Automated Classroom and Sickroom Allocation in Exam Halls

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***Abstract*—With consideration for health-related limitations, the Exam Hall Management System is made to assign exam rooms to students in an effective manner. Our approach decreases the computational load, resulting in a scalable and effective system. Exam creation, scheduling, and management for a variety of classes and disciplines are all possible with the system. While students can check their exam schedules and report health difficulties, faculty members have the ability to assign exam totals. As a way to reduce health concerns, sick kids are assigned to a special sick room. It has an algorithm for the best seating arrangements, digitalizes a number of exam administration responsibilities, and offers extra accommodations for sick pupils. Both the maximum seat utilization and adherence to health and safety regulations are met. The system's objectives are to end student misconduct, lessen the workload for administrators, and ease the strain on sick kids. Exams, seating assignments, and student data are easily managed with the use of key data structures like ArrayLists, HashMaps, and HashSets. This project provides a holistic solution that improves exam integrity, management efficiency, and student care by addressing concerns of malpractice, administrative pressure, and student welfare.**

***Index Terms*—Seating arrangement, health**

I. Introduction

Exam logistics management is a crucial component of educational administration that must be managed effectively to guarantee that tests run well and students are properly accommodated. Exam room assignments made via traditional procedures might be time-consuming, subject to last-minute modifications, and may not fully take into account students' health concerns. Presented in this research, the Exam Hall Management System is a comprehensive system that blends automated scheduling, health and safety considerations, and classroom allocation to meet these difficulties. For this we have used different modules in order to operate the allocation. Large-scale scheduling problems usually involve a great deal of complexity and computing load, which our method dramatically lowers. To complete our project, we have employed a number of different data structures, including array lists, hash sets, and hash maps.

Traditional exam logistics often fail to adequately address health concerns, leading to incidents where students' needs are not met, causing them to lose valuable exam time or compromise their health. The lack of accommodations for health needs increases stress and anxiety among students, negatively impacting their focus and performance. Ensuring that all students, regardless of their health conditions, have equal opportunities to perform their best during exams by providing a supportive environment.

The system has separate modules for teachers, administrators, and students. In order to reduce the danger of infection, administrators can designate sick rooms for students who report health concerns, assign classrooms, and set and manage exam schedules. Teachers have the authority to determine a test's final grade, and students can report any health issues as well as view their exam dates.

As an array list can grow and shrink dynamically, making them more flexible than arrays, which have fixed size. So an array list can be used to list health reports and upcoming tests, to maintain lists of grades and students, to handle and manipulate exam schedules and room assignments with ease, and to manage lists of students, classrooms, and exam dates. Array lists also offers a simple API for adding, removing and managing elements.

Hash Maps provide O(1) average time complexity for get and put operations due to their hashing mechanism and allows storing data in key-value pairs, making it easy to associate specific data with unique keys. Hash Maps are used to associate students with their health reports and exam schedules, to map students to their respective exam rooms, to track classroom capacities and assignments dynamically, to map students to sick rooms and manage exam schedules, and to quickly update and retrieve assignments related to health.

Hash Sets ensure that all elements are unique, automatically handling duplicates so, used to efficiently maintain and track unique health reports and room designations, as well as to ensure speedy lookups and prevent duplicate assignments or entries.

Exam Hall Management System integrates these features to improve student safety and well-being during exam periods while streamlining the administrative process. In light of the present global health issues, where monitoring students' health has taken precedence, this approach is very pertinent. It is important to know that the sick student is taken care of or allotted a different room with their concern only.

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II. Problem Statement

Design an Exam Hall Management System that automates the process of scheduling exams, allotting classrooms, managing student seating arrangements during exams, and handling health conditions of students. The system should provide functionality for administrators, faculty, and students to perform various tasks related to exam management and student well-being.

III. Literature Survey

A focus of many studies has been on exam seat allocation optimization while taking into account limitations such room capacity, a variety of topic areas, and expanding student populations. A method to reduce exam hall cheating and improve seating arrangements was reported by researchers [1]. It involved the use of three subsequent algorithms. This method outperforms hand methods in highlighting the significance of subject distinctiveness, space size, and orientation for designing efficient seating arrangements. Several studies have looked at the transition from manual to automated systems for scheduling exam rooms, highlighting the drawbacks and inefficiency of traditional methods. Previous research has demonstrated how web-based technologies can improve educational settings' accessibility, effectiveness, and accuracy. These technologies' ability to handle complex data and user interactions is demonstrated by well-documented examples [2] of how to build online systems with HTML, JavaScript, CSS, PHP, and SQL.

A system of automated supervision duties allocation (SDA) and student seating arrangement (SSA) was presented by [3] in order to address the physical labor involved in exam management. The study highlights the operational efficiency benefits available in exam seat distribution by showing that automation considerably saves costs and enhances productivity when compared to manual alternatives. For speedy data retrieval, effective search engine indexing techniques are essential. The balanced multi-way B-tree and hash map hybrid approach covered in [4] enhances search efficiency. By modifying this approach, seat allocation data may be conveniently managed and retrieved, guaranteeing prompt and dependable updates.

Using distinctive biological characteristics like fingerprints is emphasized in the deployment of biometric authentication systems to improve exam security, as stated in [5]. In order to preserve the integrity of the exam sitting procedure, this technology guarantees great security and lowers the possibility of impersonation. Secure access controls are essential given the complexity and security risks associated with web authentication systems, as discussed in [6]. Ensuring secure and allowed access to sensitive student and exam data is crucial to online exam seat allocation systems.

Extraction of useful insights from opinion-based texts such as movie reviews and product reviews requires the use of this approach[7]. Recurrent neural networks (RNN), bidirectional long short-term memory (Bi-LSTM), and convolutional neural networks (CNN) with global average pooling (GAP) are only a few of the machine learning algorithms whose effectiveness is examined in this study. Particularly with bigger datasets, the known inefficiencies of partial text lookups in Database Management Systems (DBMS) employing LIKE clauses and regular expressions are significant. While indexing columns help with performance by matching against index keys, leading wildcards still require a lot of index checks. These limitations call for the use of full-text search[8], which indexes words within columns making it more efficient and effective.

Modern ocean observatories use IoT technologies to deliver analytical data in real-time on emergency alerts, ocean acidification, and climate change[9]. Data transfer from ocean units to analytical centers may be greatly improved by employing strong communication methods in combination with low-cost, portable, and interoperable designs. This effort advances knowledge by demonstrating how IoT innovations connect with our project's goals and offer beneficial applications and business potential in marine science. Tree-based techniques are so effective at data verification, especially Merkle and Verkle trees, they play a critical role in managing data integrity. VADIA shows significant gains and an 80

[11] provides an example of how to solve complex assignment problems using local search techniques and metaheuristics such as Tabu Search. By using these methods to improve seat allocation calculations, it is possible to guarantee ideal assignments that take various limitations into account. The requirement for systematic validation of automated systems is reinforced by the GUI testing approaches covered in [12]. This approach is important to guarantee fairness, minimize mistakes, and ensure the stability and accuracy of the seat allocation process.

To reduce last-minute ambiguities, test hall seating management solutions must be developed [13]. Exam experience and efficiency are enhanced when students can locate their exam rooms with ease when they are provided with comprehensive exam information ahead of time. Evolutionary computing techniques like genetic algorithms have been shown to be effective in preventing examination misconduct through optimal seating arrangements [14]. By solving NP-complete issues such as seating arrangements, these strategies lessen the possibility of cheating.

In web-enabled contexts, dynamic and sophisticated security policies are explored in [15], wherein real-time decision-making capabilities are emphasized. Such dynamic access restrictions, which adjust to changing access requirements and preserve data confidentiality, guarantee the safe and effective administration of exam seat distribution systems.

IV. Methodology

Getting into details of fig 1, an Exam Hall Management System's user-system interaction is depicted in the sequence diagram that is provided. The main menu (mainMenu()) is accessed first, and then conditional branching according to the user type (Admin, Faculty, or Student) occurs. Exams can be added, removed, scheduled, classrooms assigned, ill students reallocated, and seating arrangements viewed by administrators. Marks and exam time are set by the

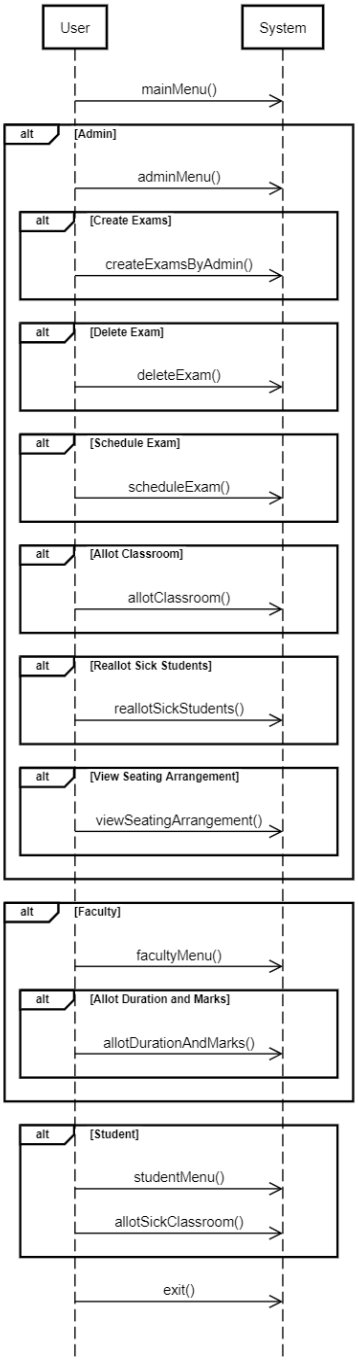

Fig. 1. Sequence diagram of all the three modules

faculty. Students can check their exam schedules and report themselves sick if necessary by navigating to their menu. The system's exit (exit()) marks the conclusion of the sequence. Every function call highlights the data and control flow by corresponding to particular system operations.

Algorithm

Step 1: Initialize the System Initialize the list of exams. Initialize the map for classrooms and their seating arrangements. Initialize the set for sick students. Initialize the map for class students.

Step 2: Display Main Menu Display options for Admin, Faculty, Student, and Exit. Get user choice.

Step 3: Admin Menu If the user chooses Admin: Prompt for the admin password. If the password is correct, display Admin menu options: Create Exams Delete Exam Schedule Exam Allot Classroom Reallot Sick Students View Seating Arrangement Back to Main Menu

Step 4: Faculty Menu If the user chooses Faculty: Prompt for the faculty password. If the password is correct, display Faculty menu options: Allot Duration and Marks Back to Main Menu

Step 5: Student Menu If the user chooses Student: Prompt for class and roll number. Check if the student is scheduled for any exams. Prompt to check if the student is well. If not, mark the student as sick and reallocate them.

Step 6: Create Exams by Admin Prompt for the number of classes and exams. For each class, get class name and number of exams. For each exam, get subject and add it to the exams list.

Step 7: Schedule Exam Prompt for exam number. Get date and timing for the selected exam.

Step 8: Allot Duration and Marks by Faculty Prompt for exam number. Get duration and total marks for the selected exam.

Step 9: Delete Exam Prompt for exam number. Remove the selected exam from the exams list.

Step 10: Allot Classroom Prompt for exam number, classroom, class name, and roll number range. Allocate students to the specified classroom.

Step 11: Reallot Sick Students Identify sick students and reallocate them to the sick room.

Step 12: View Seating Display the seating arrangement for each classroom.

Step 13: Exit

V. SYSTEM IMPLEMENTATION

Admin module provides administrative functionalities for creating, scheduling, and managing exams, as well as handling classroom allocations and managing the seating arrangement for sick students. 'Create Exam' function allows the admin to create new exams by specifying subjects and associated details. 'Schedule Exam' enables the admin to set the schedule for exams, including dates and times. 'Allot Classroom' facilitates the allocation of classrooms for different exams. 'Reallot Sick Students' reassigns sick students to a designated sick room based on their health status. 'View Seating Arrangement' displays the seating arrangement for all students in different classrooms.

Faculty module allows faculty members to manage and assign marks to students for the exams they administer. 'Allot Marks' function helps faculty members in allocating marks to students for their respective exams.

Student module provides functionalities for students to view their exam schedules and seating arrangements, and to report

their health status. It consists of few functions in which one is used to view their exam schedules and assigned classrooms. The other function is to report student's health status, which may affect their seating allocation.

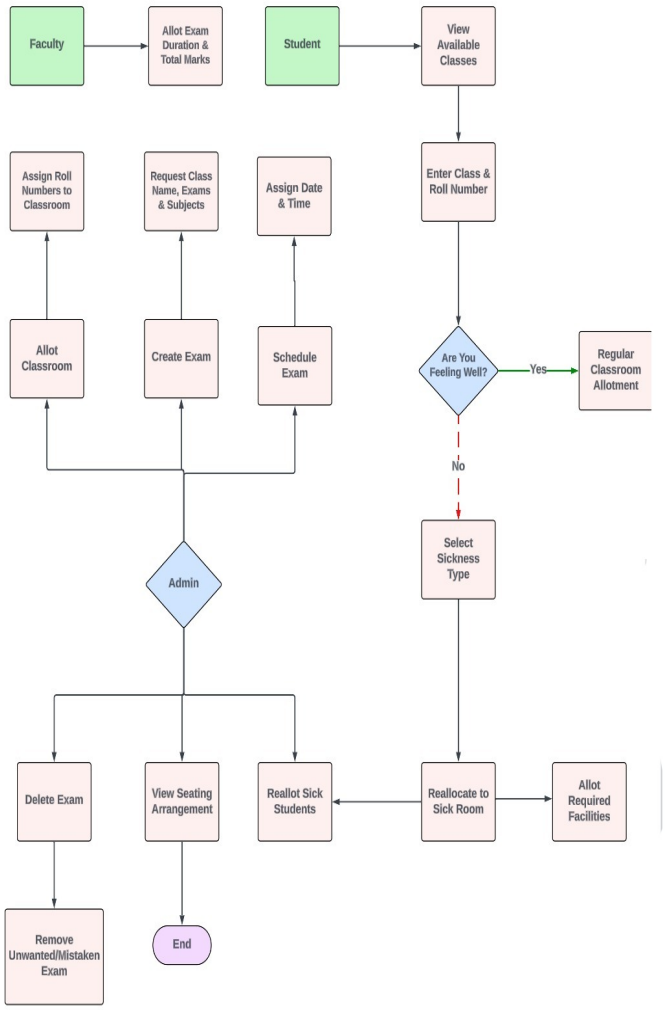

Fig. 2. Workflow of the three modules

Here, in fig 2 an admin starts the flow by creating exams which asks for the number of exams and classes that are going to be part of the allocation. The wiser our schedule, the better our efficiency. Schedule the exams given with date and time. Note that one cannot assign the date and time of past or present. We need to know the maximum marks as well as the duration of the exam, so faculty menu does that job.

Now, classrooms are to be allotted, by asking the starting and ending roll numbers of students. Let's get to the main point where in the student menu, a student is being asked whether their health is okay or not.

If yes, the arrangement is going to be as usual done by the admin without any changes and can be viewed by selecting view arrangement in the admin menu. But if no, they'll be asked the reason, i.e., to choose among the given options which will trigger the reallocate sick students from the admin menu. Then goes to view arrangement.

We can see the matrix that can be visualized as a classroom form the top while viewing the arrangement. And just incase a wrong exam or some issue happened with the scheduled exam, it can be deleted by the admin. We are basically providing the flexible way to accommodate, arrange, take care of students that are needy for the health care during exams.

VI. Result and Analysis

Administrators, teachers, and students can all take examinations with ease thanks to the Exam Hall Management System, which effectively handles exam creation, scheduling, and classroom allocation. The system is flexible enough to handle several tests in different courses since it uses dynamic data structures. To further contribute to the preservation of a hygienic exam atmosphere, it has a considerate mechanism that isolates sick pupils by moving them to a defined sick room. In order to reduce the likelihood of cheating and encourage better exam management, the seating arrangement rationale forbids students from the same class from sitting together. Though uncomplicated, the text-based interface guarantees accessibility and use. All in all, the system offers an all-inclusive approach to efficiently oversee exam logistics, taking into account the requirements of all parties concerned.

As we know, for the efficiency, lower time complexity is generally preferable because it means that an algorithm or data structure will take less time to complete operations as the size of the input grows. We can see in fig 5.2.1 that time complexity of hashmaps is the lowest one with O(1): Constant time complexity means the operation takes the same amount of time regardless of the input size. This is the most efficient., next is the threes with O(log n): Logarithmic time complexity where the time grows logarithmically with the input size.

VII. Conclusion

In terms of how educational assessments are administered, the Exam Hall Management System is a major improvement. The technology improves efficiency by automating the scheduling of tests, assigning classrooms, and monitoring the health conditions of students. A safer and more structured exam atmosphere is promoted by the inclusion of elements like the reallocation of unwell students to designated rooms, which guarantees that health considerations are taken into account. This project provides a more dependable and efficient exam management procedure by reducing errors and easing the administrative load. This system is a great resource for teachers, administrators, and students alike, as seen by its successful adoption, which also shows how it might revolutionize exam management in educational institutions.

VIII. Future Scope

A. Improved Health Management

Incorporating health monitoring devices to track students' health in real time is one possible improvement for the future.

In addition to automatically updating health statuses, this would allow the system to contact relevant stakeholders, like parents and school health officials. The implementation of automated health checks is an additional measure to guarantee each student's security and well-being prior to exams.

B. Advanced Analytics and Reporting

It would be feasible to track exam and student performance in great detail by integrating advanced analytics tools into the system. Educators and managers could utilize this information to identify trends, areas of proficiency, and areas that require improvement. Enhancing the institution's data-driven decision-making processes and boosting overall student accomplishment levels may be made possible by improved reporting capabilities that provide valuable information.

C. Cloud Deployment

A cloud-based platform would provide many advantages for the Exam Hall Management System, such as enhanced scalability, accessibility, and data security. Updating the system with the newest features and security measures would be possible thanks to cloud deployment, which would enable smooth updates and maintenance. Furthermore, improved disaster recovery and backup options made possible by cloud storage would safeguard sensitive exam and student data.

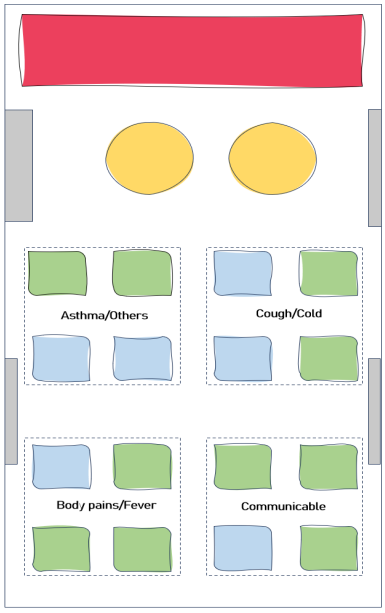

Fig. 3. Future scope ideology of the classroom

The figures fig 6.1 and fig 6.2 says a lot about the idea of the sickroom that we have been dealing with throughout the paper. We have to note that the space between each student is more ensuring the spreading of infections. We categorized the students according to the priority of the seriousness of their reason of illness so that we can provide them with the care taker if necessary with their will obviously. The classroom planning also makes sure that the ventilation is amazing as required for the students inside that class. In case of emergency

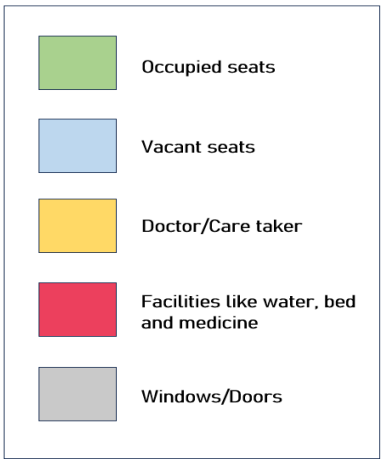

Fig. 4. Reference for fig 3

a doctor is also available right there, which helps the student to build up some confidence that nothing can happen to them and are able to write the test without any interruption. We also made sure that no student from the same class has been seated adjacent, if they belong to the same priority in the illness, they'll be having a vacant seat in between them, so we haven't lost our integrity anywhere. Facilities like medicine, water, bed are also provided making sure that no time is wasted from the students' examination and everything is available within that classroom.

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