

Object Oriented Programming

Assignment-01

Part 1: Conceptual Implementation

1. **Array Initialization:**
 - Write a function to initialize an array with random numbers between a given range.
2. **Reading and Writing Arrays to Files:**
 - Implement functions to:
 - Save an array to a file.
 - Read an array from a file.
3. **Memory Addressing:**
 - Demonstrate how array elements can be accessed using base + index arithmetic.
4. **Array Passing to Functions:**
 - Write a function to modify an array passed to it. Include a print statement to show how the array is visible at the point of declaration but not directly inside the function (use a debugger to verify).

Part 2: Problem Solving

1. **Linear Search:**
 - Implement functions for:
 - Finding the first occurrence of an element.
 - Finding the last occurrence of an element.
 - Finding the Kth occurrence of an element.
 - Finding all indices of an element.
2. **Binary Search:**
 - Implement a binary search algorithm.
 - Modify it to count the occurrences of a given number in a sorted array.
3. **Segregation:**
 - Write programs to:
 - Separate even and odd numbers in an array.
 - Separate 0s and 1s in a binary array.
 - Separate prime and composite numbers.

Part 3: Sorting and Analysis

1. **Sorting Algorithms:**
 - Implement the following sorting algorithms:
 - Bubble Sort
 - Insertion Sort
 - Selection Sort
 - Extend one sorting algorithm to sort only a specific range within the array or by gaps.
2. **Frequency Analysis:**
 - Find the mean, mode, and median of an array.
 - Sort an array based on the frequency of elements (highest frequency first).
3. **Distinct and Unique Elements:**
 - Write functions to:
 - Find all distinct elements in an array.

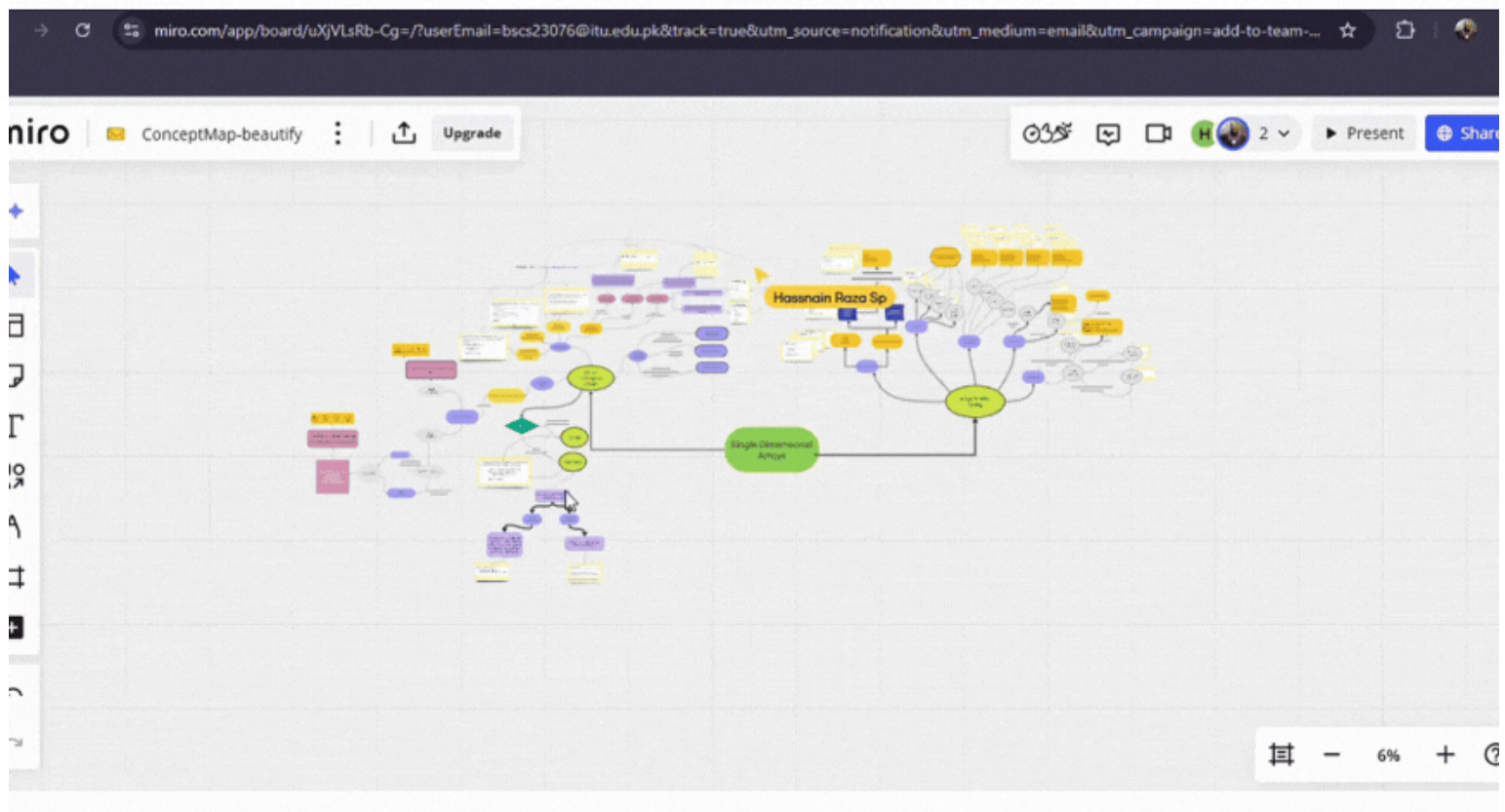
- Find all unique elements (elements that appear exactly once).

Part 4: Concept Map

Create a concept map of **single dimensional array** illustrating all the major concepts and problem solving related to the single dimensional array.

INSTRUCTIONS:

- Make a group of two members for task 4 and task 5.
- Make a concept map on miro.
- You have to submit the concept map in **pdf** format.
- Use your **itu email** to make an account on the miro
- You can find some inspiration for the concept map from the following link:
https://miro.com/app/board/uXjVLxehLPA=?share_link_id=165701477257



Part 5: Find missing links in the Concept Map

- Find all the missing concepts and the linkages connection string attached to that missing links in Conceptual Part of Array (The left hand side).
- Now find the missing concepts in problems solving approaches where an essential problem solving generalized technique is missing.

Good luck

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Happy Coding