DC_Expt_6

Program :

```
import java.io.*; // Importing necessary package for input handling
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// 211P030

class BullyAlgo {
  int cood, ch, crash; // Variables for coordinator, choice, and crash count
  int prc[]; // Array to represent process states (1 = alive, 0 = crashed)

  // Method to conduct an election when the coordinator crashes
  public void election(int n) throws IOException {
    BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
    System.out.println("\n The Coordinator Has Crashed"); // Indicating
coordinator failure

    int flag = 1; // Control variable for election loop

    while (flag == 1) {
      crash = 0; // Reset crash count

      // Count the number of crashed processes
      for (int i1 = 0; i1 < n; i1++)
        if (prc[i1] == 0)
          crash++;

      // If all processes are crashed, terminate election
      if (crash == n) {
        System.out.println("\n***All processes are crashed ***");
        break;
      } else {
        System.out.println("\nEnter the Initiator"); // Get initiating process
for election
        int init = Integer.parseInt(br.readLine());

        // Check if the initiator is valid (exists and is not crashed)
        if ((init < 1) || (init > n) || (prc[init - 1] == 0)) {
          System.out.println("\nInvalid Initiator");
          continue;
        }

        // Election process begins from the initiator
        for (int i1 = init - 1; i1 < n; i1++)
          System.out.println("Process " + (i1 + 1) + " called for election");

        System.out.println("");

        // Checking process status (Alive or Dead)
        for (int i1 = init - 1; i1 < n; i1++) {
          if (prc[i1] == 0)
            System.out.println("Process " + (i1 + 1) + " is Dead");
          else
            System.out.println("Process " + (i1 + 1) + " is Active");
        }
        // Identify the new coordinator (highest numbered active process)
        for (int i1 = n - 1; i1 >= 0; i1--) {
          if (prc[i1] == 1) {
            cood = (i1 + 1); // Assign highest numbered active process as
coordinator
            System.out.println("\n*** New Coordinator is " + cood + " ****");
            flag = 0; // Election process ends
            break;
          }
        }
      }
    }
  }

  // Method to handle the Bully Algorithm operations
  public void Bully() throws IOException {
    BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
    System.out.println("Moin MN (211P030)\nEnter the number of processes:");
    int n = Integer.parseInt(br.readLine());

    prc = new int[n]; // Initialize process states (Array to track which
process is alive)
    crash = 0;

    // Set all processes to active (1)
    for (int i = 0; i < n; i++)
      prc[i] = 1;

    cood = n; // Initially, the highest numbered process is the coordinator
    do {
      // Menu for user interaction
      System.out.println("\n\t 1. Crash a process");
      System.out.println("\n\t 2. Recover a process");
      System.out.println("\n\t 3. Display New Coordinator");
      System.out.println("\n\t 4. Exit");
      ch = Integer.parseInt(br.readLine()); // Taking user choice

      switch (ch) {
        case 1 -> {
          // Case to crash a process
          System.out.println("Enter a process to crash ");
          int cp = Integer.parseInt(br.readLine());
          // Validate process ID
          if ((cp > n) || (cp < 1)) {
            System.out.println("Invalid Process! Enter a valid process");
          } else if ((prc[cp - 1] == 1) && (cood != cp)) {
            // If the process is active and is not the coordinator
            prc[cp - 1] = 0; // Mark it as crashed
            System.out.println("\nProcess " + cp + " has been crashed");
          } else if ((prc[cp - 1] == 1) && (cood == cp)) {
            // If the crashed process is the coordinator, start election
            prc[cp - 1] = 0;
            election(n);
          } else {
            System.out.println("\nProcess " + cp + " is already crashed");
          }
        }
        case 2 -> {
          // Case to recover a crashed process
          System.out.println("\nCrashed Processes Are: \n");

          // Display crashed processes
          for (int i = 0; i < n; i++) {
            if (prc[i] == 0)
              System.out.println(i + 1);
            crash++;
          }
          System.out.println("Enter The Process You Want To Recover");
          int rp = Integer.parseInt(br.readLine());
          if ((rp < 1) || (rp > n)) {
            System.out.println("\nInvalid Process. Enter A Valid ID");
          } else if ((prc[rp - 1] == 0) && (rp > cood)) {
            prc[rp - 1] = 1;
            System.out.println("\nProcess " + rp + " has recovered");
            cood = rp;
            System.out.println("\nProcess " + rp + " is the new coordinator");
          } else if (crash == n) {
            // If all were crashed, the recovered process becomes coordinator
            prc[rp - 1] = 1;
            cood = rp;
            System.out.println("\nProcess " + rp + " is the new coordinator");
            crash--;
          } else if ((prc[rp - 1] == 0) && (rp < cood)) {
            // Recover process without affecting coordinator
            prc[rp - 1] = 1;
            System.out.println("\nProcess " + rp + " has recovered");
          } else {
            System.out.println("\nProcess " + rp + " is not a crashed
process");
          }
        }
        case 3 -> // Case to display the current coordinator
          System.out.println("\nCurrent Coordinator is " + cood);

        case 4 -> // Exit the program
          System.exit(0);

        default -> // Handle invalid inputs
          System.out.println("\nInvalid Entry!");
      }
    } while (ch != 4); // Loop until user chooses to exit
  }
  public static void main(String args[]) throws IOException {
    BullyAlgo ob = new BullyAlgo(); // Create an instance of the class
    ob.Bully(); // Call the Bully algorithm
  }
}
```
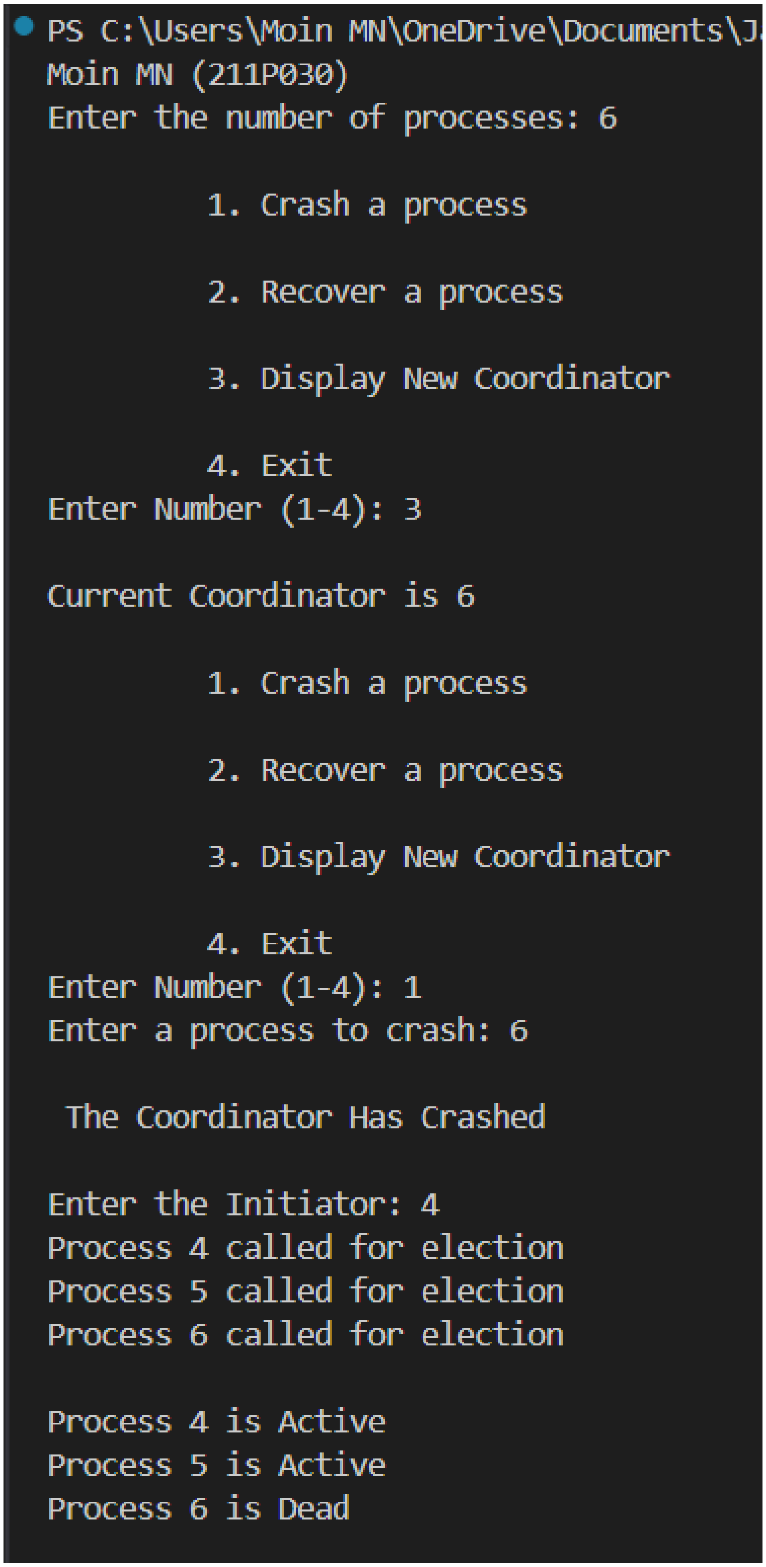
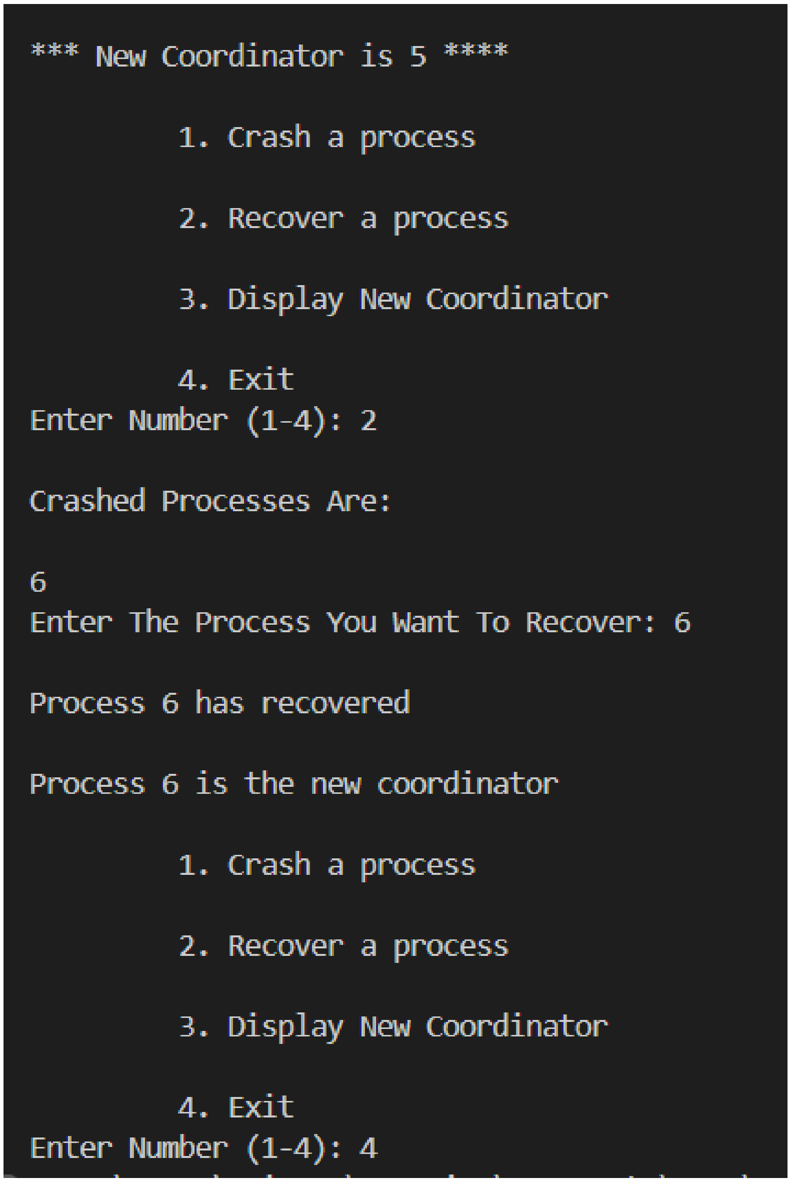

Output:



```
PS C:\Users\Moin MN\OneDrive\Documents\J
Moin MN (211P030)
Enter the number of processes: 6

         1. Crash a process

         2. Recover a process

         3. Display New Coordinator

         4. Exit
Enter Number (1-4): 3

Current Coordinator is 6

         1. Crash a process

         2. Recover a process

         3. Display New Coordinator

         4. Exit
Enter Number (1-4): 1
Enter a process to crash: 6

 The Coordinator Has Crashed

Enter the Initiator: 4
Process 4 called for election
Process 5 called for election
Process 6 called for election

Process 4 is Active
Process 5 is Active
Process 6 is Dead
```



```
*** New Coordinator is 5 ****

         1. Crash a process

         2. Recover a process

         3. Display New Coordinator

         4. Exit
Enter Number (1-4): 2

Crashed Processes Are:

6
Enter The Process You Want To Recover: 6

Process 6 has recovered

Process 6 is the new coordinator

         1. Crash a process

         2. Recover a process

         3. Display New Coordinator

         4. Exit
Enter Number (1-4): 4
```