

# Time Table Generation: Constraint Programming through Random Function Approach

Shefali More

Student, Department of Computer Engineering  
Institute of Technology and Management Universe  
Vadodara, India  
*shefalimore19@gmail.com*

Parita Vyas

Student, Computer Engineering  
Institute of Technology and Management Universe  
Vadodara, India  
*paritavyas256@gmail.com*

Ayushi Shah

Student, Department of Computer Engineering  
Institute of Technology and Management Universe  
Vadodara, India  
*ayushi71195@gmail.com*

Archana Magare

Assistant Professor, Department of Computer Engineering  
Institute of Technology and Management Universe  
Vadodara, India  
*archanamagare@gmail.com*

**Abstract**-Time table Generation process involves satisfaction of *number of constraints*. The proposed system uses *random function approach* for generation of time table as well as satisfaction of constraints. In each step of algorithm, constraints are checked and modified constraint status is considered for next *iteration* of algorithm.

**Keywords:** *random function, time table generation, constraint programming*

\*\*\*\*\*

## I. INTRODUCTION

The timetable scheduling problem mainly requires the allocations of classrooms, labs, faculties to a fix time slots, while satisfying a number of constraints. This constraints divides into hard and soft. Hard constraints are mandatory to be satisfied, while soft constraints are to be satisfied as much as satisfied<sup>[1]</sup>. Mostly in colleges or schools administrative work has been done computerized but a class timetable is created manually<sup>[2]</sup>. Hence the aim is to obtain the possible accurate solution for the problem.

Various approaches are made in past to handle both hard and soft constraints. Hard constraints cannot be fragmented under any conditions. For example two lectures cannot be allocated to a single faculty in a same time slot, two batches cannot be assigning in same lab etcetera. Soft constraints are required but not completely satisfied<sup>[3]</sup>. For example labs are to be schedules in afternoon session and lectures in morning session.

## II. RELATED METHODS

**Time table generation using multi agents by steepest ascent hill climbing algorithm**<sup>[4]</sup>

Multi agents are CombinationGenerator and MinFinder. CombinationGenerator agent is developed to satisfy all hard constrain with proposed heuristic operation. It takes maximum

possible input for timetable generation. MinFinder agent is designed to satisfy soft constrain as to find combination with minimum evaluation function value. By using this method workload is distributed and complexity has been reduced.

### Random non ascendant method (RNA)<sup>[5]</sup>

Random non ascendant method (RNA) with genetic algorithm is used to compare imitation and real scenarios. RNA is mostly used to resolve soft constrains. Combination of RNA with genetic algorithm is used to deal with the next generation proposed system. Hard constraints are mostly satisfied by using this method.

### Heuristic Approach<sup>[6]</sup>

Heuristic approach is focused on resolving clashes of subjects, faculties, classrooms and labs. This approach provides optimal solution of the system, though it cannot be considered best solution because of complexity of the problem. It concerns with generation time and quality of timetable simultaneously. For that, timetable will be generated several times which are compared on the basis of feasibility.

**Tabu Search<sup>[7]</sup>**

This technique can be applied virtually to any kind of optimization problem. It is based on neighbourhood search algorithm. Search space is used by tabu search which considers all possible solutions. This method stores visited nodes in memory. It prevents the duplication of previously existing solutions. So, finding new solutions become easy.

**III. LITERATURE SURVEY**

M.Nandhini et al.[ ] proposed time table generation using multi agents. The steepest accent hill climbing algorithm is used. The first agent, satisfies all hard constrain used to generates the maximum possible combinations for the inputting timetable is CombinationGenerator. It. The second agent, satisfies all soft constrains is used to finds a combination with minimum evaluation function value for further successive examination is Min-Finder. By using both the agents, workload is distributed and complexity has been reduced.

Ana Cerdeir et al.[ ] presented lecture/lab timetable using Random non ascendant method. In a school division it is a challenging problem faced continually in educational organization. RNA is used to solve the limitations of timetable generation problem. RNA and genetic algorithm variants more precisely that called GAT4C have been used for obtaining feasible timetables in a judicious computing time. RNA algorithm satisfies majority hard constrain and for that cost become low. And for large scenario combination of GAT and RNA using an eclitist policy is the best choice.

Tarek Elaska[8] presented Examination timetable(ETT). This is a complex organization task at educational institutions that must achieve various constraints to generate the ETT to schedule exam sessions within an accurate time-slot. To automatically generate a clashless ETT solution using CLP solver, both optimization Programming Language as well as CSP definitions are applied. And in the end these results are used to satisfy the constraints of the model.

Recep ÇOLAK et al.[9] presented Course timetabling. This is a process that must be done at the beginning of the education period in all educational institutions. This is a difficult problem to solve when classroom constraints, teaching staff preferences, course restrictions are taken into consideration. In this study, the solving effect of the genetic algorithm parameters, which is a heuristic approach used in the course timetabling problem, is investigated. As a result of the experiments, it has been observed that the election operator who decides on the new generation will be effective. To obtain better results, the selector operator is set as a function which depends on number of individuals.

MasriAyob et al.[ ] presented automatically viva timetable and presentations for postgraduate students. This is one more major problem in colleges due to increasing numbers of the students. This research paper is introduce the feasible timetable for limited timeslots and physical resources for example classrooms, labs etc. And for all these the paper is using Greedy constructive heuristic method, to build a valid and accurate timetable. The heuristic method will apply to committee member and students unoccupied timetable base on a previously ordered list. This result will show that the automated timetable can generate systematically capable timetable in less time.

Guilherme O. Ribeiro et al.[ ] represented a extract solution based on Genetic algorithm. To the problem of automatic generated timetable of relational work for companies considering assorted criteria for example availability and suitability of resources, labour law, employee's personal preferences and distribution of labour demand over period. We have use a references to the needs of a call centre company that needs to plan working hours in accordance with contractual requirements and the distribution of labour request as well as existing above criteria.

**Table I LITERATURE SUMMARY**

Author	Techniques	Findings
M.Nandhini et al. <sup>[4]</sup>	Multi agents by Steepest ascent hill climbing algorithm	Handle combinations of input and find combination of minimum evaluation function value
Ana Cerdeir et al. <sup>[5]</sup>	The random non ascendant method (RNA) and genetic algorithm variants(GAT4C)	The use of this method is to satisfy both soft constraint and hard constraint.
Tarek Elaska <sup>[8]</sup>	Constraint Satisfaction Modelling and Optimization Programming Languages(OPL)	This method is used to automatically generate a conflict-free Examination Timetable
RecepColak and TuncayYigit <sup>[9]</sup>	Genetic Algorithm	Provides more effective course time table formation for education and training sector
MasriAyobe t et al. <sup>[10]</sup>	Greedy constructive heuristic	This method is to satisfy both soft constraints and hard constraints.
Guilherme O. Ribeiro et al. <sup>[11]</sup>	genetic algorithm	This can help the labor work and scale work.

#### IV. DESCRIPTION OF PROPOSED SYSTEM

The proposed system is designed to generate a clash less time-table. The system will have algorithm for processing all the data present in the database. More over keeping in view the various constraints like lectures of faculty must not clash, proper rooms that are dedicated to department are allocated for the lectures and tutorials, labs are used optimally so that they are used for the maximum possible time.

The system will detect clashes on the basis of the constraints present at that time and will avoid them while finalizing the schedule.

The input data for this system is described by the type of data from the database. The database contains:

- Subject scheme: It gives the number of lectures and labs/tutorial required to be taken per week for the given subject.
- Faculty Names: Data describe the total faculties present in particular department.
- Classrooms: It gives the number of classes allocated to particular department.
- Labs: It gives the number of labs allocated to particular department.
- Time-slots: It gives the total time-slots per day.

On the basis of the choice filling of the subjects done by faculties, faculty-subject mapping is done. The admin i.e. the time-table coordinator does the subject allocation to the faculties according to the semester. Faculties are allocated to their respective semester and section on the basis of subject allocation.

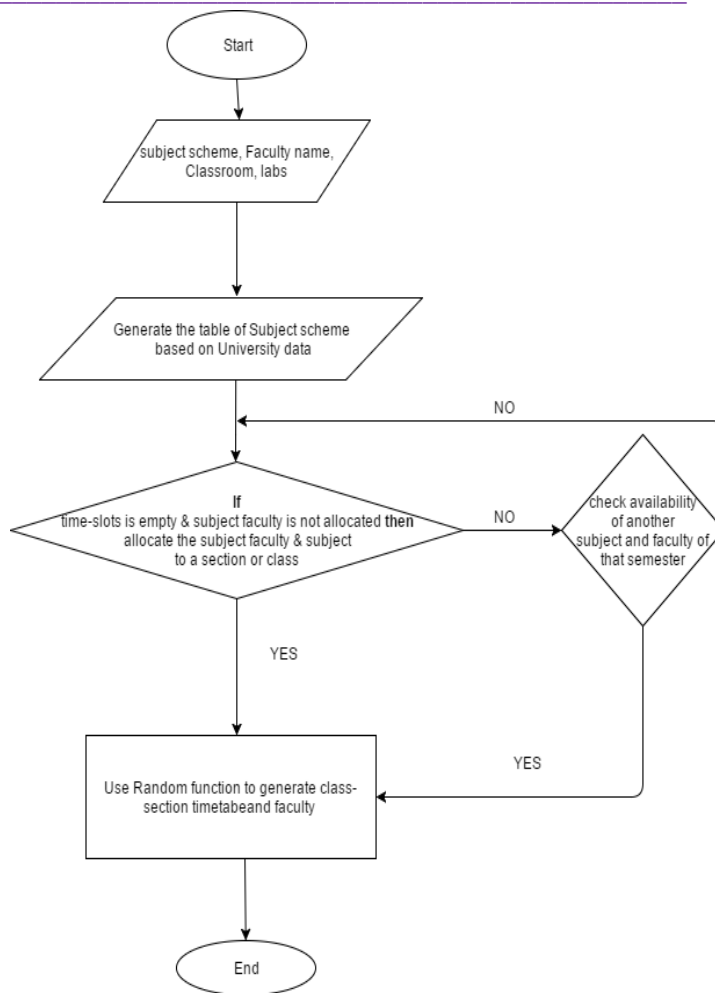
The labs are allocated to different semesters according to the time-slots; no two sections of same semester can have labs in same time-slot. Similarly the classrooms are also allocated to each semester per section. Many soft constraints are also taken into consideration during labs and classrooms allocation.

A random function is used to generate a class-wise time-table of a particular semester. The time-table generation process considers all the constraints while applying random function. The class time-table is used to generate a faculty master. A faculty master is the timetable of faculties in which the complete schedule of the faculty is shown.

#### V. ALGORITHM OF PROPOSED SYSTEM

**Input:** Subject Scheme, Faculty Name/Department, Classrooms/Department, Labs/Department, Available time-slot

**Output:** class\_section timetable, faculty\_master



#### Process Steps:

1. Generate subject scheme table for all subject per semester with available University data.
2. Generate faculty subject choice filling form for each faculty with the help of subject\_choice\_filling().
3. Perform subject allocation per semester per section base input revised from subject\_choice\_filling().
4. Use Random function for time table generation per section of a particular semester along with available constraint such as classrooms and labs.
5. Generate faculty\_master from the allocation done in step 4.
6. The latest classroom or lab occupancy and faculty\_master is used to allocate the next slot.
7. Repeat step 4 and step 5 until all the semester time table is generated.

#### VI. CONCLUSION

Random Function is used to satisfy all the constraints such as availability of labs, classrooms and faculties of this problem. By using this algorithm, work load will be reduced and allocation the resources will be effortless.

**REFERENCES:**

- [1]. Pooja P. Rathod, Kamlesh K. Lodhiya, MayurKarale, Prof. Aditya P. Bakshi “Automatic Timetable Generator”, International Journal of Research In Science & Engineering Special Issue: Techno-Xtreme 16, 1-7
- [2]. Saritha M, Pranav Kiran Vaze, Pradeep, Mahesh N R “International Journal of Advanced Research in Computer Science and Software Engineering” , 2017, IJARCSSE Volume 7, Issue 5, May 2017, Page | 204-211
- [3]. Dipesh Mittal, HiralDoshi, Mohammed Sunasra, RenukaNagpure “Automatic Timetable Generation using GeneticAlgorithm”, International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 2, February 2015, 245-248
- [4]. M.Nandhini and S.Kanmani “Implementation ofClass Timetabling UsingMulti Agents”, Intelligent Agent & Multi-Agent Systems, 2009. IAMA 2009, 1-2
- [5]. Ana Cerdeira-Pena, Luisa Carpena, Antonio Farina and Diego Seco “New approaches for the school timetabling problem”, 2008 Seventh Mexican International Conference on Artificial Intelligence, 261-267
- [6]. Anirudha Nanda, Manisha P. Pai, AbhijeetGole “An Algorithm to Automatically Generate Schedule for School Lectures using a Heuristic Approach”, International Journal of Machine Learning and Computing, Vol. 2, No. 4, August 2012, 492-495
- [7]. Deeksha C S, A Kavya Reddy, Nagambika A, Akash Castelino, K Panimozhi “Automatic Timetable Generation System” JETIR (ISSN-2349-5162), April 2015, Volume 2, Issue 4, 1006-1012
- [8]. Tarek Elsaka “Autonomous Generation of Conflict-Free Examination Timetable Using Constraint Satisfaction Modelling”, Artificial Intelligence and Data Processing Symposium (IDAP), 2017 International, 1-10
- [9]. RecepColak and TuncayYigit “The effect of Genetic Algorithm Parameters in the Solution of the CourseTimetable Problem”, (UBMK'17) 2nd International Conference on Computer Science and Engineering, 1090-1094
- [10]. MasriAyob, Ghaith M. Jaradat, Abdul RazakHamdan, Hafiz MohdSarim and MohdZakree Ahmad Nazri “Solving the Viva Presentations Timetabling Problem:A case study at FTSM-UKM”, 2011 International Conference on Electrical Engineering and Informatics17-19 July 2011, Bandung, Indonesia, 1-4
- [11]. Guilherme O. Ribeiro, Antonio J. R. de Campos, Luciana de O. Rech, Lau C. Lung “Generating Timetables Of Work Scales For Companies Using Genetic Algorithms”, Informatica (CLEI), 2012 XXXVIII ConferenciaLatinoamericanaEn, 1-10