UIT2511 – Software Development Project

**Project Report**

Academic year

2022-2023



**AUTOMATED SEATING ARRANGEMENT USING AI**

Client –

(Associate Professor, IT department)

|  |  |
| --- | --- |
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**Sri Sivasubramaniya Nadar College of Engineering**

**(An Autonomous Institution, Affiliated to Anna University)**

**BONAFIDE CERTIFICATE**

Certified that this project titled

“ **Automated Seating Arrangement For Examination Using AI**“ is the bonafide work of

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**Signature of examiner(s)**

**ACKNOWLEDGEMENT**

We would like to express our gratitude to Dr. A. Shahina mam who gave us the golden opportunity. We would also like to thank our teacher Dr .N. Radha mam for her constant guidance and support without which this project would not have been possible.

Secondly, We would also like to thank my teammates for their effort and cooperation that helped me in finalizing this project within the time frame.

We are highly obliged to all those who helped me out in completing this project.

**INDEX**

|  |  |
| --- | --- |
| SNO | TOPIC |
| 1. | ABSTRACT |
| 2. | MOTIVATION |
| 3. | PROBLEM STATEMENT |
| 4. | OBJECTIVE |
| 5. | LITERATURE SURVEY |
| 6. | REQUIREMENTS ENGINEERING |
| 7. | DESIGN AND DEVELOPMENT OF SOLUTION |
| 9. | DEPLOYMENT |
| 11. | CONCLUSION AND FURTHER SCOPE |
| 12. | REFERENCES |

**ABSTRACT**

In the realm of educational assessment, the allocation of students to examination rooms and benches while ensuring fairness, adherence to capacity constraints, and maximizing student satisfaction has remained a challenging problem. In this research paper, we propose an innovative solution that leverages the power of Genetic Algorithms (GAs) and Constraint Satisfaction Problems (CSPs) to optimize the seating arrangement process for college examinations.

Our proposed system takes as input the classroom ID, the range of roll numbers of students to be accommodated, the number of benches in each classroom, and the capacity of each bench. The primary objective is to generate an optimal seating arrangement matrix that assigns students to specific positions in examination rooms, ensuring that capacity constraints are met and that no two students with the same examination are seated in close proximity.

The Genetic Algorithm is employed to randomly generate roll numbers and allocate them to classrooms, simulating the process of natural selection and evolution. The algorithm iteratively refines seating arrangements over multiple generations, utilizing fitness functions that consider capacity constraints and fairness in seating distribution.

To satisfy the constraint of maintaining a fair distance between students with the same examination, we employ Constraint Satisfaction Problem techniques. A dedicated constraint satisfaction mechanism is integrated into the genetic algorithm to ensure that students with identical exams are seated at an appropriate distance from each other, promoting an equitable examination environment.

Our system's output is a seating arrangement matrix that provides the roll numbers of students assigned to their allotted positions in examination rooms. This matrix not only adheres to capacity constraints and fairness criteria but also maximizes student satisfaction by ensuring a balanced and efficient allocation of resources.

Through extensive experimentation and evaluation, we demonstrate the effectiveness and efficiency of our proposed system in generating optimal seating arrangements for college examinations. The results show significant improvements in student satisfaction, equitable distribution, and adherence to capacity constraints compared to traditional manual seating allocation methods.

In conclusion, our research presents a novel approach to the challenging problem of seating arrangement optimization for college examinations. By combining Genetic Algorithms and Constraint Satisfaction Problems, we have developed an intelligent system that not only ensures fairness and capacity adherence but also maximizes student satisfaction, ultimately enhancing the overall examination experience.

**MOTIVATION:**

**Faster Processing:** AI algorithms can quickly analyse large datasets of student and seating information, generating optimal seating arrangements in a fraction of the time it would take a human.

**Real-time Updates:** Automated systems can adapt to last-minute changes, such as absentees or unexpected additions, efficiently updating seating arrangements on-the-fly.

**Maximized Capacity:** AI can optimize seating arrangements to accommodate the maximum number of students within the available space, ensuring efficient use of examination venues.

**Avoiding Bias:** Automated systems can be designed to avoid potential biases in manual seating arrangements, promoting fairness and equity.

**Constraint Handling:** The system can consider constraints such as avoiding proximity between certain students or adhering to specific room characteristics.

**PROBLEM STATEMENT :**

In the context of college-level examinations, the current manual processes for seating arrangement present challenges in terms of fairness, efficiency, and adaptability. Traditional methods often struggle to optimize seating allocation within constraints, leading to suboptimal arrangements and potential biases. There is a critical need for an advanced system that leverages optimization algorithms to intelligently allocate students to available classrooms and benches, ensuring fairness, adherence to capacity constraints, and overall student satisfaction. This project aims to address these challenges by developing an intelligent seating arrangement system that combines cutting-edge algorithms with user-friendly interfaces, providing a comprehensive solution to enhance the examination experience in college settings.

**OBJECTIVE:**

* Login and Home pages should be created using web developing tools like HTML, CSS.
* An input page should be designed where the user can give his required inputs.
* There should be a proper functionality when the inputs are entered where we set out the constraints.
* There should be a data base or a formatted file from where the data can be retrieved.
* Using suitable search technique search the data and allocate the seats satisfying the constraints.

**LITERATURE SURVEY:**

1. DESIGN:

This research uses quantitative approach, while the research design used pre-experimental. The instruments were test and documentation, while test is used to measure the optimality of the arranged seating.. The result of this research is there was significant optimality and fit best into the regression fit models.

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<https://www.ijcai.org/proceedings/2023/0285.pdf>

[Aziz et al., 2013] Haris Aziz, Felix Brandt, and Hans G. Seedig. Computing desirable partitions in additively separable hedonic games. Artifcial Intelligence, 195:316–334,

1. FRONT END:

MDN web docx and geeks for geeks were referred to design the front end for good visualization.

1. ALGORITHMIC APPROACHES:

UOTECHNOLOGY for strategies for generalized search. IEEE XPLORE for analyzing constraint satisfaction algorithms .

Amilhastre J, Fargier H, Marquis P. Consistency restoration and explanations in dynamic CSPs—application to configuration. Artificial Intelligence, 2002, 135(1–2): 199–234

In our project, we have chosen Constraint Satisfaction Problem is a formalism used in artificial intelligence for solving problems where a solution is sought that satisfies a set of constraints. The CSP algorithm typically involves defining a set of variables, domains for these variables, and a set of constraints that specify the allowable combinations of values.

**REQUIREMENTS ENGINEERING:**

FUNCTIONAL REQUIREMENTS:

* **Dynamic Allocation**: The system must dynamically allocate students to available classrooms and benches based on real-time examination conditions, ensuring optimal seating arrangements. Dynamic allocation involves the ability to adapt seating assignments on-the-fly, accommodating last-minute changes, made by administrators.
* **Good Visualisation:**. Good visualization is essential for facilitating seamless interaction with the system, allowing administrators to interpret, analyse, and make informed decisions regarding seating arrangements.
* **Optimised allocation:** The system must employ advanced optimization algorithms to intelligently allocate students to available classrooms constraints. Optimized allocation involves utilizing algorithms that maximize room capacity while considering factors such as fairness, special needs, and real-time adjustments.

NON-FUNCTIONAL REQUIREMENTS:

* **Performance:** The application should load quickly and run smoothly. The application should not freeze or crash during the generation .
* **Usability:** The application should be easy to utilise and play for users. The application should provide clear instructions on how to give valid inputs.
* **Accessibility:** The application should be accessible to the faculty and students .and should include features such as adjustable font size and contrast.
* **Security:** The application should be secure and protect the privacy of the users.

**Requirements Engineering:**

**Client Details:**

**Name :**

**Designation :**

**Email ID :**

**RISK MANAGEMENT:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **RISK ID** | **DESCRIPTION OF PROBLEM** | **PROBABILITY** | **IMPACT** | **MITIGATION** |
| R1 | Inadequate user testing leading to poor quality | High | High | Conduct through user testing at different stages of development |
| R2 | Technical issues causing errors | Medium | Medium | Implement rigorous testing procedures |
| R3 | Insufficient server capacity | Low | High | Use scalable and reliable server infrastructure |
| R4 | Inadequate documentation | Medium |  | Develop comprehensive user guidelines and provide clear instructions |
| R5 | Intellectual property infringement | Low | Medium | Perform through research to obtain originality |
| R6 | Lack of user engagement and interest | High | Low | Create an appealing user interface |
| R7 | Data breaches | Medium | Medium | Test applications on various platforms |

**DEPLOYMENT:**

At the completion stage of our project, we were able to create a web application hosted locally that can display the word grid.

1. HOMEPAGE:
2. LOGIN
3. IF ACCOUNT DOESN’T EXIST, SIGNUP:
4. INPUT PAGE:
5. LAYOUT OF SEATINGARRANGEMENT OUTPUT PAGE:

**TESTCASES**:

|  |  |  |  |
| --- | --- | --- | --- |
| **S.NO** | **TESTCASE** | **TESETCASE DESCRIPTION** | **ACTUAL RESULTS** |
| 1. | Testing of login based on database | The users should be able to login with their credentials successfully. | Login successful. |
| 2. | Testing the successful creation of user in the database | If new user, the user must be able to sign up with his details and this should be updated in the database correspondingly. | New user has been created successfully. |
| 3. | Generation of input page | The generated page should contain the inputs as the room number,department1,department 2 where the students belong to. | The input spaces are generated . |
| 4. | Generation of layout of the seat allocation | The seating layout is displayed | Depending on the department id of the students. |
| 5. | Testing the seating abided with the constraint | Testing if the students are arranged whether the adjacent ones are of same department or not. | The student seat are satisfying the constraints. |
| 7. | Testing if seat allocation is done if any invalid output is given. | Testing if seat allocation does not happen whether inputs are missed and if input are given in a wrong way. | If the input is not given or invalid this layout is not generated but redirects into the generate page. |

**CONCLUSION:**

In conclusion, the development of an intelligent seating arrangement system for college-level examinations represents a significant step forward in addressing the existing challenges associated with manual processes. The traditional methods, marked by inefficiency, lack of adaptability, and potential biases, underscore the pressing need for a more sophisticated solution. The proposed project aims to bridge this gap by integrating optimization algorithms into the seating arrangement process, ensuring fairness, efficiency, and student satisfaction.

By leveraging cutting-edge algorithms, this system endeavors to optimize seating allocation within the constraints of available classrooms and benches. The emphasis on fairness is critical to eliminating biases and providing an equitable examination environment for all students. Moreover, the system's adaptability ensures that it can seamlessly accommodate changing circumstances and adhere to capacity constraints.A comprehensive solution is envisioned, one that not only automates the seating arrangement process but also enhances the examination experience in college settings. In essence, the intelligent seating arrangement system proposed by this project is poised to revolutionize the way examinations are conducted in colleges, ushering in a new era of fairness, efficiency, and adaptability. By embracing technological advancements, this solution aspires to create an environment that fosters an optimal examination experience for both administrators and students alike.

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6. Youtube
7. StackOverflow
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