

An Automatic Examination Timetable System Using Selection and Crossover Technique

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Abstract: With the increase in the number of student population, new programs being attached, an automated time-tabling system is required to cater for this increase. Most of the time-tabling problems belong to the class of (Non Polynomial) NP-hard problems, as no deterministic polynomial algorithm exists. Timetable definition is the total schedule of specific lectures attended by a group of students in an institution and the lecturers at a specific time. When solving the timetabling problem, we are usually looking for some solution, which will be the best among others. The space of all feasible solutions which is the series of desired solutions with some more desirable than the others is called search space (also state space). Each point in the search space represents one feasible solution which can be "marked" by its value or fitness for the problem. The solution is usually one point in the search space. This research centers on the utilization of computerized system concerning electronic planning and exam booking control arrangement in tertiary Institutions. The work conquers the manual arrangement of activities with respects to the issues timing and planning. The work was effectively evolved utilizing python structure, SQLite Database. Client experience was utilized, an easy to use programming language, and the bundle was tried and enhanced to yield a mechanized Time table plan booking control framework

Key Words: Timetabling, Genetic Algorithm, scheduling, Automation

I. INTRODUCTION

Timetabling concerns all exercises as to delivering a calendar that must be abstract to various limitations. Schedule can be characterized as the improvement of given exercises, activities or occasions to a lot of items in space-time lattice to fulfill a lot of alluring limitations. A key factor in running an instructive focus or fundamentally a scholastic situation is the requirement for an all-around arranged, well-all through and conflict free plan. Once upon a time when innovation was not in wide use, (address) schedules were physically made by the scholastic foundation. Each school year, tertiary organizations are confronted with the dull undertaking of drawing up scholarly schedules that fulfills the different courses and the particular assessment being offered by the various offices. Plan advancement process begins when each Head of Department give the accompanying data to be utilized for schedule booking.

The data gives the modules dates, time and settings reasonable in a specific semester examinable courses in a specific

semester. Dates for talks to be held (Lectures can be booked among Monday and Friday). Specified time for addresses (for example somewhere in the range of 8am and 4pm) the setting of the booked talks. A timetabling issue comprises of four (4) boundaries and they are: T (set of time), R (set of accessible assets), M (set of planned contacts) and C (set of requirements). This issue allocates time and assets to the contacts on such a way, that the limitations will be fulfilled. In different timetabling issues, instructive timetabling has been by and large analyzed from functional viewpoint.

Scholastic schedule is exceptionally urgent yet it expends time because of its successive events and utilization among higher establishment of learning. Another purpose behind the trouble is a direct result of the extraordinary intricacy of the development of size of talks and assessments, because of the planning size of the talks and assessments periods and high number of imperatives and rules of designation which is typically bypassed with the utilization of minimal severe heuristics, in view of arrangements from earlier year (Jose, 2008). The nature of the schedule decides the nature of time committed by speakers, understudies and chairmen to scholarly exercises. Different scholarly timetabling incorporates: I. School plan ii. Talk plan iii. Assessment plan and iv. Task schedule (Qu, Burke, McCollum, Merlot and Lee, 2004). This scholarly plan must meet various prerequisites and ought to fulfill the wants of all elements included at the same time as could be expected under the circumstances. The timings of occasions must be with the end goal that no one has more than one occasion simultaneously (Roberts, 2002). Talk time-postponing framework is an arrangement of planning address time and accessible assets in order to augment such assets [1], [2]. It is one the most significant yet tedious errand done occasionally in any scholastic organization of learning. Along these lines address time table ought to be deliberately doled out into proper timeslot for understudies, speakers and auditoriums dependent on imperatives [3]. The plan planning for the Federal Polytechnic, Ilaro is done physically by the Standing advisory group of the Academic load up for address time table. The talk time-postponing is done halfway and not on school (personnel) premise or departmental premise. Information are gathered from different divisions in each school for the readiness. The plan procedure is in three stages in particular: Data assortment from divisions, where every office will

gracefully the different courses which will incorporate the course title, course code, contact hour (addresses and down to earth), course unit and the speaker to take them. The subsequent stage is the analysis of the delivered data and the supplied information by the departments are analyzed with the available space [hall sizes]. The last stage is the Lecture time booking. In view of the examination, the talk time-table is created with three yields versus: Hall time-table [omnibus/fundamental control], Departmental Input and Lecturers time-table [control II]. In booking the talk time table, the accompanying limitations must be mulled over; No understudy can go to more than each talk in turn, No teacher can show more than one course for every time and auditorium can't be allocate to more than each specific course in turn.

II. AUTOMATED TIME-TABLING GENERATION

With the increase in the number of student population, new programs being mounted and additional lecture halls, an automated time-tabling system is required to cater for this increase. Most of the time-tabling problems belong to the class of NP-hard problems, as no deterministic polynomial algorithm exists. Timetable definition is the total schedule of specific lectures attended by a group of students in an institution and the lecturer at a specific time. It also requires specific resources such as lecture halls and so on [4]. Automated methods used to solve time-tabling include Tabu Search, Simulated Annealing, Evolutionary Algorithms and Artificial Intelligence [5]. There are a number of papers within [6] that deal specifically with Genetic Algorithm methods of automated time-tabling. Another study [7] noted that only on particularly complex or resource starved timetabling problems do Evolutionary Algorithms including GAs-Genetic Algorithms begin to outperform methods such as hill-climbing. Professional software currently available for Automated Timetabling lacks the generality required by different institutions. This can mean that code needs adjustment or lengthy training and installation programs before it can be implemented at an institution which it was not intentionally written for.

2.1 Methods of Selection

There are a wide range of procedures which a hereditary calculation can use to choose the people to be duplicated over into the people to come, however recorded beneath are the absolute most normal techniques. A portion of these strategies are totally unrelated, however others can be and frequently are utilized in blend.

1. Elitist choice: The fittest individuals from every age are destined to be chosen. (Most GAs doesn't utilize unadulterated elitism, yet rather utilize a changed structure where the absolute best or a couple of the best people from every age are replicated into the cutting edge just in the event that nothing better turns up.).

2. Fitness-proportionate determination: More fit people are more probable, yet not sure, to be chosen.

3. Roulette-wheel choice: A type of wellness proportionate choice in which the possibility of a person's being chosen is corresponding to the sum by which its wellness is more prominent or not as much as its rivals' wellness. (Adroitly, this can be spoken to as a round of roulette - every individual gets a cut of the wheel, however more fit ones get bigger cuts than less fit ones. The wheel is then spun, and whichever individual "possesses" the segment on which it handles each time is picked).

4. Scaling choice: As the normal wellness of the populace expands, the quality of the specific weight likewise increments and the wellness work turns out to be all the more separating. This strategy can be useful in making the best choice later on when all people have generally high wellness and just little contrasts in wellness recognize one from another.

5. Tournament determination: Subgroups of people are looked over the bigger populace, and individuals from every subgroup go up against one another. Just a single individual from every subgroup is picked to duplicate.

6. Rank choice: Each person in the populace is allocated a numerical position dependent on wellness, and choice depends on this positioning as opposed to supreme contrast in wellness. The upside of this technique is that it can keep fit people from picking up strength ahead of schedule to the detriment of less fit ones, which would diminish the populace's hereditary assorted variety and might block endeavors to locate a worthy arrangement.

7. Generational choice: The posterity of the people chose from every age becomes the whole people to come. No people are held between ages.

8. Steady-state choice: The posterity of the people chose from every age return into the prior genetic supply, supplanting a portion of the less fit individuals from the past age. A few people are held between ages.

9. Hierarchical determination: Individuals experience different rounds of choice every age. Lower-level assessments are quicker and less segregating, while those that make due to more significant levels are assessed all the more thoroughly. The upside of this strategy is that it lessens generally speaking calculation time by utilizing quicker, less specific assessment to get rid of most of people that show almost no guarantee, and just oppressing the individuals who endure this underlying test to more thorough and all the more computationally costly wellness assessment.

2.2 Review of Relevant Theories And Technologies

According to [12], grouped the imperatives of class-instructor timetabling issue in limitations solid and powerless. Infringement to solid limitations, (for example, plan an instructor in two classes simultaneously) bring about an invalid schedule. Infringement to frail limitations bring about substantial schedule; however influence the nature of the

answer (for instance, the inclination of educators for specific hours). The proposed calculation, transformative, has been tried in a college containing 109 educators, 37 rooms, 1131 a period time frame hour each and 472 classes. The calculation proposed in settling the booking without disregarding the solid requirements in 30% of executions.

In [13], presents an answer for the test schedule issue, figuring it as an issue of combinatorial improvement, utilizing calculations Ant, to fathom. Analyzed the outcomes got by the different works distributed, we can say that the programmed age of calendars is fit for accomplishing. A few works show that when contrasted and the calendars manuals in establishments of learning genuine, the occasions acquired by the calculations for taking care of the class-instructor timetabling issue are of better quality, since, utilizes some capacity of assessment.

According to [10], examines the execution of two hereditary calculations used to tackle class-instructor timetabling issue for little schools.

According to [11], explores the utilization of hereditary calculations to tackle a gathering of timetabling issues. Presents a structure for the use of hereditary calculations in tackling of timetabling issues with regards to learning foundations. This system has the accompanying significant focuses, which give you impressive adaptability: a revelation of the particular requirements of the issue and utilization of a capacity for assessment of the arrangements, educating the utilization with respect to a hereditary calculation, since it is autonomous of the issue, for its goal.

In [8] presents a language for portrayal of the timetabling issue, the UniLang. UniLang means to be a standard reasonable as information language for any timetabling framework. It empowers a reasonable and normal portrayal of information, requirements, quality measures and answers for various timetabling (just as related) issues, for example, school timetabling, college timetabling and assessment booking.

According to [9], presents a way to deal with sum up all the timetabling issues, portraying the fundamental structure of this issue. He proposes a conventional language that can be utilized to depict timetabling issues and its limitations.

III. ANALYSIS OF THE PROPOSED SYSTEM

In this section, thorough studying and analysis of the gathered data and fact were done on the existing system. In Akanu Ibiam Federal Polytechnic Unwana, timetable scheduling is done by

1. The submission of examinable and non-examinable courses by the timetable officer of each department.
2. The submitted documents are taken by the chairman space and timetable committee.
3. Previous school scheduled timetable and blank templates are passed round from one department to

another for the timetable officers to allocate course to halls.

4. After the exercise, tentative timetables are released for staff and students to make inputs.
5. At the end of receiving inputs from students and lectures alike, the final timetable is presented to the school and it will become a working document for that semester.

3.1 Problems of the Current System

The traditional manual generations of timetables encounters a lot of problems which may include the following:

1. Repeated time allocations may be made for a particular course thereby leading to data redundancy.
2. A lot of administrative error may occur as a result of confusing time requirements.
3. Timetable generation by center staff may have a slow turnaround.
4. Final generated timetable may not be near optimal as a result of clashing course requirements and allocations.
5. It generates a lot of paperwork and is very tasking.
6. It is not flexible as changes may not be easily made.

3.2 Proposing a New System

The proposed systems was developed to solve the timetabling problem being faced by universities every academic year and reduce high cost and slow turnaround involved in the generation of near-optimal timetables. The system has capabilities for input of the various courses, halls of lectures, departments, programs, buildings, lecturers and the specification of a few constraints from which the timetable is constructed. The proposed timetabling system for this project seeks to generate near optimal timetables using the principles of genetic algorithm (selection and crossover).

3.3 Advantages of the Proposed System

The timetable generation process by the education center staff is:

1. Unlike the manual timetabling system, the system offers flexibility.
2. It utilizes minimal processing/computing power.
3. It greatly reduces the time needed to generate near-optimal timetables.
4. It provides an easy means for data entry and revision through an intuitive interface.
5. It increases productivity.
6. Timetables generated are between to 60% - 80% optimum and it almost eliminates paperwork.
7. It simplifies the timetabling process.

Figure 3.1 and 3.2 shows the Algorithm flow charts of the users and administrator.

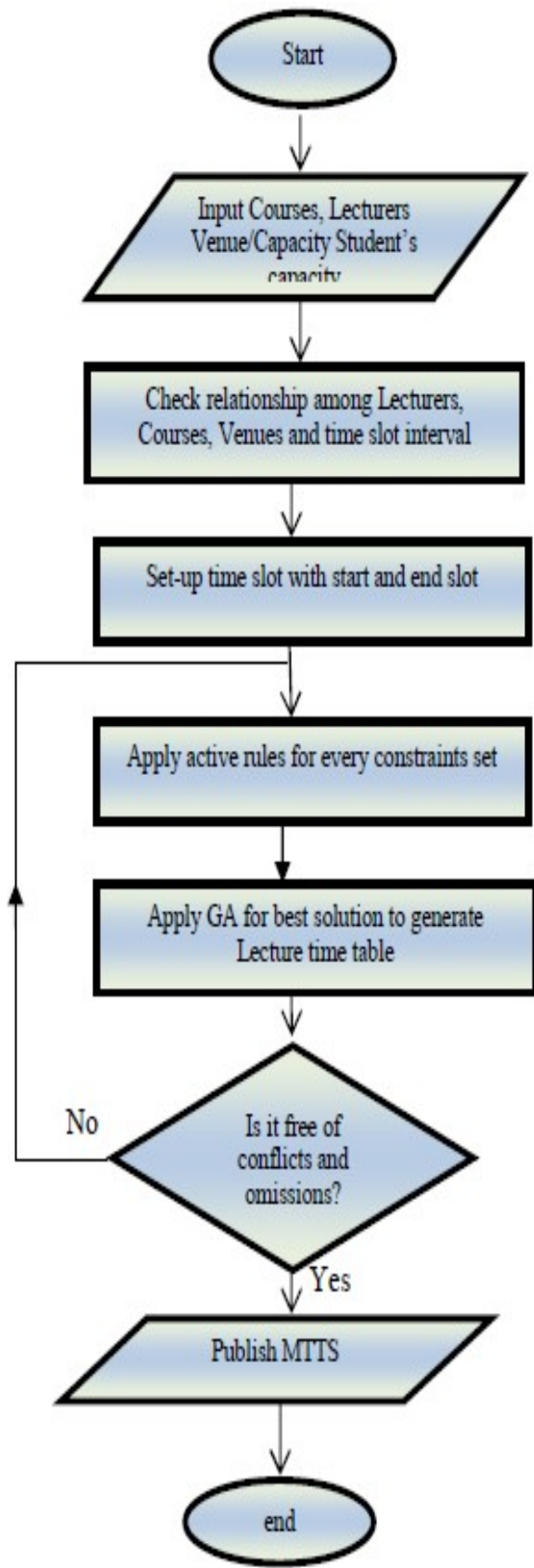


Figure 3.1 User Flow chart

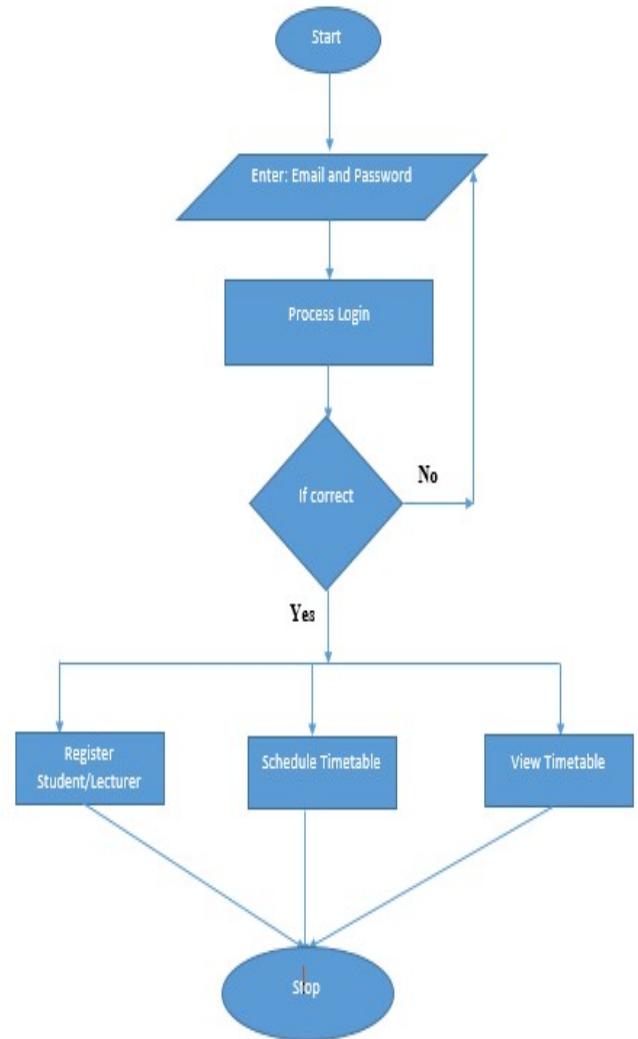


Figure 3.2 Administrator Dashboard

IV. PROCESS DESIGN

Successful procedure configuration needs to consider the suitability of the procedure to by and large association objective. Procedure configuration requires a wide perspective all in all association and ought not to have a nearsighted viewpoint. What's more, the procedure ought to convey client esteem with consistent contribution of the administration at different stages. So as to accomplish a decent procedure structure, compelling procedure methodology is required, which manages a particular details required to make the finished result. Successful procedure methodology manages crude material obtainment, client cooperation, innovation venture, and so on. Over some undefined time frame process configuration has experienced change and new ideas like Flexible Manufacturing Systems have been created, which conveys proficient and compelling creation plan and investigation.

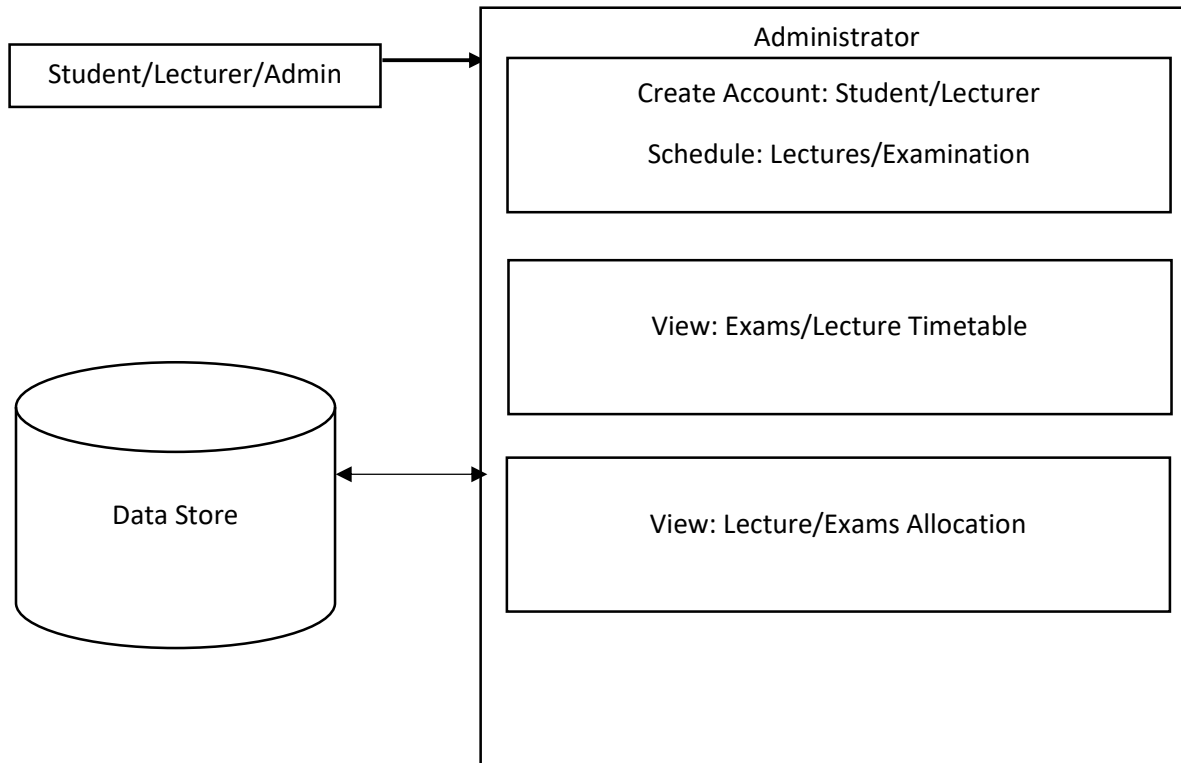


Figure 4.1 Proposed System Process Design

The system description, the responsible persons in this system are the Administrator, Student and Lecturer. The administrator creates account for users (Lecturer/Student) by presenting the user details. The administrator as well create timetable and update if any change. The student views the timetable for both exams/lectures. The Lecture too view course allocation for exams and lectures;

1. Create Account
2. Schedule
3. View

This is the simplest pattern and process of the system design to suite the entire system development.

4.1 System Structure Chart

The structure of the recently proposes framework adopt a top-down strategy from the framework to the administrator, understudy and teacher. A Structure Chart (SC) in programming building and authoritative hypothesis is a diagram which shows the breakdown of a framework to its most minimal sensible levels. They are utilized in organized programming to mastermind program modules into a tree.

Every module is spoken to by a case, which contains the module's name. The tree structure imagines the connections between modules. James and McClure (2019). The structure of the framework depiction the tree like portrayal of whole framework. The overseer control account creation and talk/test planning. The understudy and speaker see plan and portion the two tests and talks.

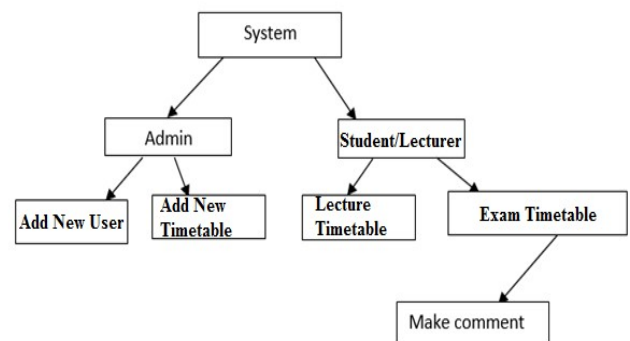


Figure 4.2 Structure Chart

Below are screenshots of the system:

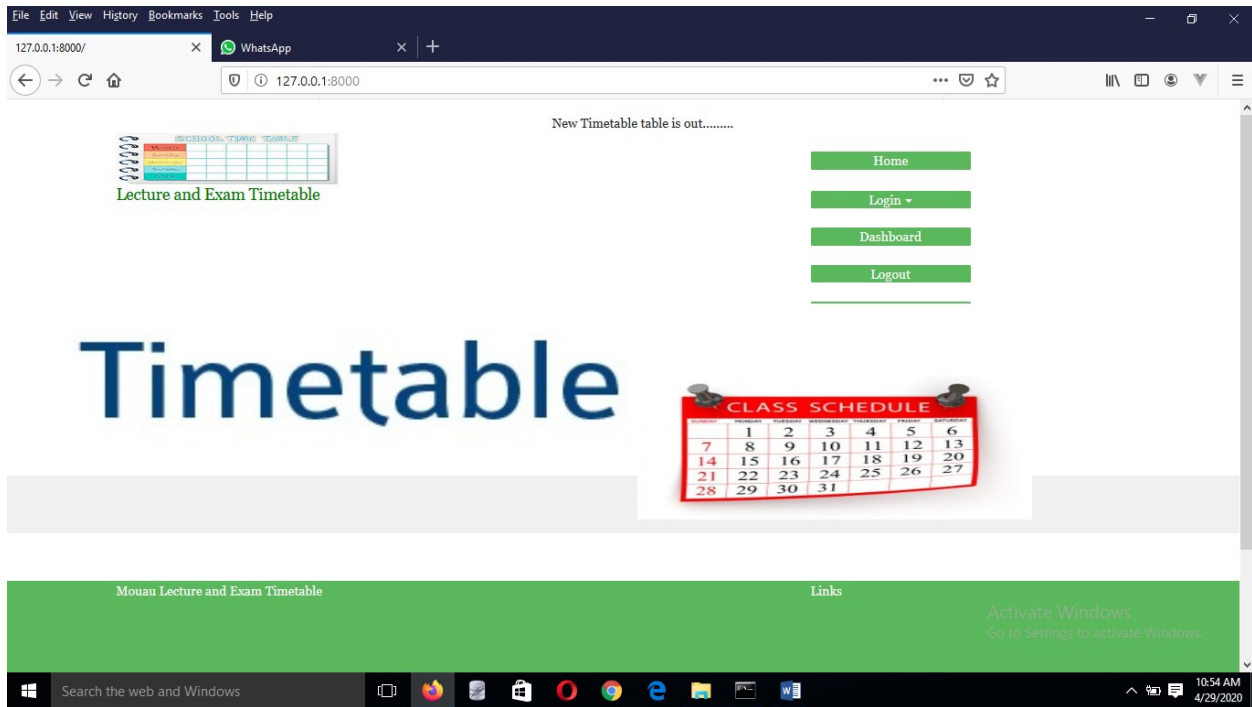


Figure 4.3 Structure Chart

Home

Login ▾

Select Role

choose role.... ▾

Email

Password

Login Account

Login Form

Select Role

choose role.... ▾

Full Name

Reg. Number/Staff ID

Department

Email

Password

Register

Add New Student/Lecturer Form

Figure 4.4 Structure Chart

#	Course Code	Day	Start Time	End Time	Venue	Lecturer		
3	LIS421	011/08/17	9:30	11:00	ETF	Samuel Glory	Edit Record	Delete Record
4	math223	09/08/2017	10am	12noon	ACB15	Imo	Edit Record	Delete Record
5	emp223	12/08/2017	6.00	8.00	Achebe	Miss Chioma	Edit Record	Delete Record
6	MTH223	23/09/2017	6	8	Achebe	Choima	Edit Record	Delete Record
7	BIO223	23/09/2017	6	8	Achebe	Choima	Edit Record	Delete Record
8	MTH228	23/09/2017	6	8	D Block	MC	Edit Record	Delete Record
9	CHM301	4/29/2020	10:30	12:30	achebe	Mr. John	Edit Record	Delete Record

Figure 4.5 Scheduled Timetables Automatically

V. RESULT AND DISCUSSIONS

This research centers on the utilization of PC framework concerning electronic plan booking control arrangement of tertiary foundation. The work conquers the manual arrangement of activity as respects to the issues distinguished, expressing the points of the new framework, expressing the different particulars and afterward executing the projects. The work was effectively evolved utilizing python jar structure, Sqlite Database and client experience was utilized, an easy to use programming language, and the bundle was tried and enhanced which yields a mechanized plan booking control framework. The venture work can't be supposed to be great, yet in any case, its advantages can't be overemphasized. It has prompted the improvement in the speed of preparing activity, productivity, exactness and improved stockpiling of things.

The structured framework was tried, assessed and prescribed to the administration of the school schedule framework. This theory has analyzed the plan booking issue. It started with a conversation into the wording and size of the examination zone. A solid qualification between the terms booking and timetabling was made to stay away from disarray in the work introduced. A diagram of the aggregate of the plan age writing that could be sourced was introduced. The significant arrangement calculations that have stood the trial of time were summed up. This was trailed by an itemized assessment of the writing. Utilizing the significant arrangement strategies the writing was ordered, and a synopsis introduced which exhibited the worldly patterns that have gone through this writing.

VI. CONCLUSION

Finally, 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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