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Automated Lecture Time-tabling System for Tertiary Institutions

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ABSTRACT: The need to automate the manual process of lecture time tabling system in higher institution of learning cannot be repeal. Despite the fact that several other administrative sectors of most institution have been automated, lecture time-tabling is still done manually because of its inherent problems. Planning lecture time table is an administrative responsibility that demands enormous attention and effort from any institution because of its constraint satisfaction problem. The Federal Polytechnic, Bida, the case study in this research operates a central time tabling system implemented by a set up committee members within the institution, which makes it more difficult in getting a flawless lecture scheduling. This manual time-tabling system used in the institution is time consuming and energy sapping which leads to loss of information, general apathy, clashes and wastage of resources. This research is targeted at ameliorating the above stated challenges. The main aim of the study is to develop an automated lecture time-tabling system to provide convenience in scheduling lecture time-table, reducing time constraints in fixing the courses and venues and reducing the risk of omission of courses and clashes of halls and lecturers. The scope of work is limited to space allocation for lectures and merging of similar courses for a particular lecturer. We also administered questionnaire to sample staff, committee members and student opinion on the existing system and the new system to be developed. The data gathered was analyzed and based on the analysis; the new system (automated time tabling system) will be the best method in tackling the lapses experienced by the old system (manual time table).

General Terms
Computer Application
Keywords: Lecture time table, Manual time-tabling system, Automated Time-tabling system, Institution.

I. INTRODUCTION

Lecture time-tabling system is a system of scheduling lecture time and available resources so as to maximize such resources. It is one of the most important yet time consuming task done periodically in any academic institution of learning. Therefore lecture time table should be carefully assigned into appropriate timeslot for students, lecturers and lecture halls based on constraints. The timetable scheduling in the Federal Polytechnic, Bida is done manually by the Standing committee of the Academic board for lecture time table. The lecture time-tabling is done centrally and not on school (faculty) basis or departmental basis. Data are collected from various departments in each school for the preparation. The timetable process is in three phases namely: Data collection from departments, where each department will supply the various courses which will include the course title, course code, contact hour (lectures and practical), course unit and the lecturer to take them. The second phase is the analysis of the provided data where the data supplied by the departments are analyzed with the available space [hall sizes]. The last phase is the Lecture time scheduling. Based on the analysis, the lecture time-table is produced with three outputs vis-à-vis: Hall time-table [omnibus/main control], Departmental Input and Lecturers time-table [control II]. In scheduling the lecture time table, the following constraints must be taken into consideration; No student can attend more than one lecture at a time, No lecturer can teach more than one course per time and lecture hall cannot be assigned to more than one particular course at a time.

Statement of the Problem

The manual timetable system currently used by Federal Polytechnic Bida, most times have issues with generating a clash-free and complete timetable. The tedious tasks of data introduction and revision of usually incomplete solutions are the bottlenecks in this case (Luisa et.al, 2006). Most educational institutions have resorted to manual generation of their timetables which according to statistics takes much time to get completed and optimal. Even at the optimal stage of the manually generated timetable, there are still a few clashes and it is the lecturer and the students that always suffered as a result of the clashes, thereby suffering the instructional system in general, which most of the time lead to limited coverage of the course

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content of the affected course. It is on the basis that the researcher intended to develop a computerized timetable system.

Purpose of the Study

The main purpose of this study is to generate a timetable while demonstrating the possibility of building the schedules automatically through the use of computers in a way that they are optimal and complete with little or no redundancy. Specifically the study will achieve the following objectives:

1. To be able to optimize the algorithm used in today's timetable systems to generate the best of timetabling data with fewer or no clashes.
2. To bring approved timetable closer to users especially to those students who are opportune to have a computer system to easily to meet with the timetabling officer and collect the soft copy and probably install it or copy it to their system.

Significance of the Study

The proposed system will provide an attractive graphical front-end for the administrators and students. It will improve flexibility in timetable construction. The system will save time. Productivity will be improved. To be able to optimize the algorithm used in today's timetable systems to generate the best of timetabling data with fewer or no clashes. With different kinds of assignments, i.e. decisions like timing of events, sectioning of students into groups, or assigning events to locations. Moreover, each institution has its own characteristics which are reflected in the problem definition (Robertus, 2002). Yet, there have been no leveling ground for developing a system that can work for most of these institutions.

Scope and Limitations of the Study

This study will only cover the management and allocation of spaces and time for lectures in The Federal Polytechnic Bida.

II. LITERATURE REVIEW

2.1. Theoretical Framework

A timetable is an organized list, usually set out in tabular form, providing information about a series of arranged events in particular, the time at which the planned events will take place. They are applicable to any institution where activities have to be carried out by various individuals in a specified time frame. From the time schools became organized environments, timetables have been the framework for all school activities. As a result, schools have devoted time, energy and human capital to the implementation of nearly optimal timetables which must be to satisfy all required constraints as specified by participating entities (Robertus, 2002).

The lecture timetabling problem is a typical scheduling problem that appears to be a tedious job in every academic institute once or twice a year. The problem involves the scheduling of classes, students, teachers and rooms at a fixed number of time-slots, subject to a certain number of constraints. An effective timetable is crucial for the satisfaction of educational requirements and the efficient utilization of human and space resources, which make it an optimization problem. Traditionally, the problem is solved manually by trial and hit method, where a valid solution is not guaranteed. Even if a valid solution is found, it is likely to miss far better solutions. These uncertainties have motivated for the scientific study of the problem, and to develop an automated solution technique for it. The problem is being studied for last more than four decades, but a general solution technique for it is yet to be formulated (Datta, et.al, 2006).

Timetabling problem is one of the hardest problem areas already proven to NP-complete and it is worthy of note that as educational institutions are challenged to grow in number and complexity, their resources and events are becoming harder to schedule (Ossam, 2009).According to Deriset al., 1997 said there are two main problems in timetabling. The first one is related to the combinatorial nature of the problems, where it is difficult to find an optimal solution, because it is impossible to enumerate all nodes in such a large search space. The second one is related to the dynamic nature of the problems where variables and constraints are changing in accordance with the development of an institution.

Therefore, a timetabling system must be flexible, adaptable and portable, otherwise the users will not use the system optimally or even as decision aids such as for storing, retrieving, and printing timetables, when the timetable planning decisions are made manually. In addition, most of the polytechnics adopting a semester system give freedom to students to choose subjects provided that all pre-requisites are satisfied. This situation further complicates the construction of a timetable. Various techniques have been proposed to solve timetabling problems. These techniques are neural networks (Gianoglio, 1990), heuristics (Wright, 1996), graph coloring, integer programming, Genetic Algorithms (Burke, et al., 1994; Paechter,et al., 1994),

The problem was first studied by Gotlieb (1962), who formulated a class-teacher timetabling problem by considering that each lecture contained

one group of students, one teacher, and any number of times which could be chosen freely. Since then the problem is being continuously studied using different methods under different conditions. Initially it was mostly applied to schools (Gans, 1981; Tripathy, 1984). Since the problem in schools is relatively simple because of their simple class structures, classical methods, such as linear or integer programming approaches (Lawrie, 1969; Tripathy, 1984), could be used easily. However, the gradual consideration of the cases of higher secondary schools and universities, which contain different types of complicated class-structures, is increasing the complexity of the problem. As a result, classical methods have been found inadequate to handle the problem, particularly the huge number of integer and/or real variables, discrete search space and multiple objective functions. This inadequacy of classical methods has drawn the attention of the researchers towards the heuristic-based non-classical techniques. Worth mentioning non- classical techniques that are being applied to the problem are Genetic Algorithms (Alberto et al., 1992), Neural Network (Looi, 1992), and Tabu Search Algorithm (Costa D., 1994). However, compared to other non-classical methods, the widely used are the genetic/evolutionary algorithms (GAs/EAs). The reason might be their successful implementation in a wider range of applications. Once the objectives and constraints are defined, EAs appear to offer the ultimate free lunch scenario of good solutions by evolving without a problem solving strategy (Al-Attar, 1994). A few worth mentioning EAs, used for the school timetabling problem, are those of Abramson et al., (1992); Piola.(1994) and Bufeet al.,(2001). Similarly, EAs, used for the higher secondary school class timetabling problem, are those of (Carrasco et al.,2001);Srinivasanet al., (2002) and Dattaet al., Since 1995, a large amount of timetabling research has been presented in the series of international conferences on Practice and Theory of AutomatedTimetabling (PATAT).

III. CONCLUSION

At the end of the software development, an automated time tabling system was generated to overcome the shortcoming of manual time tabling system. This automated system will simplify the manual process, ensure optimum allocation of resources and reduce the risk of omission of courses and clashes of halls and lecturers. The application software developed can be adapted and customized in other institutions of learning to ease the burden of the manual process. Also based on the statistical analysis of this research study, automated time tabling system will be the best method to be adopted in tackling the lapses of its manual counterpart as evidenced by the opinion of the respondents and the hypothesis tested. This study therefore recommends the full deployment of this prototype and its implementation which will ease the burden of the manual process of time-tabling system and improve the academic activities of the institution at large.

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