Lesson 04 Demo 08

Implementing the Radix Sort Algorithm

Objective: To sort numeric data using the radix sort algorithm in JavaScript for processing digit-based datasets such as zip codes or invoice numbers

Tools required: Visual Studio Code and Node.js

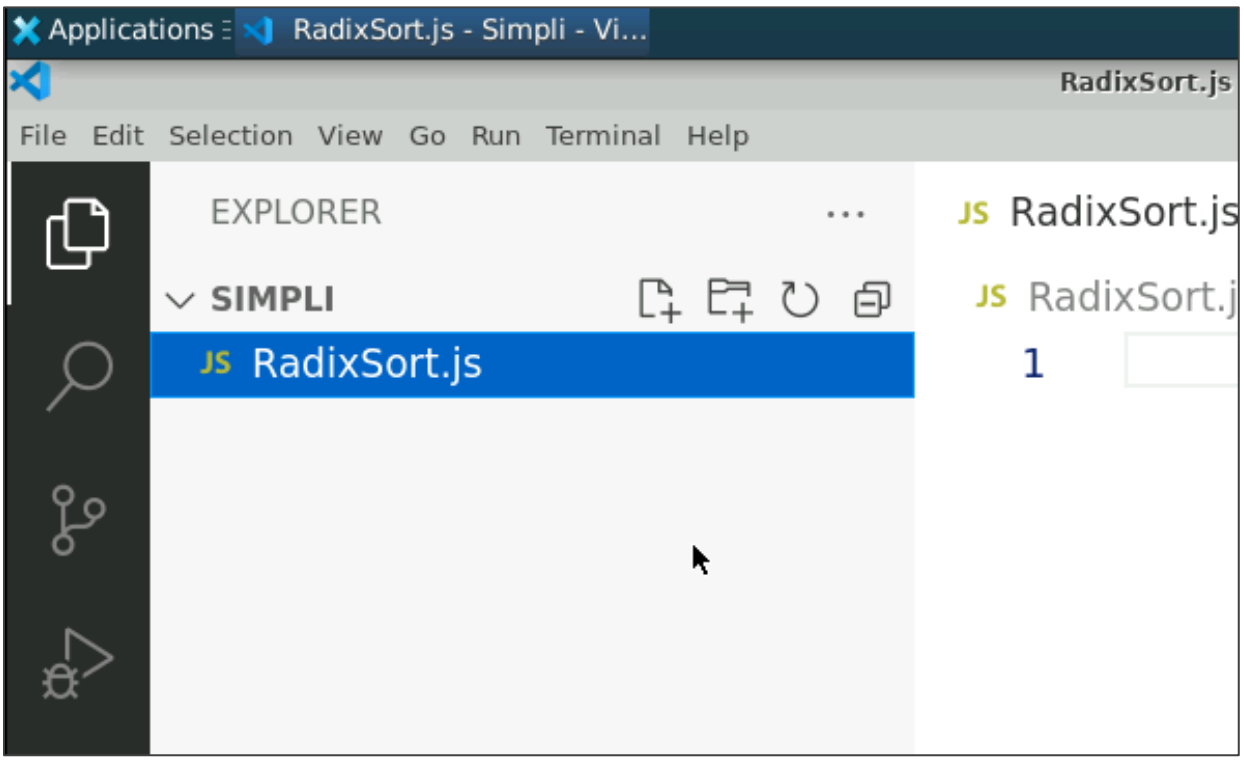
Prerequisites: A basic understanding of arrays and loops in JavaScript

Steps to be followed:

1. Create a JavaScript file and execute it

Step 1: Create a JavaScript file and execute it

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

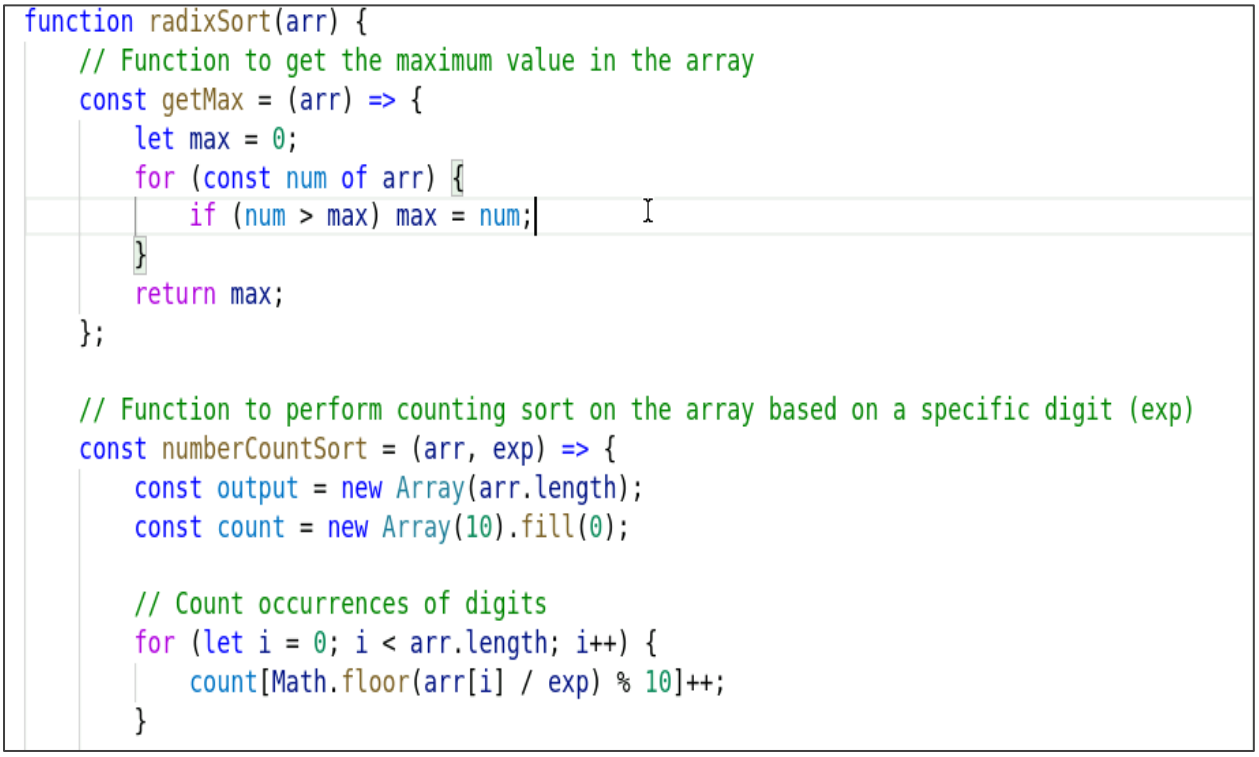


.

1.2 Add the following code to 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;
    };

    // 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]++;
        }
```

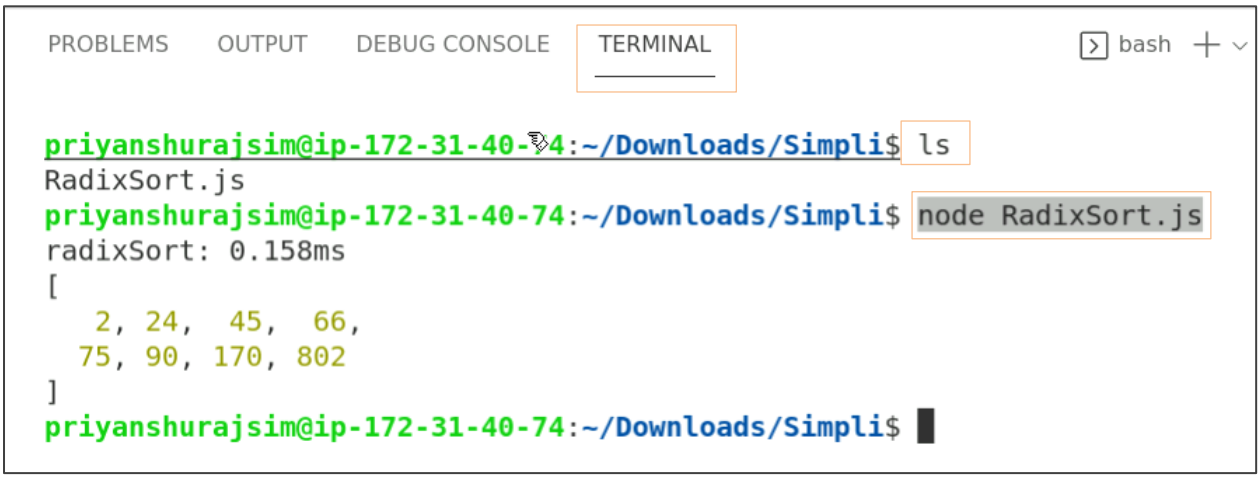
.

```
        // 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);
```

.

1.3 Press **Ctrl** + **S** to save the file and execute it in the **TERMINAL** using the following commands:
ls
node RadixSort.js



By following these steps, you have successfully implemented and executed the radix sort algorithm in JavaScript, efficiently sorting an array while analyzing its time complexity of O(d(n + b)) and space complexity of O(n + b).