iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** V **Month of publication:** May 2024

DOI: https://doi.org/10.22214/ijraset.2024.61269

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue V May 2024- Available at www.ijraset.com

The Benefits of N Queen Visualizer for Education

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Abstract: ***The N-Queen Visualizer is a valuable tool for learning computer science. It helps engagingly explain complex engineering concepts by using animation. Users can customize the size of the chessboard and the speed of the visualization to suit their learning needs. They can choose to watch the animation automatically or step through it at their own pace. This allows them to actively engage with the material and gain a deeper understanding of the problem-solving process.***
Keywords: Data Structure and Algorithm, Algorithm Visualization, Genetic Algorithm, N-Queen Visualizer, HCI, N-Queen Problem.

I. INTRODUCTION

The N-Queen Visualizer provides an interactive interface that uses code to display visual representations of the N-Queen troubleshooting process. By incorporating visualization, this tool greatly simplifies the process of understanding the complex mechanisms of solving the N-Queen puzzle. Users are shown step-by-step dynamic graphics of algorithms, providing a clear and intuitive insight into their operation With the N-Queen Visualizer, users can actively participate in the algorithm by adjusting parameters such as chessboard size, scanning speed, etc. This program allows students to adapt their experience to their preferred pace, facilitating a deeper understanding of problem-solving techniques. The N-Queen Visualizer is a new web-based learning tool designed to facilitate the understanding of the N-Queen problem-solving process. This interactive platform harnesses the power of visualization to simplify complex concepts, making them accessible to students of all levels. Through dynamic displays directly integrated into the web interface, users can verify the inner workings of these algorithms and gain insight into their processes and performance. The versatility of the N-Queen Visualizer makes it suitable for individual learning and classroom instruction. Students can use the tool to enhance their understanding of algorithmic principles, while teachers can incorporate it into their course materials to enhance the learning experience for their students. Our N-Queen Visualizer provides a versatile learning experience that can stand alone and complement existing educational materials. Although N-Queen is a powerful standalone tool for understanding complex problem-solving systems, its true value shines through when applied to computer science N-Queen Visualizer with use gives students the freedom to explore and consolidate their understanding of these key concepts at their own pace.

This not only reduces the burden on teachers to focus on advanced topics but also stimulates students' curiosity and enthusiasm for learning. With the N-Queen Visualizer, students are empowered to take control of their educational journey, providing deep immersion and mastery of N-Queen algorithms.

II. LITERATURE SURVEY

The interactive platform, N Queen Visualizer, has gained significant attention in the computer science education field as it facilitates the learning process by visually representing algorithms Some examples of relevant literature are given below:

A. Historical Perspective

The N-Queens problem was first formally defined in the mid-19th century, and since then, it has attracted the attention of mathematicians and computer scientists alike. Historically, researchers tackled the problem through pen-and-paper methods and manually created solutions for small values of N. These early explorations laid the foundation for algorithmic approaches and computational solutions that would emerge in the later decades.

B. Educational Visualizers

Universities and educational institutions have recognized the value of visual representations in teaching complex problem-solving and engaging students in hands-on learning. These visualizers often allow users to interact with the chessboard, experiment with different N values, and observe how algorithms approach the problem.

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C. Algorithm Visualization

Algorithm visualization plays a crucial role in understanding the strategies and techniques employed to solve the N-Queens problem. These visualizations help illustrate the step-by-step process of finding valid solutions, highlighting the decision points and the search space exploration.

D. Human-Computer Interaction (HCI)

The HCI community has explored N-Queens visualizers from the perspective of user interaction and usability. Studies have investigated how users engage with these visualizers and how they affect problem-solving strategies.

III. PROPOSED METHODOLOGY

The proposed approach for designing a framework to illustrate the functionality of an algorithm can be summarized as follows:

1) A user-friendly web interface that enables users enter the value of n which can be of their own choice.
2) Working of an algorithm will be seen with the help of animation.
3) Offer an option to visualize the solution or backtrack if no solution exists.
4) Provide feedback to users when they make an invalid value of n.
5) Display messages indicating the number of possible arrangements.

IV. MODULE DESCRIPTION

The visualization module is designed to teach data structures and algorithms using interactive visualizations. Its goal is to enhance the learning and teaching of algorithms by:

1) Providing interactive visualizations instead of static ones.
2) Allowing students to use their own examples, which can lead to a better understanding of algorithms.
3) Enhancing understanding of how algorithms work, which can enable teachers to focus more on advanced applications.
4) Offering a unified interface for visualizing the N Queen problem which provides students with a single platform for their learning needs.

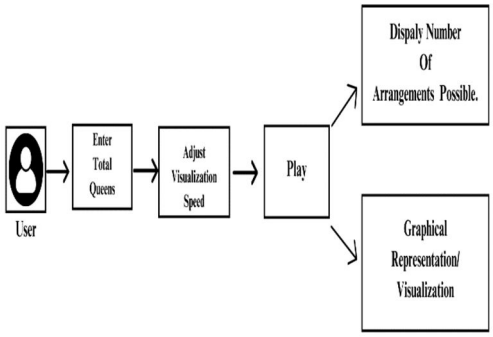


Figure 1:Block Diagram of Model

A. Layer 1

Layer 1 allows the user to select their preferred queen size for visualization and set visualization speed. As depicted in the figure, a student can effortlessly comprehend the functioning of n queen problem through engaging animations.

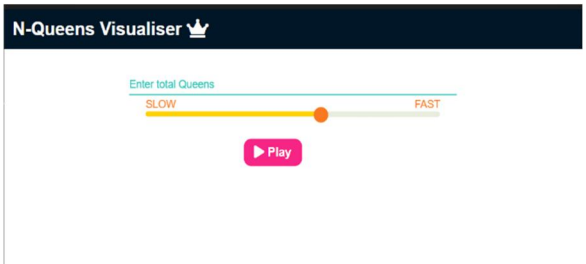


Figure 2: Home Page of Website

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue V May 2024- Available at www.ijraset.com

B. Layer 2

Once the user has entered the values, and the values are valid then the visualization process begins . In case of incorrect values, such as an overly large one, the system provides immediate feedback to guide users towards valid inputs, ensuring a smooth and effective learning experience.



Figure 3: Invalid Input Feedback

C. Layer 3

In case of correct values visualization process begins and allowing the student to interact with and visualize the n queen problem in action.

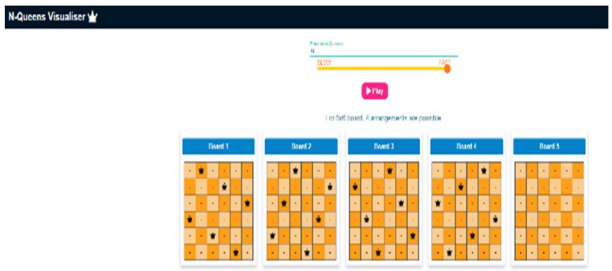


Figure 4: N queen problem visualization

V. IMPLEMENTATION

N Queen Visualizer is a project that offers an interactive platform for teaching and learning through simulation. The system uses only three coding languages: HTML5, CSS, and React JS, making it more efficient and user-friendly for learners. HTML5 and CSS create and update the user interface, while React JS runs the algorithms and updates the interface accordingly. The communication between HTML5 and React JS is bidirectional, allowing for seamless integration and updating of the interface. The modified React JS code has a more object-oriented focus, enabling better function calls for each button.

The interaction on the back end of the Visualizer system is simplified as here users can select the size of the chessboard and visualize the placement of queens using the backtracking algorithm. This simplification makes it easy for learners to visualize and observe how the N queen problem works.

The main purpose of developing an N-Queen Visualizer project using HTML, CSS, and JavaScript is to provide a user-friendly platform for learners to explore and understand the N-Queen problem-solving algorithms. Through interactive visualization, users can dynamically observe how different algorithms approach the challenge of placing N queens on an N×N chessboard without any queen threatening another. By enabling users to adjust parameters such as board size and algorithm selection, the visualizer facilitates hands-on learning, deepening their understanding of algorithmic principles and problem-solving strategies.

VI. RESULT

The N Queen Visualizer website provides a platform for learners to interactively explore the n-queen problem. The n-queen problem is a classic computer science problem that involves placing n chess queens on an n × n chessboard so that no two queens threaten each other. Using the N Queen Visualizer website, learners can visualize the process of solving the n-queen problem. The system allows learners to select the size of the chessboard and the number of queens to be placed on the board.

Once the parameters are set, learners can run the algorithm and observe how the queens are placed on the board in a way that satisfies the problem's constraints.

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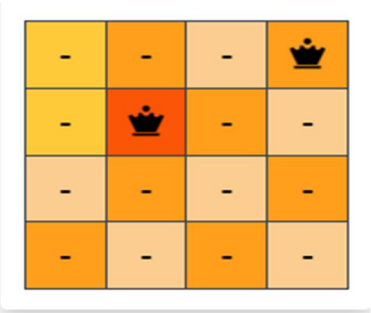


Figure 5: Showing 4x4 Grids.

As the algorithm runs, the website displays the current state of the board, with queens placed in their current positions.



Figure 6: Placing queens at different grids.

If a conflict is detected, the algorithm backtracks to the previous state and attempts to find a different solution.
By using the n-queen problem learners can gain a deeper understanding of backtracking algorithms and how they can be used to solve complex problems.
In conclusion, the n-queen problem is a classic computer science problem that can be solved using backtracking algorithms.

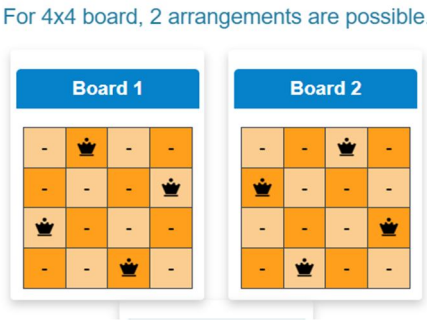


Figure 7: N-Queen Algorithm Visualization

VII. CONCLUSION AND FUTURE SCOPE

After conducting research, we found that there were no proper means for teachers to effectively convey their ideas to students in an easy-to-understand manner. To address this issue, we built an application that offers a range of benefits.
Firstly, we found that humans retain concepts better through visual learning as opposed to textual or verbal explanations. Therefore, our application includes interactive visualizations to enhance the learning experience.
Secondly, our application is user-friendly and includes various fun activities such as visualizing through mazes and patterns to engage people of all ages. Furthermore, enhancing the visualizer with advanced features such as real-time performance descriptions, interactive tutorials, etc. can greatly enhance its educational value by providing detailed information providing users with algorithm efficiency and optimization strategies to empower them to make informed decisions and solve their problem-solving skills.

Additionally, the inclusion of interactive tutorials or guided exercises can provide a structured learning experience, guide users through algorithmic problem-solving fundamentals, and foster active engagement.

In conclusion, the N Queen Visualizer project has the potential to significantly improve computer science education by promoting a deeper understanding of algorithms through interactive visualizations.

Looking ahead, the future scope of the N-Queen Visualizer project encompasses several exciting possibilities for expansion and improvement. Firstly, additional algorithms can be integrated into the visualizer, broadening the range of problem-solving techniques available for exploration. Incorporating algorithms such as simulated annealing or genetic algorithms can offer users diverse perspectives on tackling the N-Queen problem, enriching their learning journey and fostering creativity in algorithm design.

In addition, the N-Queen Visualizer project presents opportunities for collaboration and community engagement within the broader educational ecosystem. By opening up the project and inviting contributions from educators, researchers, and enthusiasts, Visualizer can evolve into a collaborative platform for sharing knowledge, resources, and best practices in algorithmic graphics and education Community driven participation will be encouraged through conferences, workshops, and hackathons vibrant academic innovations The ecosystem can be fostered, so that students of all levels and backgrounds can benefit from it.

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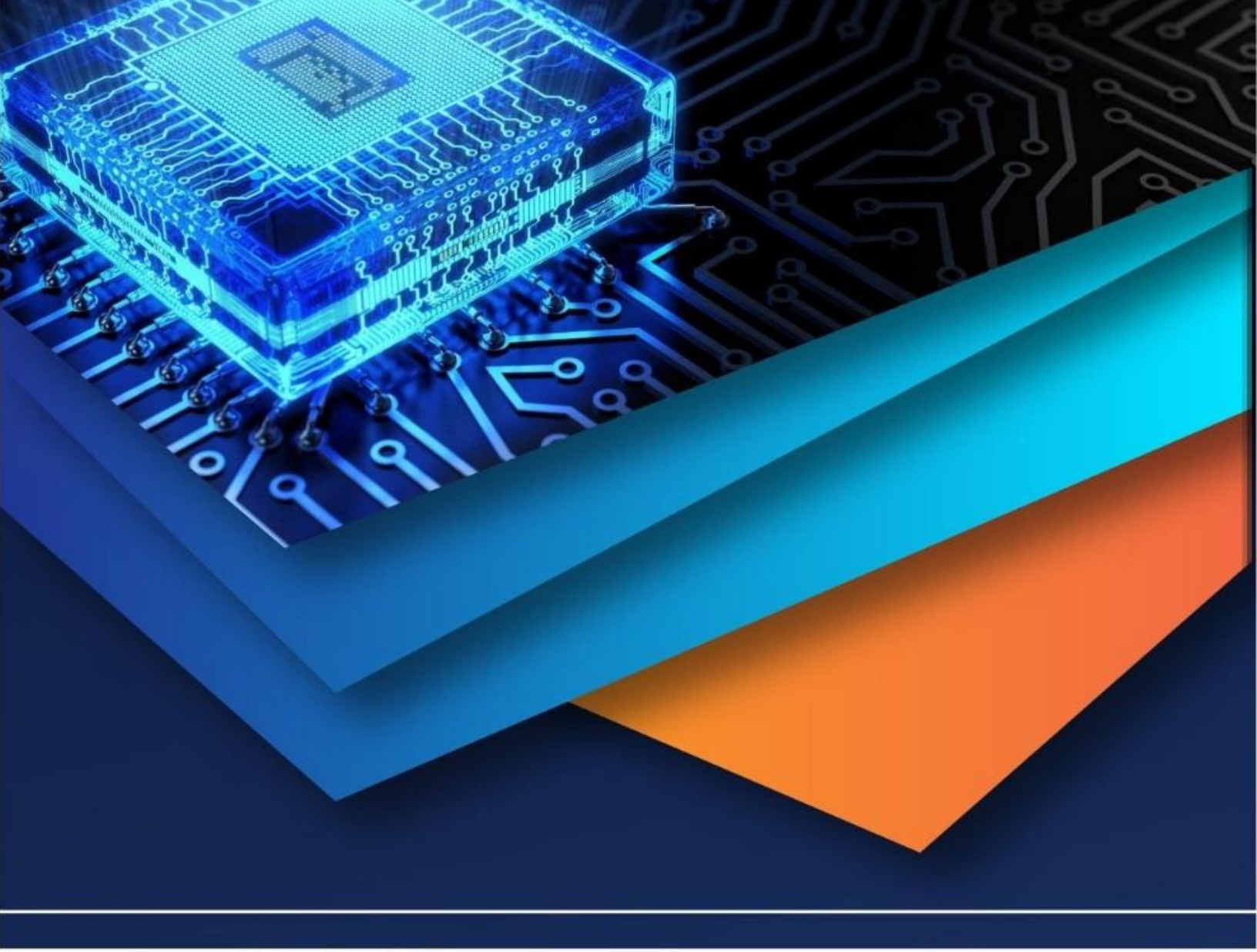
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