

# Android Based automated Timetable Generator

Prajna Pandey<sup>1</sup>, Pragya Rai<sup>2</sup>, Swasti Sharma<sup>3</sup>

<sup>1,2,3,4</sup>Department Of Information Technology

<sup>1,2,3,4</sup>Babu Banarasi Das Institute Of technology and Management

Faizabad Road, Lucknow

Affiliated to AKTU

*Anurag Tiwari*

*(Professor)*

*Babu Banarsi Das institute  
of technology and Management  
Lucknow , Uttar Pradesh*

*Prajna Pandey  
Babu Banarsi Das institute  
of technology and Management  
Lucknow , Uttar Pradesh*

*Pragya Rai  
Babu Banarsi Das institute  
of technology and Management  
Lucknow, Uttar Pradesh*

*Swasti Sharma  
Babu Banarsi Das institute  
of technology and Management  
Lucknow , Uttar Pradesh*

**Abstract: University comprises of all subject students and faculty, Therefore to make the university work with a schedule these three major attributes need to function in a more coordinated manner. The schedule, up till now , are designed through a manual process where a group of people come together and sit along investing time to bring out the efficient time table. But this becomes more cumbersome when attributes increases. Therefore this hectic task of making the time table is done by the android based timetable generator application. The application is more controlled by the admin or in other words admin have the access to every activity. The admin Id and password are saved prior and rest student and faculty need to be registered by simply with email-id and password.**

**Keywords:** Scheduling, NP-complet, NP-hard, Hard Constraints, Soft Constraints, Android Studio, Timetabling, Java.

## 1. INTRODUCTION

Scheduling the time table has always been the human requirement for carrying out the task in a more efficient and convenient manner. Its been widely used in educational institute ,coaching centers etc. The most common practice that is been followed up till now is manually setting up the time table and then following it year after

year by making modification to the older ones. In manually setting up the time table, a group of people come together, sit and based on constraints that need to be applied ,place the input faculty to the desired days and allot the subject. This manual system of setting up the time table in colleges with increased number of

attributes like faculty, subject or student is time taking and most of the time ends up with various lecture classes clashing either same room or with same faculty having more than one class at a time. These are natural error of clashing and are just due to common human errors which are very difficult to prevent and avoid in processes such as these of scheduling. Now to overcome these problems what institutes and universities usually do is that they just take the previous years timetable, modify it and use each next year. Though this task is less hectic but still it is a tedious and lack the efficiency.

Now to overcome all these problems the proposed solution is to make an automated system which is more reliable, efficient and is easy to use. The system will take various inputs such as details of students, subjects and class sections and faculty available and then depending upon these inputs and after applying the set constraints the application will generate a possible time table, making optimal utilization of all resources in a way that will best exist with the constraints.

However, to generate this time table their schedule should meet the requirement of new courses and faculty addition before allotting the particular time in particular class. Timetable development process starts when Head of Department provide information such as date for lectures, specified time, subject faculty class section etc. which will be used for timetable scheduling.

A timetabling problem consists of following four parameters and they are:

1. Time  $T$ ,
2. Available Resources  $R$ ,
3. Scheduled Faculty  $F$ ,
4. Set of Constraints applied  $C$
5. Now this problem will assign the particular time to respective subject faculty and resources will be used in such a way that the constraints will be satisfied. Since the problem is a combinatorial optimization problem belonging to NP-hard class, the computation time for timetabling tends to grow exponentially as the

number of variables increase. But the best possibility has been always designed from time-to-time to solve this problem.

## 1.2 System Architecture

Saving data to a database is useful for structured data or common data, such as contact information, faculties, section. This page assumes that we are familiar with SQL databases in general and helps in getting started with SQLite databases on Android. The APIs needed will use a database on Android and are available in the [android.database.sqlite](https://developer.android.com/reference/android/database/sqlite) package.

An input/output processing method in a data processing system comprises of a calculation device processing data records as input/output pages, recording media having a plurality of recording mediums and storing the data records, and a data processing device connected between the calculation device and the recording media, the method comprising the steps of: receiving, in the data processing device, a data request having a page address list describing data records to be retrieved and a search condition, describing a data group selected from the data records, from the calculation device;

processing the data request by reading data records from the recording media in response to the page address list, and extracting the data group from the data records satisfying the search condition;

One of the main principles of SQL databases is the schema: a formal declaration of how the database is organized. The schema is reflected in the SQL statements that are used to create the database. Just like files that are saved on the device's [internal storage](#), Android stores the database in the app's private folder. The data is then secured, because by default this area is not accessible to other apps or the user.

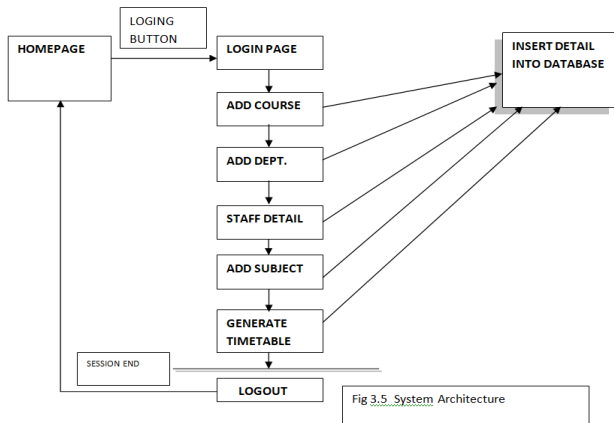


Fig 3.5 System Architecture

## 2. REVIEW OF LITERATURE

By studying the current established system the information can be inferred that still the generation of the timetable has been done manually. This gives a way to a lot more hectic and chaotic approach and is often a complex one when applied with lots of constraints. This means manually modifying the timetable is a heavy work load and tedious while going through a process. Through the automated timetable generator, this manual changes can also be made by just by simply dragging and dropping which may sometime lead to colloidal output, but that change can further be removed by generating another one.

### 2.1 TIMETABLING

The timetabling[1] is generally a multi-dimensional assignment problem, in which students and lecturers are assigned to courses and events are assigned to class section and timeslots.

A timetable construction is an NP-complete[2] scheduling problem. It is not a standard job problem because of the additional constraint and non-collision allocation.

The idea of automatic generation of timetable is not a new one. Some papers aims only to prove that this scheduling is NP-hard/complete. Although there are papers describing rather simple algorithm based on greedy heuristics, most of the researchers uses meta-heuristics to solve this problem. Despite all the contribution mentioned above, the problem of automatic

generation of an optimal timetable is still considered unsolved, mainly because of the need of conducting a lot of heavy computations. The time table generation is highly constrained, but mentioning that all the problem differs greatly for different colleges and educational institutions. Because of its complexity it is difficult to write a universal program, best fitting for all imaginable timetabling problems.

Furthermore, there exist many problem solving methods, which usually use the concepts of standard optimization algorithms such as Backtracking, Evolutionary Algorithms or Constraint Logic Programming.

The Local Search Procedures: procedures such as Simulated Annealing, Tabu Search and Genetic Algorithms. These methods expresses constraints as some cost functions, which are minimized by a Heuristic Search of better solutions in a neighborhood of some initial feasible solution.

The Constraint Programming (CP):

Its main advantage is declaratively. This makes the program easy to modify, which is crucial in timetabling problems. The constraints are handled through a system of constraint propagation, which reduces languages, both features do not need to be programmed explicitly.

The ability to express complex constraints in a simple, declarative way is important for introducing the requirements of the university timetabling problem into the program and is crucial for their successful interpretation.

## 3. CREATION PROCESS OF THE APPLICATION

### 1. Software Process Model

The Waterfall Model is the model to be used for processing. In this model, each phase must be completed before the next phase can begin and there should be no overlapping in the phases. Waterfall model is the earliest SDLC approach that is being still used for software development. In this, it is very important to take the sign off of the deliverables of each phase. In this approach, the whole process of software development is divided into separate phases.

The outcome of one phase acts as the input for the next phase sequentially. This means that any phase in the development process begins only if the previous phase is complete. The waterfall model is a sequentially designed process in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of Requirement System Design, Implementation, Testing and Maintenance.

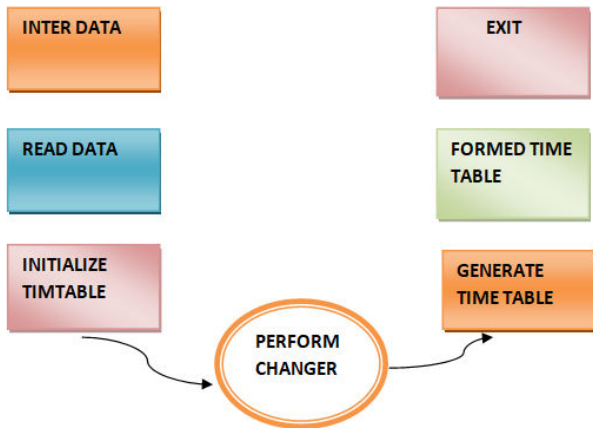


Fig.3.4 flow of data within the project

### 2. Use of Java[4] Language

When building the app using Android Gradle we used of Java 8 language APIs. The Android Gradle plugin provides built-in support for using Java 8 language features. Java is a programming language and a platform that is used for coding the project. It is a high level, robust, object-oriented and secure programming language. It was developed by *Sun Microsystems* (which is now the subsidiary of Oracle) in the year 1995. *James Gosling* is known as the father of Java. Android Studio creates a .java file containing skeleton code, when start writing on a file which includes a package statement, any necessary imports, a header, and a class or type declaration.

### 3. Using Android Studio[5]

The workflow to develop an application is followed to efficiently build a well-designed app for institution and college. It's workflow starts with the following:

Setting up the workspace: This is the phase we start by installing the android studio based on

IntelliJ IDEA. With learning the fundamentals the platform is all ready to build up the project.

Start dealing up with the codes and developing the app: Android Studio includes a variety of tools and intelligence to help work faster, write quality code, design a UI, and create resources for different device types.

Developing and Running the app: During this phase, the project is finally developed into a debuggable APK package that can be installed and run on the emulator or an Android-powered device. Furthermore the app can be customized, different variants can be created and built.

Debugging and testing the application developed: This is the iterative phase in which we continue writing the app but with a focus on eliminating bugs and optimizing app performance. Of course, creating tests will help in those endeavors. Furthermore various performance metrics can be analyzed such as memory usage, network traffic, CPU impact etc.

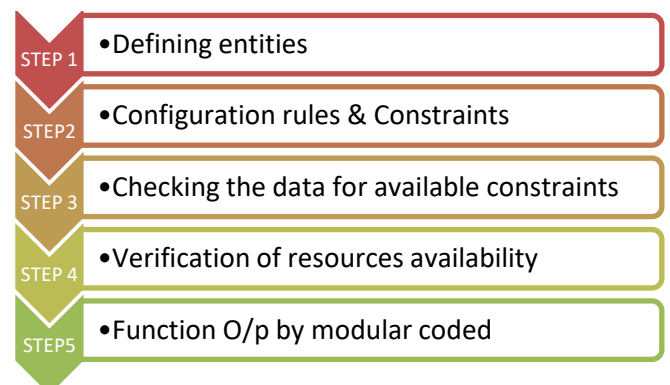


Fig.3. Timetable generation process

### 4. Hardware and software requirement

Hardware Requirement:

- Pentium IV Processor machine
- Minimum RAM: 256 MB to 512 MB
- Disk Free space: 250 MB+
- 64-bit variants of all platforms are supported in addition to the 32-bit variant.
- Requires android version 5.0 “lollipop” and above

#### Software Requirement:

- Microsoft Windows 7/8/10 (32-bit or 64-bit)
- GB RAM minimum, 8 GB RAM recommended (plus 1 GB for the Android Emulator)
- GB of available disk space minimum, 4 GB recommended (500 MB for IDE plus 1.5 GB for Android SDK and emulator system image)
- 1280 x 800 minimum screen resolution.

#### 4. Test Cases

User Login/Registration: To begin with login, the user need to register by filling up basic registration details. There are multiple fields in registration page and every field has to fill by the user. The user can be logged in through email-id and password.

Admin Login: - Admin login id and password is kept compulsory fields and is by default set into the system. And if the admin-id or password doesn't match then it will show an error message.

Rest view field will contain the addition of subject, entering no. of faculty, students, class section etc.

With few defined constraints the timetable is generated. The output is viewed to faculty and student. The subject time in particular duration is also given through notification.

#### 5. Tools used in Writing Research Study:

The research paper has been written with the help of various tools which include writing tools and as well as some research tools. Writing tools include MS-word, Pdf convertor, google search engine, google blogs, Google scholars. Simple data organisation & descriptive data analysis.

Inquiries in form of questionnaire, single inquiry method & gathering the data. These set of tools together have provided better flexibility to move to a possible

approach while writing this research paper.

#### 6. Conclusion

The main theme of this project is to generate the Timetable by taking the faculty list, Department list, Subjects list & Time schedule as input and generate the Timetable by satisfying all the constraints. The Admin was given with special privileges to add/modify the faculty details of the department, subject details, lecture scheduling. Add / View / Delete a Timetable. The Admin can login to the website and make changes according to his wish. Similarly the faculty does have their own credentials to enter into the site and watch the class wise Timetable.

An application with the proper UI is developed for scheduling and is provided to Admin and Faculty to login with their credentials and do their respective duties and the student to view and get notified about the scheduled timetable.

This paper has concentrated on solving of lectures timetabling problem using android application platform. The platform has tried solving timetabling problem especially with some suggested improvements. The initial timetabling problem with large number of binary variables has been significantly reduced to the acceptable size by grouping of several constraints applied to form one output. We have used android studio to develop software application with firebase to store and archive timetables data for future using.

#### References

- [1] Parallel algorithms of timetable generation, Łukasz Antkowiak
- [2] Michael R. Garey and David S. Johnson. Computers and intractability: a guide to the theory of np-completeness.
- [3] <http://ieeexplore.ieee.org/xpl/articleDetails.jsp?tp=&arnumber=1490384&queryText%3DTi+metable+Generation>
- [4] <https://www.oracle.com/in/java/technologies/javase-downloads.html>
- [5] <https://developer.android.com/studio>
- [6]. Saving Data on Android (First Edition): Learning Room, Firebase and SQLite with java.

[7].S,A. K., n.d. Mastering Firebase for Android Development: Build real-time, scalable, and database security,Android apps with firebase.

[8].MySQL Administrator's Bible, 1st edition by Sheeri K. Cabral and Keith Murphy to covers MySQL database administration including query optimization, index tuning, managing storage engines, caching, authentication and managing users, partitioning and replication, logging, database and performance monitoring, security, backup and recovery, managing the data and availability.

[9].Rankin, R. C. , 1996: Automatic timetabling generator in practice. Practice and Theory of Automated Timetabling.

[10].Atif Ansari, and Prof Sachin Bojewar: "Genetic Algorithm to Generate the Automatic Time-Table – An Over View", (2014).

[11]. A timetable prognostication for technical Educational System Using Genetic Algorithm.