Lesson 04 Demo 08

Implementing Radix Sort Algorithm

Objective: To demonstrate the radix sort algorithm and explain its time and space complexity using JavaScript

Tools required: Visual Studio Code and Node.js

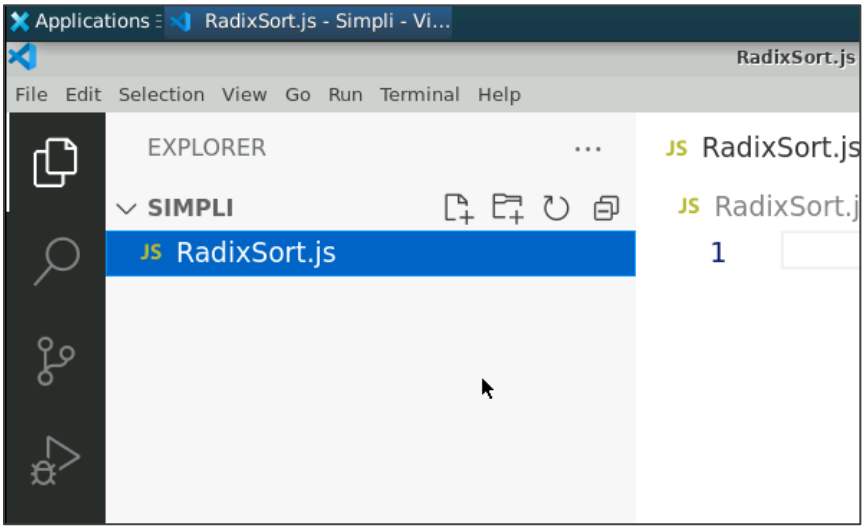
Prerequisites: Basic understanding of arrays and loops in JavaScript

Steps to be followed:

1. Create and execute the JS file

Step 1: Create and execute the JS file

1.1 Open the Visual Studio Code editor and create a JavaScript file named **RadixSort.js**



1.2 Write the code given below in the **RadixSort.js** file:

```
function radixSort(arr) {
  // Function to get the maximum value in the array
  const getMax = (arr) => {
    let max = 0;
    for (const num of arr) {
      if (num > max) max = num;
    }
    return max;
  };

  // Function to perform counting sort on the array based on a specific digit (exp)
  const numberCountSort = (arr, exp) => {
    const output = new Array(arr.length);
    const count = new Array(10).fill(0);

    // Count occurrences of digits
    for (let i = 0; i < arr.length; i++) {
      count[Math.floor(arr[i] / exp) % 10]++;
    }

    // Change count[i] so it contains the actual position of this digit in output[]
    for (let i = 1; i < 10; i++) {
      count[i] += count[i - 1];
    }

    // Build the output array
    for (let i = arr.length - 1; i >= 0; i--) {
      output[count[Math.floor(arr[i] / exp) % 10] - 1] = arr[i];
      count[Math.floor(arr[i] / exp) % 10]--;
    }

    // Copy the output array to arr[], so that arr[] now contains sorted numbers
    for (let i = 0; i < arr.length; i++) {
      arr[i] = output[i];
    }
  };

  // Get the maximum value in the array
  const max = getMax(arr);
```

```
  // Measure the execution time
  console.time('radixSort');

  // Do counting sort for every digit (exp)
  for (let exp = 1; Math.floor(max / exp) > 0; exp *= 10) {
    numberCountSort(arr, exp);
  }

  // Measure and log the execution time
  console.timeEnd('radixSort');
}

// Example usage
const array = [170, 45, 75, 90, 802, 24, 2, 66];

// Call radixSort function
radixSort(array);

// Log the sorted array
console.log(array);
```

```
function radixSort(arr) {
    // Function to get the maximum value in the array
    const getMax = (arr) => {
        let max = 0;
        for (const num of arr) {
            if (num > max) max = num;
        }
        return max;
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    // Function to perform counting sort on the array based on a specific digit (exp)
    const numberCountSort = (arr, exp) => {
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        for (let i = arr.length - 1; i >= 0; i--) {
            output[count[Math.floor(arr[i] / exp) % 10] - 1] = arr[i];
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        // Copy the output array to arr[], so that arr[] now contains sorted numbers
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    // Get the maximum value in the array
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    console.time('radixSort');

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const array = [170, 45, 75, 90, 802, 24, 2, 66];

// Call radixSort function
radixSort(array);

// Log the sorted array
console.log(array);
```

1.3 Save the file and execute it in the terminal using the following command:
node RadixSort.js

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL                    bash

priyanshurajsim@ip-172-31-40-74:~/Downloads/Simpli$ ls
RadixSort.js
priyanshurajsim@ip-172-31-40-74:~/Downloads/Simpli$ node RadixSort.js
radixSort: 0.158ms
[
   2, 24,  45,  66,
  75, 90, 170, 802
]
priyanshurajsim@ip-172-31-40-74:~/Downloads/Simpli$
```

In this example, we used the radix sort algorithm in JavaScript to arrange the items in an array. It has a time complexity of O(d(n + b)) and a space complexity of O(n + b).

By following these steps, you have successfully implemented and executed the radix sort algorithm in JavaScript, including measuring its execution time.