

An Analytical Automatic Timetable Generation

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Abstract — Assigning proper timetable for all the faculty to complete the syllabus in time is always a tough task. This is mainly because of the problem of assignments of the subjects to the faculties in a given stipulated time. The reason behind this is, every teacher is loaded with a certain amount of workload hours every day, and in some scenarios this workload is being distributed in shifts. So for managing time, according to each of the staff's requirements while creating the Timetable is really a cumbersome task. The major hurdle that is facing in this task is overlapping of the teaching hours. So a very few existing software tools are there in online which are eventually creates automatic time table based on the input of the staff load. But all of them are very costly or they never reveal their characteristics to the before buying. So to introduce a powerful and cost effective method of generating the time table for the input details like number of allocated hours for theory and a number of allocated hours for lab for a given teaching staff is the much needed thing in the research. So this proposed paper studies the past works to generate the timetable and try to evaluate their limitations to put forward a new system in upcoming edition.

Keywords: Timetable generation, Decision making, Synchronous data allocation

I. INTRODUCTION

Timetable Generation is one of the oldest problems faced by academicians and managers of a company. It is essential to optimize the assignment of jobs to the machines, jobs to the workers and classes to the teachers so as to minimize and reduce conflicts and to be able to tread the path of least resistance. The problem of timetabling is not new and has influenced the researchers since time immemorial.

To achieve optimal timetable, even nowadays, the predominant technique is doing it manually. The assignment of

tasks and other jobs manually introduces a lot of discrepancies in the process and it is more prone to the introduction of human error in the process. there has been a lot of research in this area but nothing concrete has been presented by the authors of those publications to reduce the burden as many universities and colleges employ manual timetabling.

This paper utilizes various techniques for solving the creation of a timetable. The technique proposed in this paper utilizes, Entropy estimation, Shannon Information Gain with the help of Genetic algorithm and Hungarian task allocation to achieve an innovative solution to this problem.

Entropy is a term used in physics as the measure of randomness. Randomness is explained in a very elaborate fashion in the laws of physics. In the beginning of time and our universe itself, all the matter in the universe was collected together in one point just before the big bang happened. At the moment when all the matter was concentrated in a point, the entropy was 0, that would mean very little information can be used to describe the information it contained.

But right after the big bang, the entropy of the universe increased, that is the information required to describe the system with the plethora of stars and galaxies that are in this universe. The entropy of the universe is ever increasing and will keep increasing continuously.

Entropy estimation in computer science is defined as the measure of messiness or randomness in a given set of data. This is usually accompanied by some amount of information gain as the randomness adds quite a lot of information by increasing its entropy. The entropy used here is Shannon Information Gain. It is a widely used mechanism for the classification of data.

Shannon Information Gain is one of the most commonly used algorithms for the classification of data for the Data Mining procedure. The Shannon Information gain is very

similar to the concept of Entropy, which is a compelling measure of disorderliness or the messiness of data. Classification algorithms have a very distinct job to perform, that is splitting the data into smaller subsets. This is done with the idea that the messiness will reduce with the further division. Therefore, the Shannon Entropy has one central goal, that is the goal of any classification algorithm, to reduce the entropy of the whole data.

This research paper dedicates section 2 for analysis of past work as literature survey and finally section 3 concludes the paper.

II. LITERATURE SURVEY

This section of the literature survey eventually reveals some facts based on thoughtful analysis of many authors work as follows.

Y. Rehman [1] explores the realm of education by isolating the most common problems found in laboratory teaching in engineering universities, which impact the overall understanding of a student. The authors performed an experiment for the assessment of the instructors as the academic growth of a student is highly dependent on the effectiveness of the instructor. The authors, therefore, observed the results that prove that it is indeed true.

R. Badoni [2] states that the UCTP or University Course Timetabling Problem is widely used for scheduling and allocating various rooms according to the student's needs and is maximized to achieve high efficiency. Sometimes, there have been some inconsistencies that have crept into the scheduling process and that has led to a decrease in the efficiency of the system. Therefore, the authors have proposed the addition of the ACO or Ant Colony Optimization algorithm to the system which eliminates all the drawbacks in the system.

J. Zhong [3] expresses that the problem of railway timetable scheduling is one of the most basic problems faced by the railway industry. As the railways are needed for maintaining the quality of the service for the transport system, it is imperative to solve the problem of the railway timetable scheduling efficiently. Therefore, the authors have attempted to solve the problem by introducing the enhanced Differential Evolution algorithm or the DE algorithm. This algorithm eliminates all the inconsistencies of the previous PRTS versions and reduces the wait time for the passengers drastically.

S. Ribic [4] introduces Integer Linear programming as a very popular technique for the construction of school and university timetables. As most of the timetable software is usually designed for use in making timetables for the university, as that is a lot more complicated than the generation of timetables for the school. The timetables are varied in nature and differ from school to school and country to country; therefore, it is difficult to achieve a generalized constraint for each and every implementation. Therefore, the authors have proposed a timetabling algorithm based on integer linear programming that meets all the constraints in different school timetabling systems.

S. Limanto [5] explains that the examination of a thesis is one of the most important aspects of graduation. There are extensive techniques for the examination of a thesis which starts from the organization of the examination timetable, which is still being according to the traditional standard scheduling techniques. Due to techniques being very old and dated, they are not as efficient and fast. Therefore, to ameliorate this effect and incorporate all the constraints, the authors have implemented a web-based system that utilizes the genetic algorithm for increased efficiency in the timetabling process.

X. Yang [6] states that the UTCP or the University Course Timetabling Problem is a complicated problem that relies on the organization of the time-slots of the lecturers and the classrooms and laboratories to get an efficient combination of them to flow accurately. The area of UTCP has been the most important topic for researchers for a long time and a lot of solutions were suggested on this problem. There has been an increased amount of interest in solving this problem as it can be utilized for different applications outside of the university and be applied to solve some practical problems.

M. Almeida [7] expresses that the process of generation of an academic timetable is one of the most difficult of tasks in the area of scholarly planning. This is due to the fact that it requires a lot of time and resources to also allocate and cannot be done if the professors are busy with the workload. Most of the time timetabling technique has largely been done manually which is an extremely time and resource-intensive approach. As most of the techniques that have been proposed rely on optimization techniques, but the authors believe this problem could be solved by using heuristics and achieve a better output.

S. Awang [8] stresses the importance of the generation of a timetable as it is one of the most widely used methods for the organization of an event or a day. For a university, there are a lot of constraints and a lot of data that needs to be considered for the formulation of a timetable. The method of reliable generation of a timetable is one of the most demanding tasks as it requires more time and resources. Therefore, the authors have presented an innovative technique for the generation of the timetable by utilizing random selection and heuristic. This combination is one of the most reliable and fast techniques for the generation of the timetable.

Y. Ting-Hong [9] investigates the urgency of the timetabling for the purpose of course planning, as it is very complicated to generate a working model of the timetable. There are a lot of requirements that need to be fulfilled before planning a course timetable. The authors developed a technique that can calculate the urgency of a particular timetable in the course planning. As the urgency of the timetable task is calculated, it can be used to find the urgency function of space and time. All of these predicted values are then adjusted to the specific college through an analytic hierarchy process. This generated a generalized form that can be used on any application or college.

F. Guo [10] introduces an innovative technique for the process of generating timetable with the help of reinforcement learning. The authors have stated that there are various problems that are faced by a person creating the timetable for the first time. To eliminate various difficulties that are faced when altering timetable scheduling action vector and timetable eigenvector, the researchers have utilized a Naïve Bayesian classification algorithm for mining the historical data efficiently. The proposed system can generate and schedule timetables very efficiently compare with the conventional approach.

P. Kaewchanid [11] presents a unique technique for the teaching assistant scheduling problem with the introduction of the constraint-based approach. This is one of the classical approaches used when generating a timetable manually. The authors have also implemented an EDF (Earliest Deadline First) and cluster method to group the resources and to schedule the task with the shortest deadline first. This leads to a lot of bottlenecks and problems and the authors have implemented the constraints to eliminate the problems and perform the timetabling efficiently and faster in comparison with other conventional techniques.

III CONCLUSION

The person who is in charge of timetable creation through a manual work in an educational organization knows the complexity of this task. As mentioned earlier, there are very few costlier software are available in the market to generate the timetable automatically. So this paper studied all the past work to understand their flaws to introduce a new technique of generating the timetable using the Genetic and Hungarian task allocation module, which will be reflected in the upcoming edition of our article.

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