comparison also takes place on the number of maximum lectures a teacher can conduct. If the teacher has been allocated more than the allowed maximum lectures the subject is moved into a clash data structure. [1]

User Input

- Teachers
- Subjects
- Time Slots
- Classrooms

ii. Pooling Algorithm

We can treat time table generation scheduling as a process of fill in a blank timetable with the known courses, in a certain rule and condition. The rule and condition shape into the algorithm in computer, we can use this algorithm to create a Time Table with little manual work. To decrease the unreasonable part, we just need a little time to rectify it with human labour, and this process save us a lot of time. In the scheduling algorithm based on priority, we first need to rank the courses under certain conditions, such as course time, art or science, importance etc. And then, we can use the pooling algorithm to scheduling the reasonable timetable. At last, rectify the unreasonable part to perfect the timetable. [2]

iii. Evolutionary Algorithm

Evolutionary Algorithms (EAs) can be employed to effectively address arbitrary instances of automated timetabling problem. Evolutionary Algorithms are a class of direct, probabilistic search and optimization 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.

Automated Curriculum Scheduling 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 an optimal solution.

iv. Software Engineering Algorithm

The main requirements of this software project are listed below:

- Print out the timetable.
- To authenticate the user using the online system.
- Display the subjects that the user is allowed to take.
- Allow the user to select the subjects. Generate the possible timetable combination track which combination is selected by the user. [3]

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Additional requirements include:

- Allow for add drop of subjects.
- Track total academic units been registered.
- Determine number of vacancies for a particular timetable combination.

v. Genetic Algorithm

Genetic algorithm is a general and optimization algorithms inspired by -processes and normally associated with natural world. They can be used as techniques for solving complex problems and for searching of large problem spaces. Unlike many heuristic schemes, which have only one optimal solution at any time, Genetic algorithms maintain many individual solutions in the form of population. Individuals (parents) are chosen from the population and are then mated to form a new individual (child). The child is further mutated to introduce diversity into the population. Rather than starting from a single point within the search space, GA is initialized to the population of guesses. These are usually random and will be spread throughout the search space. A typical algorithm then uses three operators, selection, crossover and mutation, to direct the population toward convergence at global optimum. [4]

IV. SOME COMMON MISTAKES

There are some mistakes which are already there in the currently exciting systems.

- The teacher might not be available for a particular time slot.
- The classroom might not be available for a particular time slot.
- A classroom may be allotted to more than one lecture at the same time.
- Classroom should have enough capacity to accommodate all the students of that particular class.

V. FEATURES

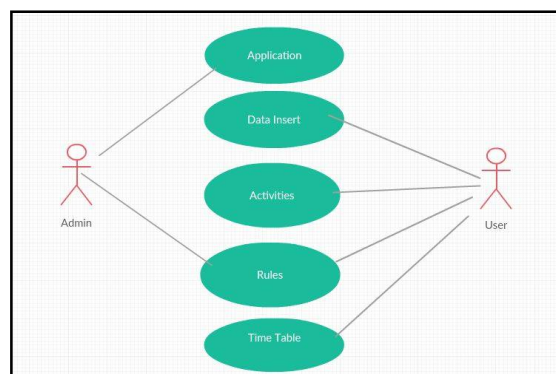
The system provides following features which make it different from the already existing systems:-

- It is quick and easy to enter all the subjects and class rooms.
- Automatic generation of the time table that fulfills all your requirements.
- Separate teacher and class wise time tables which is really helpful.
- Lectures to be scheduled per day are kept in mind.
- It can generate any number of time tables.
- It can potentially be used as part of an automatic solver.

VI. DIAGRAMS

Use Case Diagram

This diagram represents the interaction between users and the system. This identifies the role of users and the admin with the external system. This determines the functional scope of the package.



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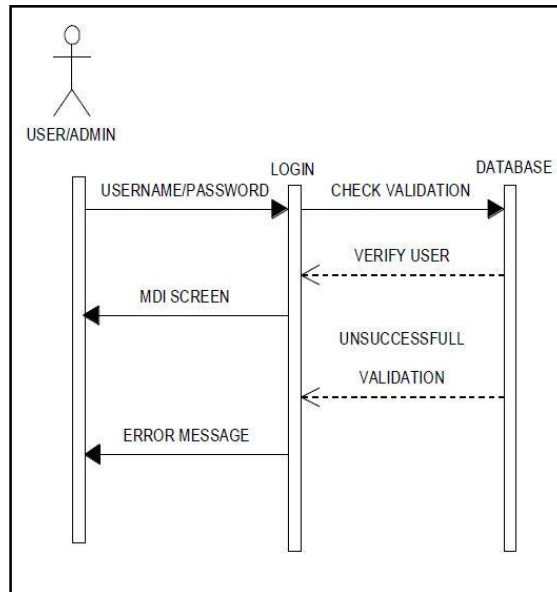
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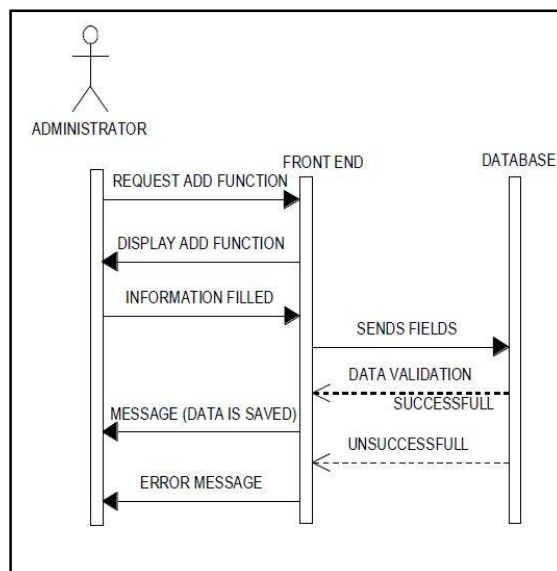
Sequence Diagram

This elaborates the use case and describes the whole scenario. It tells us about the behaviour of the user.

1) Login



2) Add Teacher in Database

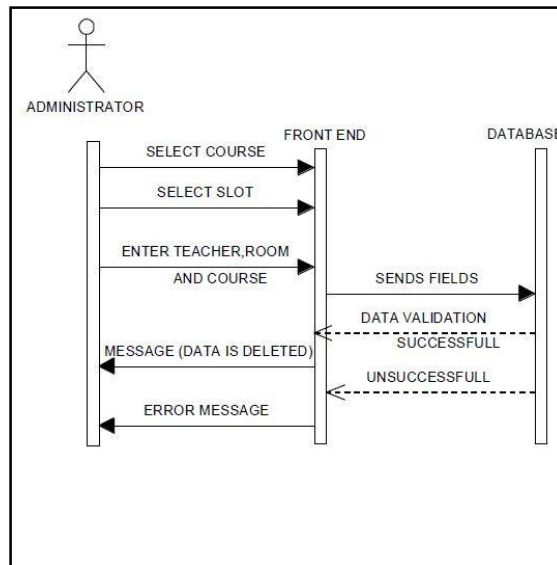


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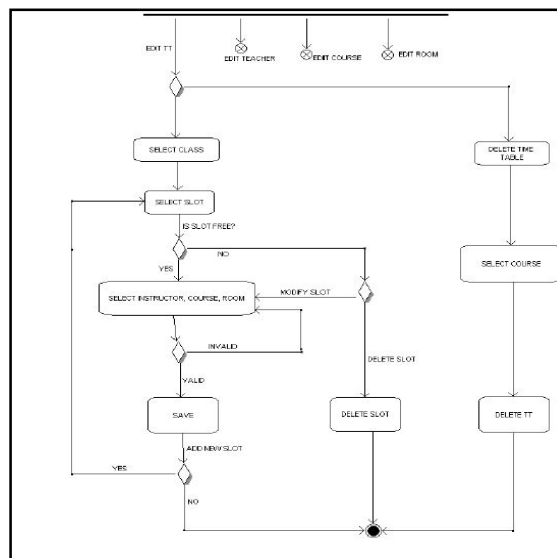
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3) Add Time Table Details in Database



Activity Diagram

Activity Diagram is mainly used as a flow chart which consist of activities performed by the system. It is not just a flow chart, it has some extra capabilities too. This diagram shows the flow with which the user enters the system and performs all the steps to generate the time table.



VII. CONCLUSION

The Time Table Generation System is an application for generation of timetable for students and teachers which turn out to be efficient and optimal. The efficiency of this is to generate the system with zero clashes. In this system there



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will enough security which helps only relevant staff to access the software as there is a proper login system to access the software.

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