



Automatic Timetable Generator Using Genetic Algorithm

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Abstract—*Timetable creation could be a very difficult and time-engrossing function. Forming a timetable takes parts of tolerance and hours. Time table is created for different purposes like organizing schools and colleges, making time charts for preparation and transport plans, and numerous more. Creating a timetable requires considerable time and supervision. In our paper, we have seeks to shrink these challenges of creating a timetable by Genetic algorithm. By utilizing genetic algorithms, are ready to develop a schedule that is more accurate, exact, and free of human errors while also reducing the time needed to do so. The elementary stage is made up of all the common compulsory classes that have been developed and organized by a centralized body. The individual's departmental courses are found in the next phase. Directly this timetable is ready physically, by controlling those of prior a long time, with the as it were the point of creating a realistic timetable.*

Keywords – Genetic Algorithm, Selection, Cross over, Fitness

I. INTRODUCTION

Timetabling is the task of creating a timetable while satisfying some constraints. Technology makes lifestyle easier by providing better support to different systems, better accuracy, better security options, easier maintenance, etc. Nowadays technology eventually means “computers” which is the greatest achievement of the last century. Day by day computers are being more and more popular because of their features like ease of work, ease of learning, greater accuracy with the least time consuming and last but not the least i.e. ease of maintenance with cost-effectiveness. So as a part of this ongoing evolutionary approach, traditional systems are being computerized to make them more fruitful than ever.

II. LITERATURE REVIEW

Time Table Arranging is an NP-hard issue and subsequently, polynomial time is undeniable utilizing innate calculations. It is a commonplace arranging issue that appears up to be gloomy work in each academic organized once or twice a year [5]. In earlier days, timetable arranging was done physically with a single person or many accumulate included in the task of arranging it physically,

which takes a allocate of effort and time. Orchestrating timetables is one of the preeminent complex and error-prone applications [6]. Timetabling is the errand of making a timetable while satisfying some goals. There are in a general sense two sorts of restrictions, fragile restrictions, and troublesome objectives. Sensitive restrictions are those on the off chance that we harm them in arranging, the abdicate is still considerable, but troublesome objectives are those which on the off chance that we manhandle them; the timetable is no longer considerable [3]. The seen space of a timetabling issue is as well perpetual, various courses of action exist inside the seen space and few of them are not doable. Achievable arrangements here cruel those which do not abuse difficult goals and as well endeavor to fulfill fragile confinements [8]. We have to select the preeminent fitting one from feasible courses of action. The most reasonable ones here are brutal ones that do not mishandle fragile impediments to a more noticeable degree. In these amplified hard constraints have been taken care of totally and it has been ensured that soft constraints are as well taken after as much as conceivable.

III. EXISTING SYSTEM

Within the current system, the entire handle of making a timetable is done physically by taking care of all the conceivable limitations tall as well as little imperatives. The foremost dull errand of planning a timetable is from the instructive framework, particularly the College Timetabling. Here a specific teacher/lecturer is charged with the duty of making an ideal timetable manually, the teacher/lecturer has to look out for all conceivable imperatives like must have the correct data of the overall number of students, faculty individuals, the appropriate time course of action, etc. In case of the instructor's nonappearance, he/she who is capable of timetabling should organize another address at that time, which suggests a single individual separately is taking care of so much obligation that's exceptionally much time devouring as well as an excited work for the speaker.

A. Advantages of Existing System

- Can be made superior through collaboration with the different substances included because it is subjective.
- Changes are possibly done speedier on time as it were for particular conditions and not for all.

B. Disadvantages of the Existing System

- A Very Confusing and time-consuming strategy for manual creation, as well as frenzied work for teachers as misplaced exertion, is put by them for it.

IV. PROPOSED METHODOLOGY

The devices utilized for the arrangement and strategy Calculation and Stream chart. From the stream chart underneath, the steps carried out by the system executive are as take after: The system executive logs into the system. The executive at that point inputs the courses with their codes and the unit. At this point, the admin will keep counting until the number of courses required has been inputted. The admin can oust a course that has been inputted inside the case of mishandling. After contributing the courses, it moves to the taking after page where all the address hallways or rooms that will be utilized will be inputted. After contributing these, the system at that point makes the timetable system. In order to address timetabling concerns, we are putting up a framework that would automatically produce a timetable for the founded. A timetable will be created after the course and addresses have been designed while taking into account all potential constraints and inputs.

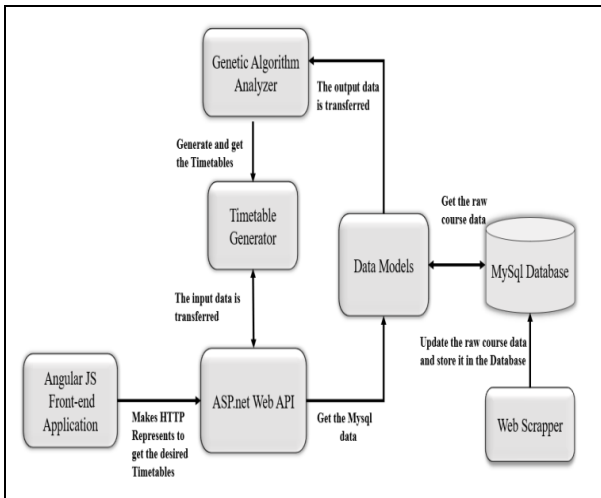


Fig 1. System Architecture

A. Genetic Algorithm

Metaheuristic techniques called genetic algorithms are used to address computer problems that call for broad search spaces for potential solutions. They incredibly usually rely on adaptable frameworks to function successfully in changing circumstances. A self-adaptive method is desired

to raise the level of a broad statement in timetabling, for instance.

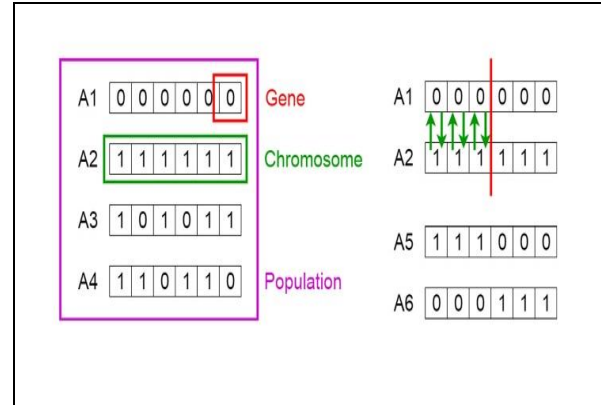


Fig 2. Genetic Algorithm

B. The Basic Elements of Genetic Algorithm

A Genetic Algorithm (GA) may be a useful programming technique for solving issues. It falls under the heading of developmental calculations, which may be a subset of manufactured insights. In 1960, John Holland, a teacher, invented it. In the 1970s, his book *Adaptation in Normal and Manufactured Frameworks* was essential in advancing genetic algorithm (GA) research. This tactic was inspired by the Darwinian idea of characteristic progression, which holds that the world's living things geometrically duplicate, leading to a struggle for existence primarily owing to a lack of food and space. The most advantageous variants are found in the fittest individuals, and their accumulation promotes the development of species.

C. Selection of Roulette Wheel

The "wheel of fortune" or "roulette wheel" method, which is famously based on probability, looks to offer a far superior; superior; stronger; improved" arrangement in choosing members of the mating pool. Consider a five-part population that is following a wellness regimen for an easy way to illustrate the idea.

TABLE I. FITNESS FUNCTION

S.No	DNA	FITNESS
1	A	5
2	B	2
3	C	0.1
4	D	1.2
5	E	2

The total fitness is $5 + 2 + 0.1 + 1.2 + 2 = 10.3$

In Table 2, the normalized fitness scores and percentage values are shown.

TABLE II. NORMALIZED FITNESS

DNA	FITNESS	NORMALIZED FITNESS	EXPRESSED AS A PERCENTAGE
A	5	0.5	50%
B	2	0.2	20%
C	0.1	0.01	1%
D	1.2	0.12	12%
E	2	0.2	20%

D. Tournament Selection

Additionally, this technique selects individuals for the mating pool based on their work in wellness. Due to its simplicity and efficacy, it may be a frequently used tactic in GA. The plan calls for an atypical selection of individuals from a larger population. They will vie with one another for a position within the next generation.

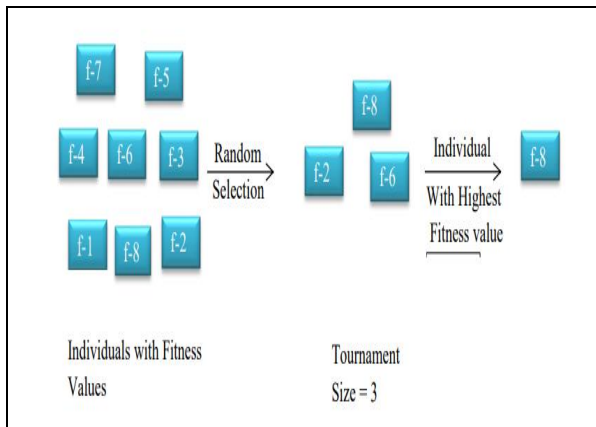


Fig 3. Selection of Tournament

V. DESIGN AND IMPLEMENTATION

The entire strategy of planning based on hereditary calculation is clarified in detail in this segment. A planning method is partitioned into a few imperative modules. The manual lecture-timetable planning may be a restriction fulfilment problem where we discover a solution that satisfies the set of provided requirements. Numerous solutions to the problem of creating timetables for colleges and schools have been proposed in the past. Timetabling problems can be understood using a variety of techniques learned from operational research, such as chart coloring, local look techniques like tabu look, recreated tempering, Genetic Algorithms, or backtracking-based limitation fulfilment.

A. Flow Chart

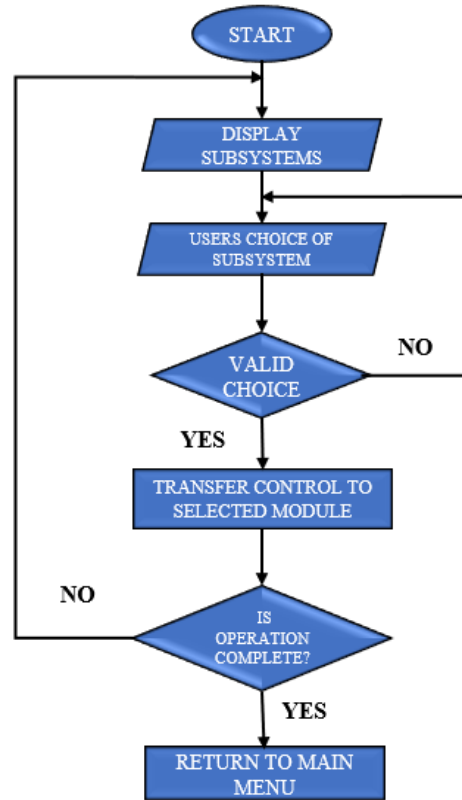


Fig 4. Flow Chart

B. Population Evaluation

The assessment of an agreement's greatness using sensitive imperatives is known as the appropriateness of the agreement. The arrangement is substantial at this point. The core of genetic algorithms is population evaluation. This step assesses which arrangement employing fitness work is superior to others. A run between and 1, where 1 is considered to be the best arrangement of the populace, can be used to determine fitness, with other individuals running them. In this situation, a fitness arrangement of 1 and a fitness arrangement of 0 will alternate continually.

C. Function of Fitness

$$F(X) = \frac{\rho 1(x) - \rho v(x)}{\rho 1(xWT) - \rho v(xWT)}$$

Where, $\rho 1(x)$ = Average density of the sequence of x.

$\rho v(x)$ = Analogue for the poor phase.

X indicates a timetable that is being evaluated.

W is the number of restrictions.

T = Value of overall fitness.

D. Evolution of Crossover

The Crossover Evolution may be a tactic employed to create a new population based on an existing, more seasoned population. Two chromosomes are used in the simple crossover evolution, which allows for the creation of X modern chromosomes. It divides the two chromosomes into pieces.

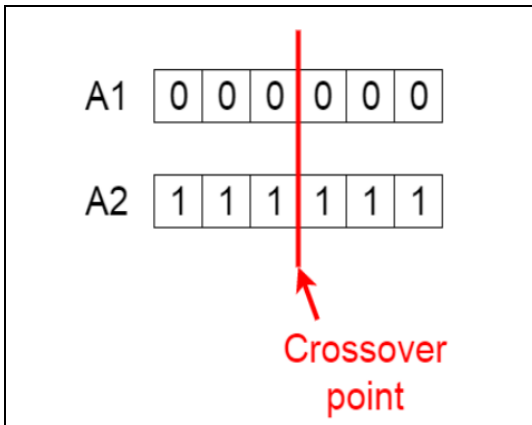


Fig 5. Crossover Point

1. Encoding and decoding of data
2. The first population
3. Mutation

E. Encoding and Decoding of Data

The first step when starting a Genetic Algorithm is data encoding. To install fundamental respect, it transforms a solution into a chromosome, much like a string. It is used to increase the algorithm's forward speed. Transforming the data into a double string is an easy way to accomplish this. A quality can be converted into a twofold string or be a component of a chromosome. By organising the data in this way, the algorithm may be treated more easily. Side-by-side quality strings make up the chromosomal string.

F. The First Population

The initial stage of GA is this. Hard limitations are used to generate a specific number of random people. The user's needs determine which populations are chosen. Due to evolution, a small portion of a population will eventually fall and wipe out the entire population. A large population, on the other hand, will provide better outcomes but will use up more resources and move more slowly. It is possible to depict the population as a whole.

G. Mutation

The algorithm is made to move by using the Mutation. It entails arbitrarily modifying a quality's values to produce an unexpected stunning arrangement. These arrangements present a neglected angle for work in wellness. Without affecting other arrangements, the

transformation alters the chromosome as if it were a separate entity.

VI. RESULT AND ANALYSIS

A. Login Page

The login page permits the students/teachers to get access to an application by entering their usernames and password. This is often a course primarily to get input from the user either through a content record or through shape and give it to the working classes of the calculation.



Fig 6. Timetable Login page

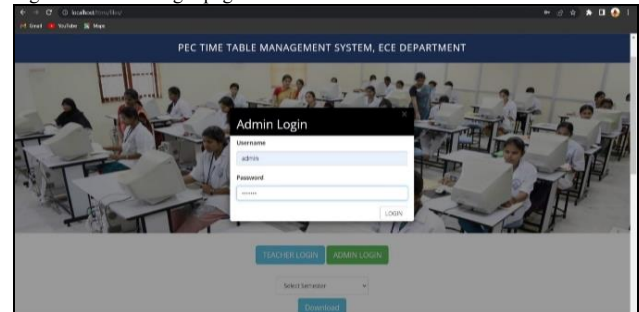


Fig 7. Timetable Login page

B. Add Teachers and Subject

This module has the feature to add teachers and subjects to manage the workforce data. It has a Faculty number, Name of staff, Designation, Contact Number, and Email ID, and a relegation that speaks to the no. of clusters to the instructor. This can be the course of the calculation that conjures other classes and calls strategies for hybrid, change, choice, etc...

Faculty No.	Name	Alias	Designation	Contact No.	Email ID	Action
EC001	satya		Professor	786507290	satya@gmail.com	Delete
EC003	Dr. J. Ananthakrishnan		Professor	903687802	ananta	Delete
EC002	Mr. S. L. Shanthi		Assistant Professor	786420872	shanthi@gmail.com	Delete
EC002	Mr. N. Velup		Associate Professor	786502282	nvelup@gmail.com	Delete
EC004	Mr. C. Ramen Kumar		Associate Professor	786507492	ramen@gmail.com	Delete
EC005	Dr. V. Anand		Associate Professor	907548552	anand@gmail.com	Delete
EC021	satya		Assistant Professor	904687800	satya@gmail.com	Delete
EC002	Shanthi		Assistant Professor	907578720	shanthi@gmail.com	Delete
EC021	Sandya		Assistant Professor	907551120	sandya@gmail.com	Delete

Fig 8. Add Teachers

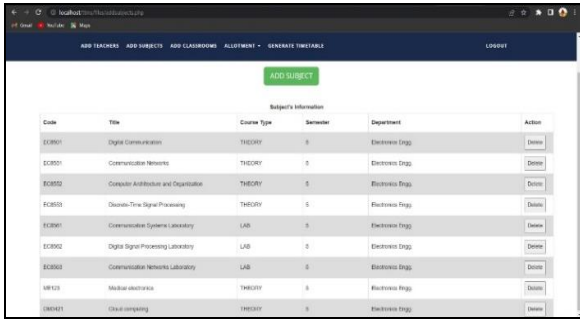


Fig 9. Add Subjects

C. Add Classroom

Classrooms are the foremost essential unit of Genetic Algorithms. It speaks to a single characteristic of Quality. It is essentially for testing reasons. It contains a few strategies like print classes() which offer assistance to keep track of calculations through the support.

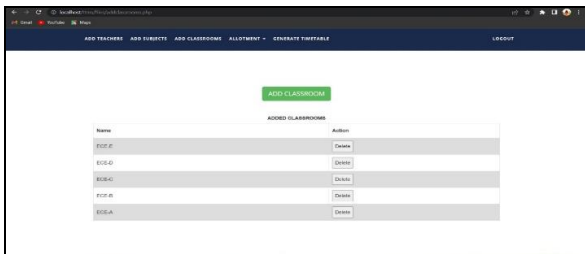


Fig 10. Add Classrooms

D. Generate Timetable

This lesson question holds a cluster of Space. Typically fundamentally a course to produce modern spaces at first for each class.



Fig 11. Generate Timetable

TABLE III. COMPARISON WITH RELATED WORKS

Ref No	Title	Technique	Focused
[1]	Singular Resource Constrained Project Scheduling Problem	Genetic Algorithm	To rectify an infeasible schedule.
[2]	Educational timetabling	Evolutionary Algorithm	Features with feeded timetable
[3]	Sports timetabling	Two-dimensional space algorithm	Organizing high-dimensional intense space
[7]	School timetabling problems	The Two-phase tabu search algorithm	A small number of students and limited resources
This Work	Automatic Timetable Generator	Genetic Algorithm	A web app to produce automatic timetables and force android gadgets

VII.CONCLUSION

The process of Time Table generation has been completely mechanized with this computer program. This web app can presently cater to different colleges, and schools which can depend on it for their Time Table planning which prior had to be done by hand. Utilizing Hereditary qualities Calculation, a number of trade-off arrangements, in terms of different destinations of the issue, maybe get exceptionally effortlessly. Besides, each of the arrangements has been found much superior to a physically arranged arrangement which is in utilize.

VIII.FUTURE WORK

With great information structures, it is conceivable to create a set of conditions that produce the timetable accordingly-, or can be utilized to check the physically created timetable against the control. Given the operation's universality, it can be encouraged to be changed to more specific scenarios, such as college and test planning, and can even be advanced to create railway timetables. The most curious future course within the improvement of the extend lies in its expansion to imperative proliferation. The timetable issue is NP-Complete. Timetable administration has been made less demanding with this arrangement. It incorporates a web app to produce timetables and force android gadgets.

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