



Timetable Automation

Project Proposal

Project Advisor:

Ms. Abeerda Akram

Group Members:

Nimra Batool	L16-4106
Ali Hamza Khan	L16-4280
Haider Imran Khan	L16-4221
Ilsa Mariam	L16-6342

National University Of Computer and Emerging Sciences
Department of Computer Science
Lahore, Pakistan

1. Abstract

Timetable scheduling is a major problem for an academic institute. Scheduling a clash free timetable manually is not an easy task. Therefore, this project aims to automate this process by developing a software system, which will help the management of the institute in generating an optimal timetable.

2. Introduction

Time is the most precious thing, which should be used wisely and efficiently. Resource allocation with limited resources available is a quite difficult task to do. Scheduling a timetable is a very important task for all kind of institutes. It requires a lot of hard work and manpower. Manual Timetable Scheduling is not only time consuming, but it may arise new conflicts because this problem is multi-dimensional. Multiple constraints like teacher preferences, student clashes and venue clashes need to be addressed while scheduling a timetable for the institute.

Observing this problem in many institutes, this process is decided to be automated, so that time of both administration and students can be saved. This process can be automated by developing a software system based on Artificial Intelligence (AI) algorithms or by deploying an existing solution UniTime. This will help in generating an optimized clash free timetable or a timetable with minimum number of clashes. Moreover, another module will also be developed which will help students in selecting sections of the courses by providing multiple suggestions of the sections at the time of registration. If a student has a clash, it will also suggest multiple solutions to resolve that clash, so that student may get a clash free timetable.

3. Goals and Objectives

Timetabling is known to be a non-polynomial complete problem i.e. there is no known efficient way to develop a solution. In addition, the most striking characteristic of NP-complete problems is that, no best solution (a hundred percent optimized) to them is known [1]. Our goal will be to find an optimum solution that can create a university timetable for us in the minimum possible cost and time. However, it is improbable to find an approach that solves this problem in a polynomial period of time [2]. Following are some objectives:

- To make a generic optimized solution for scheduling of timetable in every semester.
- To cater time preferences of visiting and permanent teachers.
- To handle allocations of rooms and labs efficiently according to the seats and number of sections of courses.
- To provide a list of clash free possible sections of the courses, in which a student may want to register.

4. Scope of the Project

As stated earlier, for the automation of timetable scheduling, work will be done on two modules. The first module is automation of timetable. The input dataset will be given to the system for instance, the offered courses in that particular semester along with teachers allocation, the preferred timeslots given by the teachers from other departments as well and the information of number of sections and seating plan of rooms available to our department. The system will be generating a time table. Two approaches can be helpful for this purpose. The first approach could be an Artificial Intelligence (AI) algorithm, which will be explored to solve this problem by incorporating as many objectives as possible.

Next approach is UniTime system that can also be deployed for this purpose. UniTime is an open source university timetabling system, which allows educational institutions to generate timetable, change in timetable when needed, resolve course conflicts for students and also venue conflicts etc. UniTime will be explored that how much it can help to solve this problem.

The second module named as Student Timetabling will be relatively shorter, in which the timetable (generated manually or automated) as an input to the system. The student will input the courses he wants to study in the upcoming semester. The system will show what possible options of sections or courses the student can take to avoid clashes.

5. Initial Study and Work Done so Far

While reviewing different research papers we explored different techniques to generate the Timetable automatically. Due to complexity of the problem, most of the work done focuses on the heuristic algorithms which attempt to find good approximate solutions. Some of these include Genetic Algorithms (GA), Tabu Search, Simulated Annealing and Scatter Search methods. Heuristic optimization methods have also been used to get the feasible solutions for timetable clashes problem. The work, which we have researched, revolves around Genetic Algorithm [3] and heuristic algorithms [1]. After extensive research, the best outputs were shown by Genetic Algorithm. However, additional research will be continued with time, in order to bring more competence in the Solution to be designed. [1]

PAPER TITLE	ALGORITHM USED	DATASET USED	PERFORMANCE MEASURES
An Algorithm to Automatically Generate Schedule for School Lectures Using a Heuristic Approach.	A heuristic approach to give a general solution to school timetabling problem.	Students, Teachers and resources taken from the school.	It ensured almost more than 50 percent precise results in a five-day week. The Focus was only on the Teachers' availability.
Automatic Timetable Generation using Genetic Algorithm	Genetic Algorithm which follows the idea of survival of the Fittest.	Students, Teachers and resources taken from the institute.	Accuracy and precision was not clearly mentioned but the system was mentioned to provide the desired results. Faculty's Convenience is mainly focused.

6. References

- [1] N. Anirudha, P. P. Manisha and G. Abhijeet, "An Algorithm to Automatically Generate Schedule for School Lectures Using a Heuristic Approach," *Journal of Machine Learning and Computing*, vol. 2, no. 4, 2012.
- [2] B. E. K. and N. J. P., "A multistage evolutionary algorithm for the timetable problem," *IEEE transactions on evolutionary computation*, vol. 3, no. 1, pp. 64-74, 1999.
- [3] S. Shraddha, G. Saraswati and K. Sneha, "Automatic Timetable Generation using Genetic Algorithm," *International Journal of Scientific & Engineering Research*, vol. 9, no. 4, 2018.

