

Automated Timetable Generation using Genetic Algorithm

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Abstract— At present we are using a manual system of preparing time table in colleges with a large number of students. Here the manual system means the teacher needs to prepare the timetable which is very much time-consuming. Most colleges have several different courses and each course has several subjects. Now there are limited faculties and each faculty teaching more than one subject. So now the timetable needed to schedule the faculty at provided time slots in such a way that their timings do not overlap and the timetable schedule makes the best use of all faculty subject demands. We use a customized algorithm for this purpose. In our timetable generation algorithm, we proposed to utilize a timetable object.

Index Terms—Website, timetable generator.

I. INTRODUCTION.

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 and working like crash courses, coaching centres, training programs etc.

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 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.

In such cases perfectly designed time table is reused for whole generation without any changes, proving to be dull in such situations. Other cases that can cause problem is when the number of employers/workers are weak, resulting in rescheduling of time table or they need to fill on empty seats urgently.

Institutions/Schools/Collages/Universities are the regular users of such timetables. They need to schedule their course to meet the need of current duration and facilities that are available to them.

However, their schedule should meet the requirement of new course addition and newly enrolled students to fresh batches. This may result in rescheduling the entire time table once again for its entire batches and to be scheduled in shortest possible time before the batches course start.

Another problem that occurs when scheduling time table for exams. When multiple batches have exam on same day, they need to be schedules effectively considering all problems related to facilities that are available to conduct these exams simultaneously.

II. LITERATURE REVIEW.

1. A STUDY ON AUTOMATIC TIMETABLE GENERATOR. Parkavi A (M.S. Ramadan Institute of Technology). The paper was published in May 2018 <https://www.researchgate.net/publication/32626533> :-

It is large and highly constrained, but above all the problem differs greatly for diverse colleges and learning institutions. It is hard to write a universal agenda, fitting for all possible timetable problems. Even though manual creation of timetable is sustained, it is still universal, because of the lack of suitable computer programs. Timetable problems There exist a lot of diverse timetable problems such as:

- University Timetable
- Exam Timetable
- School Timetable
- Sports Timetable
- Worker Timetable

Moreover, there exist a lot of problem solving methods, which typically use the concept of customary optimization algorithms such as genetic algorithms, Backtracking, Constraint Logic Programming. In recent years two major approaches appear to have been victorious. • Local Search Procedures • Constraint Programming (CP). B. The Local Search Procedures The local search measures such as Simulated Annealing, Tabu Search and Genetic Algorithms. These method convey constraints as various cost functions, which are minimized by a Heuristic Search of enhanced solution in a neighborhood of some opening realistic result.

2. Practices in timetabling in higher education institutions. R. A. Oude Vrielink ,E. A. Jansen , E. W. Hans , J. vanHillegersberg. The paper was published on 27 October 2017.

<https://www.researchgate.net/publication/320675938> Practices in timetabling in higher education institutions a systematic review:-

This paper proposed a technique for smart autogenerate scheduling system specifically for the educational sector.

In constructing a precise and high efficient timetable there are constraints that needs to be conceded i.e. availability of class rooms, students, lecturers, courses, time slots etc. These are the tedious elements that contribute to the challenges in producing the same. Considering Faculty of Electrical Engineering (FKE) University Technology MARA (UiTM), Pasir Gudang campus as a piloted project, the proposed Auto-Generated Scheduling System

(AGSS) is expected to overwhelm these problems. AGSS will provide the accessibility to the timetable committee to arrange the detail by simply loaded the information i.e. numbers of lecturer, list of class room, courses and loading detail (ATS) into the developed algorithm Artificial Intelligence (AI) expert system.

Xampp and Visual basic is used in developing the timetable database and Graphical User Interface (GUI) for timetable system respectively. Based on the loaded information, the system will generate the class timetable automatically with individual user customizable setting. AGSS is adept to envisage the cost effective with fast and precise solution on the timetable management thus providing alternative solutions for timetable management while maintaining quality, reliability, and functionality.

3. Automatic Time Table Generator, 1. Sarthe M, 2. Pranav Kiran Vase, 3Pradeep, 4Mahesh NR. The paper was published on 5, May2017. http://ijarcse.com/Before_August_2017/docs/papers/Volume_7/5_May2017/SV7I5-0234

4. Adithya R Pai, Ashwitha S, Raksha Shetty, Prof. Geethalaxmi “Automated college timetable generator” International Journal of Scientific & Engineering Research Volume 9, Issue 4, April-2018:-

The problem of class teacher timetabling was first studied by Gottlieb in 1962. Since then several algorithms have been introduced to solve the problem. The earliest solution proposed was based on sequential methods that deal with timetabling problems as a graph problem. Later, several researchers applied the Evolutionary Algorithm (EA) and Genetic Algorithm (GA) approach to find a feasible and optimized solution for highly constrained systems. Metaheuristic methods ,tabu search, cluster methods, simulated annealing, scatter search methods, fuzzy logic are some other approaches used by the intelligent methods such as Swarm intelligence, Artificial Neural Networks and hybrid approach. However, all these methods took help of foundational algorithms which are highly sensitive, even a small change results in different group level behavior. Also, the user interface was not involved, which made deployment harder.

III. PROBLEM ANALYSIS AND LIKELY BENEFITS BASED ON LITERATURE REVIEWS

Problems:

- a) User has to format it a bit after it is prepared.
- b) In case of system failure, a whole new infrastructure is constructed.

IV. OBJECTIVES

The main objectives of our project are:

- a)The final system should able to generate time tables in completely automated way which will save a lot of time and effort of an institute administration.
- b)To make a timetable system generic so that we can work equally well for different School, Colleges and Universities.
- c)User defined constraints handling.
- d)Ease of use for user of system so that he/she can make automatic timetable.
- e)Focus on optimization of resources i.e. teachers, labs and rooms etc.
- f)Provide a facility for everyone to view timetable.
- g)Generate multiple useful views from time table.

V. METHODOLOGY USED

Managing This section describes the approach, design and implementation of the Automated Timetable Generating System as a framework.

A design methodology is a methodical approach to creating a plan by applying a set of methods and guiding principle. We have followed these methodologies.

Total requirement of the system including the framing of timetable strategy should be concerned A database should be formed. As for every rules taken for the reason of maintaining the records. Record all possible scenarios and then upcoming with flow-charts to handle the scenario.

The scheme should be carefully tested by running all the test cases written for the system.

Firstly we should do timetables for first year classes so by entering details of first year timetables of all section.

Read the details like faculty, subjects, section into the database.

Retrieve the first-year timetable timeslots and assign the timeslots to the respective faculty.

Retrieve the subjects allotted for first year faculty and start filtering their subjects in the timetable.

The faculty who handles the theory classes will be allotted for tutorial and related lab.

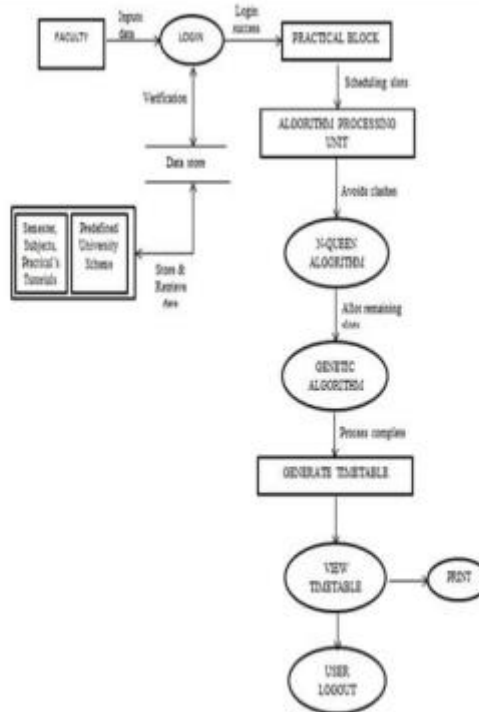
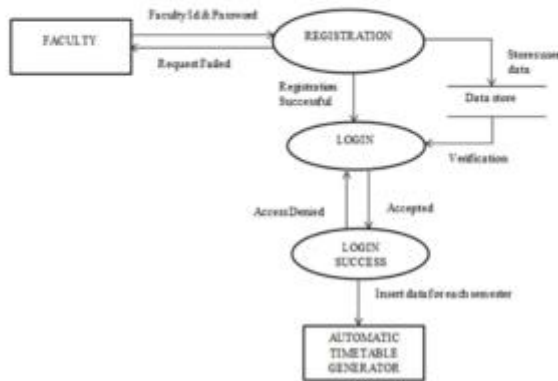
All faculties should get two hours of classes in the day session depending on the subject allotted.

The workload allotted for professor, associate professor, and assistant professor have to be followed.

Data Flow Diagram:



Level 0

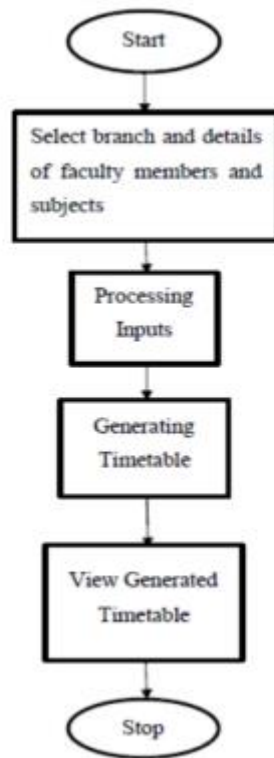


LEVEL 2

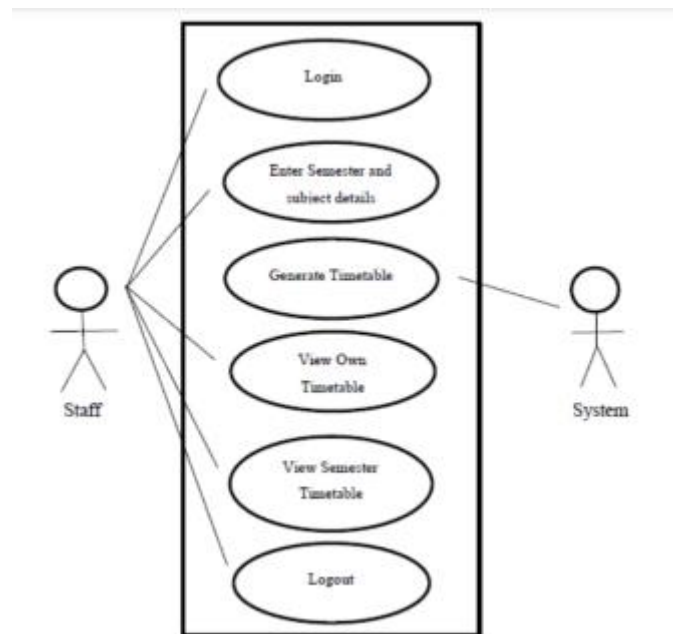
A data flow diagram is a graphical representation of the “flow” of data through an information system, modelling its process aspects. A DFD shows what kinds of information will be input to and output from the system, where the data will come from and go to, and where the data will be stored.

Flowchart:

A flowchart is a type of diagram that represents an algorithm, workflow, or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows. The diagram below shows the step by step working of the automatic timetable



Use case diagram 1:



A Use case diagram at its simplest is a representation of a user's interaction with the system and depicting the specifications of a use case. A use case diagram can portray the different types of users of a system and the various ways that they interact with the system. This type of diagram is typically used in conjunction with the textual use case and will often be accompanied by other types of diagrams as well. Here the staff will enter semester and subject details. The system will process these inputs and generate the timetable.

VI. PLACE OF WORK AND FACILITIES AVAILABLE / REQUIRED

We worked on this project in our college laboratories. For the project, we also work at patronized company sites for knowing their demands and changes from time to time. Because of that we fluently get to know about their events and the stories of some events to describe in a website and make some creative content to make the website.

VII. FACILITIES REQUIRED

Hardware Requirements:

• Hardware	: Processor Intel dual-core and above
• Clock speed	: 3.0 GHz

• RAM size	: 512 MB
• Hard Disk capacity	: 400 GB
• Monitor type	: 15-inch color monitor

Software Requirements:

• Operating System	: Windows XP, Windows 7, Windows 8, Windows 11
• Internet connection	: Existing telephone lines, Data card.
• Browser	: Google chrome's latest version
• Database	: MySQL.
• Software	: Visual Studio 7.33.0

VIII. RESULTS AND PERFORMANCE MEASUREMENTS**1. Operational Feasibility**

In this step, we verify different operational factors of proposed systems like man-power, time etc., whichever solution uses less operational resources, is the best operationally feasible solution in which the solution should also be operationally possible to implement. Operational Feasibility determine if the proposed system satisfied user objectives could be fitted into the current system operation. The methods of processing and presentation are completely accepted by the clients since they can meet all user requirements. The proposed system will not cause any problem under any circumstances. Our project is operationally feasible since the time requirements and the personal requirements are satisfied. We are a team of four members and we worked on this project for three working months.

2. Technical Feasibility

In this step, we verify about the proposed systems are technically feasible or not. i.e., all the technologies required to develop the system are available readily or not. Technical Feasibility determines whether the organization has the technology and skills necessary to carry the project and how this should be obtained. The system can be feasible because of the following grounds: All necessary technology exists to develop the system. This system is too flexible and it can be expanded further. This system can give guarantees of accuracy, ease of use, reliability, and security of your data. This system can give instant response to inquire. Our project is technically feasible because, all the technology needed for our project is readily available.

3. Economic Feasibility

Economically, this project is completely feasible because it requires no extra financial investment and with respect to time, it's completely possible to complete this project in 6 months. In this step, we verify the proposal which is more economical. We check the financial benefits of the new system with the investment. The new system is economically feasible only when the financial benefits are more than the investments and expenditure. Economic Feasibility determines whether the project goal can be within the resource limits allocated to it or not. It must determine whether it is compulsory to process with the entire project or whether the benefits obtained from the new system are not worth the costs. Financial benefits must be equal or exceed the costs. Our project is economically feasible because the cost of development is very minimal when compared to financial benefits of the application.

IX. CONCLUSION

It is complicated task that to handle many Faculty's and allocating subjects for them at a time physically. So our proposed system will help to overcome this disadvantage. Thus we can produce timetable for any number of courses and multiple semesters. This system will help to create dynamic pages so that for implementing such a system we can make use of the different tools are widely applicable and free to use also.

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