VIGNAN'S NIRULA
INSTITUTE OF TECHNOLOGY & SCIENCE FOR WOMEN
(Approved by AICTE, New Delhi & Affiliated to JNTU Kakinada)
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Department of Information Technology

Innovative Practice

Faculty Name : Dr. K.V.S.S.Rama Krishna , Dr.K.Venkateswara Rao
Course Name : Design and Analysis of Algorithms
Class : III B.Tech I Semester
Academic Year : 2022-2023
Title of the Topic : Quick Sort
Activity Name : Think-Pair-Share

Objective of the Activity:

The objective of the Think-Pair-Share activity is to engage students in active learning and encourage collaborative thinking about the Quick Sort algorithm. This exercise promotes problem-solving, critical thinking, and peer discussions, helping students better understand the complexities of Quick Sort, such as its partitioning mechanism, time complexity analysis, and its applications in various real-world scenarios.

Activity Procedure:

1. Preparation:

- **Objective:** Introduce students to the Quick Sort algorithm, its working principles, and the performance metrics (Time Complexity, Space Complexity).
- Provide a brief explanation of the Quick Sort algorithm, explaining key concepts like pivot selection, partitioning, and recursion.
- Prepare a set of sample unsorted arrays for students to work with.
- Prepare worksheets for students to document the steps of the algorithm, the pivot selection, the partitioned array after each step, and the final sorted array.

2. Phase 1 – Think (5-7 minutes):

- **Individual Work :**
  • Each student works individually on sorting a given array using the Quick Sort algorithm.
  • They follow the steps of Quick Sort, selecting a pivot, partitioning the array, and recursively applying the algorithm to the subarrays.
  • Students document their process in the worksheet:

    - The chosen pivot for each step.
    - The partitioned array after each pivot.
    - The final sorted array.

3. Phase 2 – Pair (10-15 minutes):

- **Collaboration:**
  • Students pair up with a partner and compare their approaches and results.
  • Discuss the pivot selection strategy (e.g., first element, last element, middle element, or random).
  • Students explain the partitioning process and discuss any differences they may have encountered in their individual sorting steps.
  • Collaboratively, the pair should discuss how different pivot choices can affect the algorithm's performance and efficiency.

4. Phase 3 – Share (10-12 minutes):

- **Class-wide Sharing:**
  • Each pair shares their experience with the class.
  • They explain how the pivot was selected and describe how the array was partitioned during each iteration.
  • The instructor leads a class discussion comparing different strategies and results, explaining how pivot selection influences Quick Sort's efficiency.
  • Students discuss the time complexity (average, best, and worst cases) and the space complexity of Quick Sort, highlighting real-world applications of the algorithm.

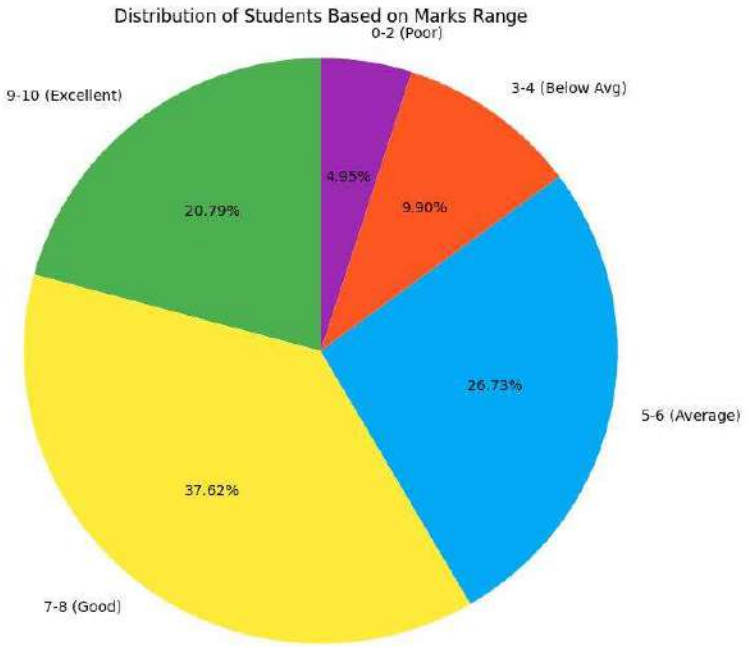
5. Wrap-Up (5 minutes):

- **Reflection:**
  • Students reflect on their learning, focusing on the effectiveness of Quick Sort in various scenarios.
  • A class discussion takes place on which sorting techniques (Quick Sort vs. other algorithms like Merge Sort, Bubble Sort, etc.) work best in different types of data and scenarios.
  • Instructor wraps up by summarizing key points: how Quick Sort is an efficient, divide-and-conquer algorithm and how different choices (like pivot strategy) can impact performance..

Screenshot of the Practice

Assessment Analysis

Marks Range	Number of Students	Percentage
9-10 (Excellent)	21	20.79%
7-8 (Good)	38	37.62%
5-6 (Average)	27	26.73%
3-4 (Below Avg)	10	9.90%
0-2 (Poor)	5	4.95%
Total	101	100%



Conclusion of Think-Pair-Share Activity

Quick Sort is an efficient, divide-and-conquer sorting algorithm with an average time complexity of O(n log n), making it fast for large datasets. While its worst-case time complexity is $O(n^2)$, this can be mitigated with optimized pivot selection methods..

Signature of the Faculty **Head of the Department**