Automation of Exam Hall Seating Plan using Harmonic Search Algorithm

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Abstract— Automatic Exam Hall Seating Plan Generation using graph coloring algorithm is a web based application developed for the college to simplify exam hall allotment and seating arrangement. The purpose of developing this application is to computerize the traditional way of conducting exams. Another purpose is to generate the seating plan automatically which reduces the human effort to a major extinct and also avoids the mistakes in the seating plan. The mistakes generally occur when the different department students have the same exam (but with different codes) on the same day because they might be considered as different subjects. This newly invented concept can aid for the students to check their exam hall details.

Key words: Harmony Search, Graph coloring algorithm, Fragmentation, Greedy Algorithm

I. INTRODUCTION

Every Institution held the Examinations periodically, therefore preparing the seating plan is an important task to be done by the Exam Cell. Allocating each student to a specific seat in a particular room is a massive task. This paper ascribes to develop a Seating Plan Generation Application for an Examination which automatically allocates students to specific seats based on their Id numbers. The students will be serially arranged in numeric order with respect to their Id numbers. Each student will be allocated to a specific seat moreover no two students from the same department or the same course can be seated next to each other.

In the Back End, the database will maintain the list of rooms available for the examination. Each room consists of a particular number of rows and columns, therefore each room is considered as a multi -dimensional array while processing for a seating plan generation. This application can be appreciably used for any kind of examinations moreover it can also be used for other events like college fests, cultural programs etc. It reduces our time and makes the process organized and coherent. This application comprises an extensive variety of uses in our daily lives and made seating planning very efficient

II. ALGORITHMS DESCRIPTION

A. *Harmony Search:*

Harmony Search is a meta heuristic optimization algorithm. It is introduced by Zong Woo Geem, Joong Hoon Kim and G.V. Loganathon. It is used in the process of improvisation of jazz musicians.

This algorithm tries to find a vector X which optimizes an objective function.

Steps:

1) Generate random vectors as many as HMS, then store them in HM.
2) Generate a new vector X' for all components.
3) If X' is better than worst vector, X^{Worst} in HM, then replace X^{Worst} with X'.
4) Repeat the above two steps until all the criteria get satisfied.

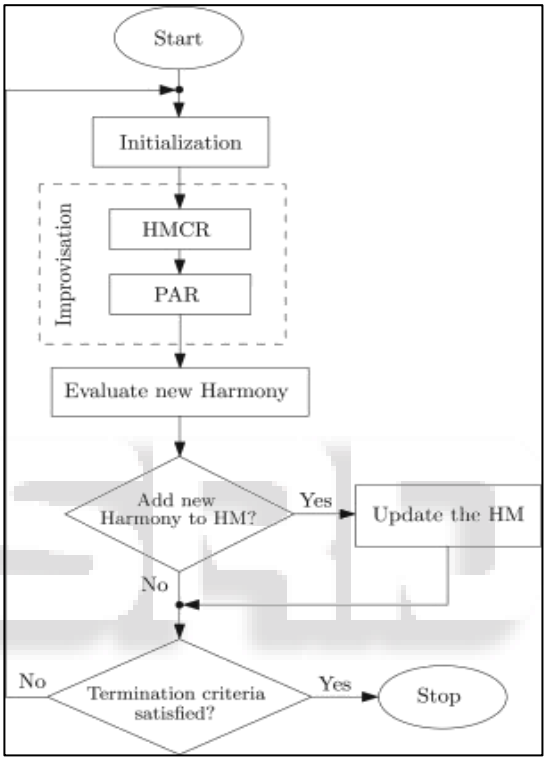

Fig. 1:

1) Advantages of Harmonic Search over other Optimization Algorithms:

- It uses stochastic random searches.
- It generates a new vector considering all the vectors in the population unlike genetic algorithm which considers only parent vectors to generate a new vector.

2) Adaption to our project:

begin

- Assign the students under a different subject codes to the different arrays.
- Mention limit of groups in each hall and adjusting rate of groups.
- Calculate the Capacity of a room.
- Assign the value zero to the variable Count.
- Initialize the seating of each hall randomly with any group.
- while (Count <= Number of halls)
- If the arrangement satisfies all the criteria then break the loop.

Adjust maximum range of groups and allocate arrangement using GRAPH COLORING ALGORITHM till satisfy all constraints
end
- Display the Optimum Seating Plan
- end

3) Other Applications of Harmony Search:
- Water Distribution Networks
- Vehicle Routing Problems
- Optimization of Plate fin heat exchanger
- Pressure vessel Design
- Benchmark Optimization

B. Graph Coloring Algorithm:

It is used to assign colors to certain elememts of a graph subject to certain constraints.

1) Vertex coloring:

It is the most common graph coloring problem. The problem is, given m colors, find a way of coloring the vertices of a graph such that no two adjacent vertices are colored using same color.

2) Chromatic Number:

The smallest number of colors needed to color a graph G is called its chromatic number. For example, the following can be colored minimum 3 colors.

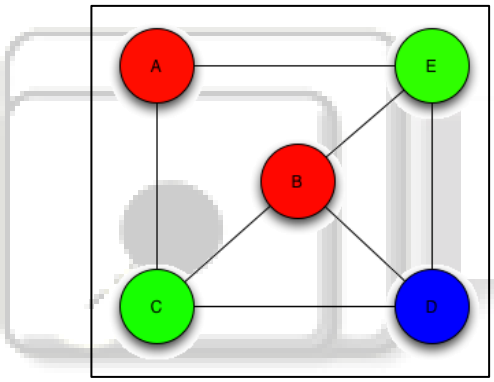

Fig. 2:

3) Algorithm:
- List the vertices in order of decreasing valency
- Color the first vertex in list.
- Go down the sorted list and color every vertex not connected to the colored vertices above the same color and cross out all colored vertices in the list.
- Repeat the process on the uncoloured vertices with a new color until all vertices are covered.

4) Adaption to our project:

begin
- Assign the first student of a first group to the first seat in the hall.
- Assign the next student to the next seat if it is not nearer to the same subject code
- Otherwise, assign the student of the next group.
- Repeat the procedure until all the students are assigned to a specific seat.

5) Other Applications of Graph Coloring:
- Mobile Radio Frequency Assignment
- Sudoku
- Map Coloring

III. DATA FLOW DIAGRAM (DFD)

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modelling its process aspects. ADFD is often used as a preliminary step to create an overview of the system without going into great detail, which can later be elaborated.

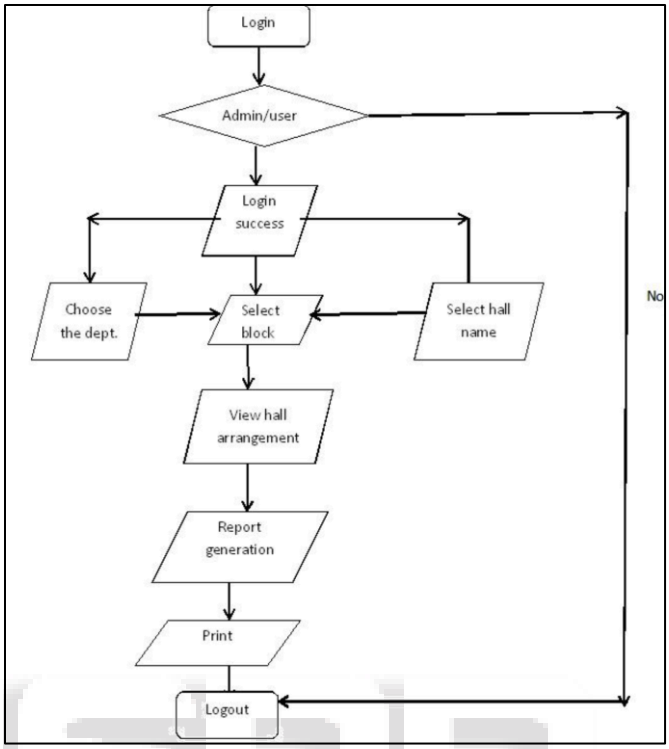

Fig. 3:

IV. SOFTWARE ENVIRONMENT

A. Hyper Text Markup Language (HTML) – FRONTEND:

HTML is the standard markup language for creating web pages and web applications. HTML elements are the building blocks of HTML pages. It can embed programs written in a scripting Language such as Javascript which the content and behaviour of pages.

B. MYSQL –BACKEND:

MYSQL is a open–source relational database management system. Collection of tables which holds the data is called Database. These databases can be related, maintained by the MYSQL.

V. MODULE DESCRIPTION

A. Admin Login Form:

Admin is the only one who can have an access to this module for the security purposes. so other users don't get rights to access to this module. He has to login using his username and password.

B. View Detail:

The students can view their details about his/her exam hall and seating provided they are already registered.

C. Seating Arrangement for Students:

This is the major module of the project in which the seating plan generation happens provided the available halls for exam and the group of students under the particular subject codes.

D. Student Registration:

The students should register themselves using their unique Id numbers. Once they registered thereafter they can login into the application and can view their seating for the forth coming scheduled exams

VI. LIMITATIONS

Even though the prototype works eminent, it is not completely reliable as it won't works for a halls which are not regular in shape (having a different number of seats in different rows or columns). It also faces the internal fragmentation problem in memory as a result it consumes more memory then needed.

VII. CONCLUSION

This paper has been a tremendous learning experience and it is an extraordinary method to reduce work. It can further extended to use for the event managements, meetings and for any large gatherings.

VIII. FUTURE IMPLICATIONS

This application can be designed such that it can also work on the larger groups of students. It can further developed such that it can also work for the exam halls which are very irregular in shape. This can be generalized to all kind of purposes like seating plans for the function halls, seminars etc.

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