# Effective Disk Management

## Report 3

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Improvement Phase

# A New Optimized Real-Time Scheduling Algorithm

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## Abstract

In this proposed algorithm, initially the disk head is at the disk start position and has the direction towards the final disk position. It means initial head position and direction of head is always same. First we sort all the cylinders input blocks by using any sorting algorithm. Initially the head is at position 0 and sequentially moves and reached from this block to the highest input block number, servicing all the input request blocks in front of the head immediately.

## Problem

- This algorithm assumes all the disk access calls to be registered before the actual processing starts. This doesn't provide satisfactory performance when there are prompt disk access calls.

## Proposed changes for Eliminating Problem

- The problem of prompt head service calls can be reduced by registering service calls in the queue in real-time. Those unprocessed head service calls are then sorted in the next cycle and processed according to the Algorithm logic.

## Proposed Algorithm

1. Assume a[] is an array containing track numbers and x is the position of last input block.
2. Inialize Head position is at 0. Assume h denotes the current head position.
3. Sort input blocks of cylinder number in ascending order with the help of any sorting algorithm.
4. Initially head position h is 0 then for subsequent requests the head position is the lowest value of a[].
5. for(i=0; i<=x; i++)
6. Service the input request in front of head immediately.
7. Total_head_movements = x;
8. Return total_head_movements;

● Proposed changes in algorithm

# Simulation Code (Proposed Changes)

Language Used : C

```c
#include<stdio.h>

                    // A function to implement swapping of two variables

                    void swap(int *xp, int *yp)
                    {
                      int temp = *xp;
                      *xp = *yp;
                      *yp = temp;
                    }

                    // A function to implement bubble sort
                    void bubbleSort(int arr[], int n)

                    {
                      //i and j are dummy variables

                      int i, j;
                      for (i = 0; i < n-1; i++)
                        // Last i elements are already in place
                          for (j = 0; j < n-i-1; j++)
                            if (arr[j] > arr[j+1])
                              swap(&arr[j], &arr[j+1]);
                    }

                    int main()
                    {
                      //n denotes total number of processes
                      //h denotes total head Movement
                      //i,k,j denote dummy variables
                      //x denotes extreme head position
                      //flag denotes whether you want to continue the process

                      int n,i,h=0,x,k,j;
                      char flag = 'f';

                      label:printf("\nEnter number of processes:");
                      scanf("%d",&n);
                      printf("\nEnter extreme head position:");
                      scanf("%d",&x);

                      if(flag == 'f')
                        n=n+1;

                      int a[n];

                      if(flag == 'f')
                      {
                        //for first time the head starts from 0 position
                        a[0]=0;

                        //taking input of processes track location from user

                        printf("\nEnter processes in request order");
```

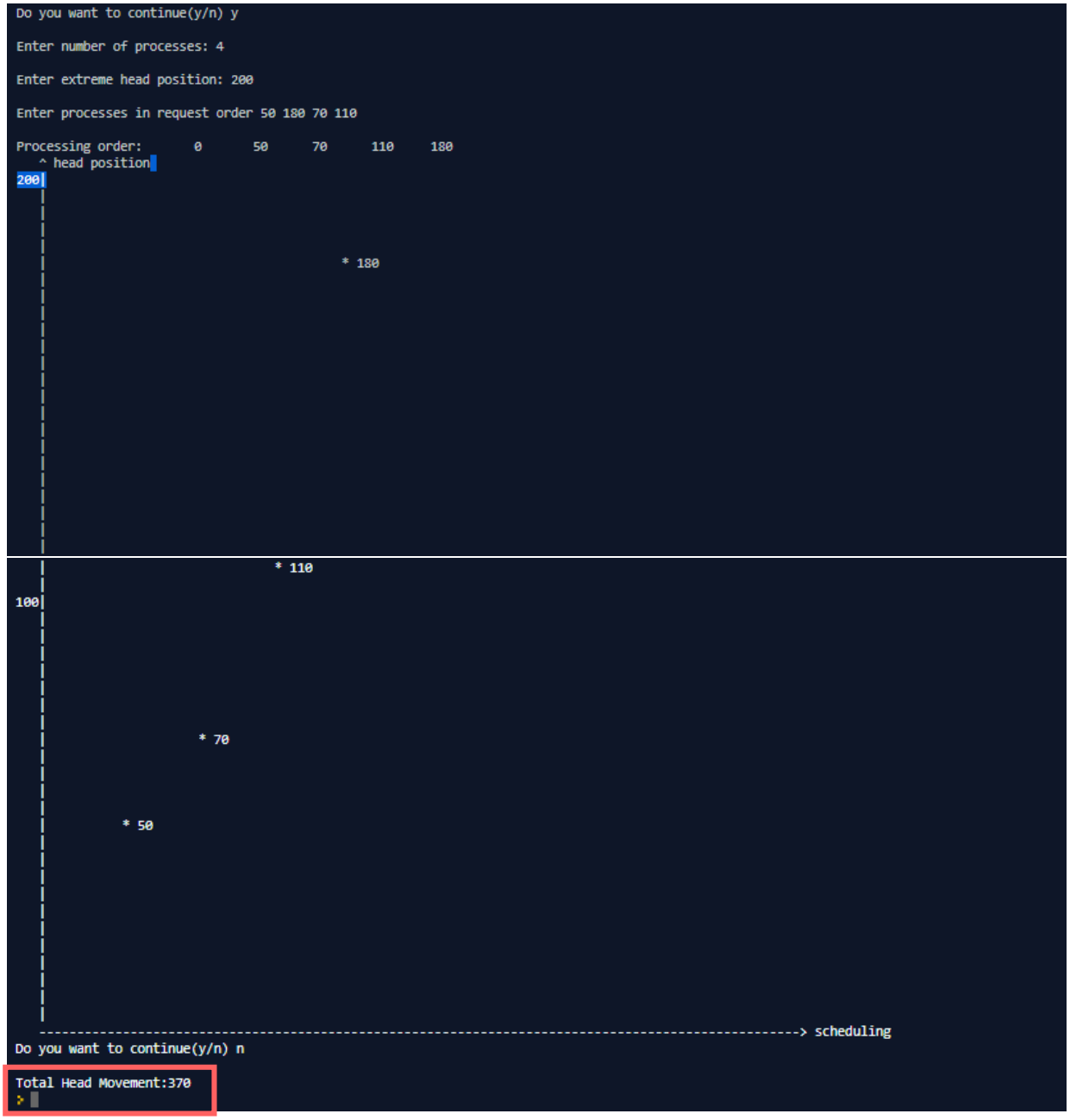
```
  for(i=1;i<n;i++)
  {
    scanf("%d",&a[i]);
  }
}
else
{
  //taking input of processes track location from user

  printf("\nEnter processes in request order");
  for(i=0;i<n;i++)
  {
    scanf("%d",&a[i]);
  }
}

//sorting and calculating total head movements

bubbleSort(a, n);

for(i=0;i<n-1;i++)
  h+=(a[i+1]-a[i]);

//output of the order in which Processing is done

printf("\nProcessing order:");
for(i=0;i<n;i++)
  printf("\t%d",a[i]);

//display the graph

printf("\n   ^ head position\n");
for(i=x/4;i>0;i--)
{
  if(i==x/4)
    printf("%d|",x);
  else if(i==x/8)
    printf("%d|",x/2);
  else
    printf("   |");
  for(j=0;j<n;j++)
  {
    if(a[j]/4==i)
    {
      for(k=0;k<j*10;k++)
      {
        printf(" ");
      }
      printf("* %d",a[j]);
    }
  }
  printf("\n");
}
printf("   ");
for(i=0;i<x/2;i++)
{
  printf("-");
}
printf("> scheduling");
```

```
  printf("\nDo you want to continue(y/n)");
  scanf(" %c",&flag);
  if(flag == 'y')
    goto label;

  printf("\nTotal Head Movement:%d\n",h);

  return 0;
}
```

# Output

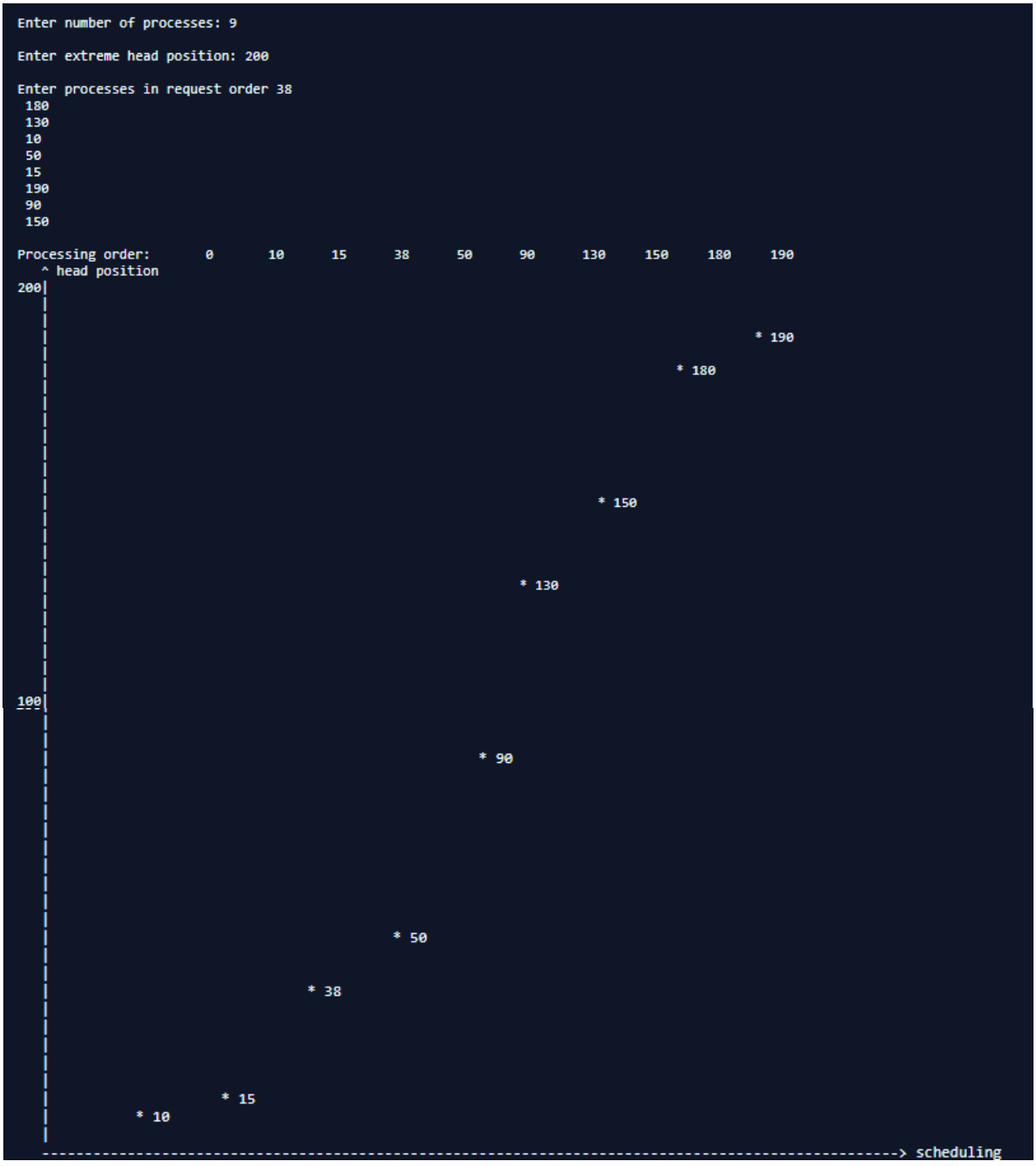
## Old Logic

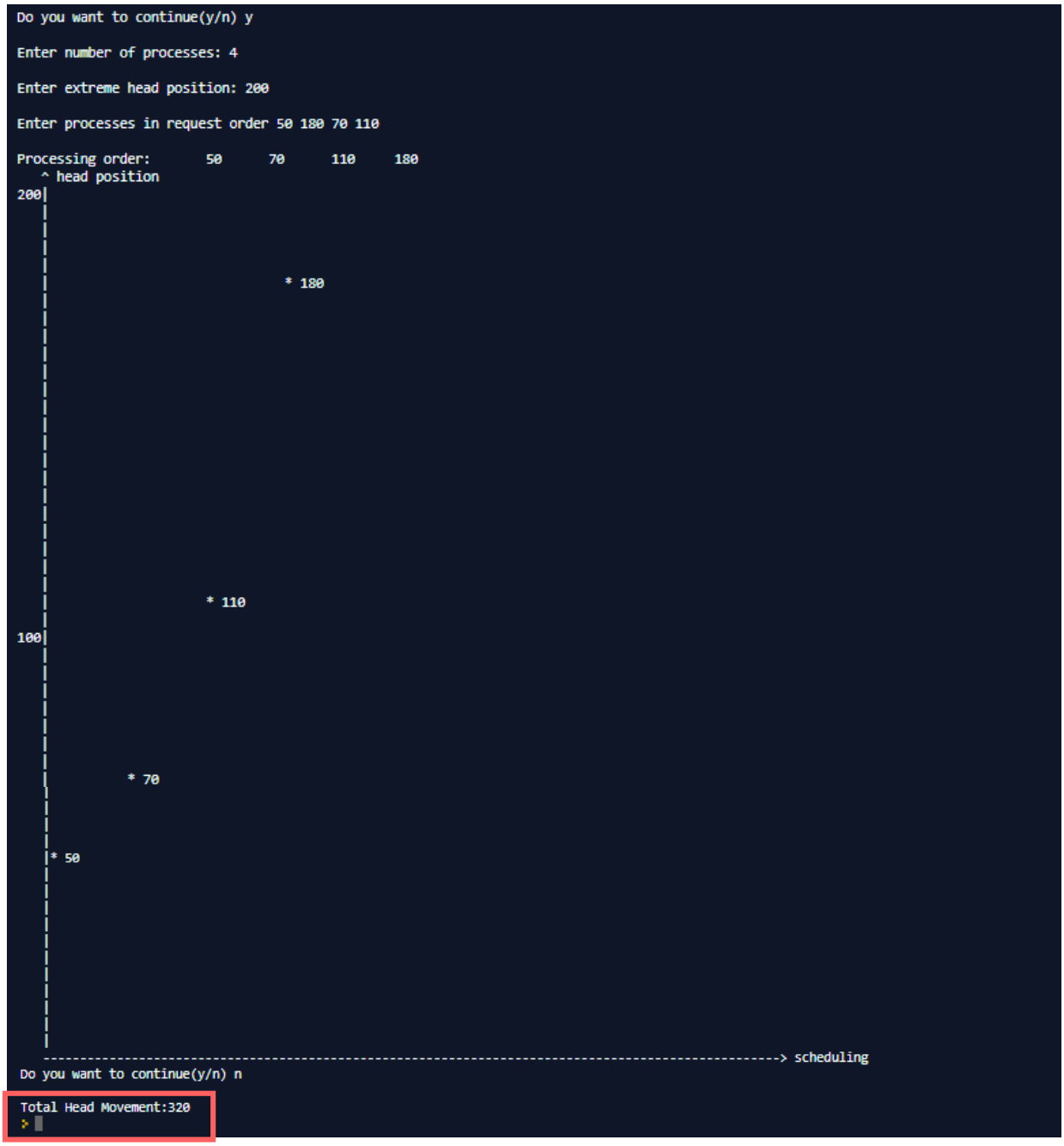
```
Enter number of processes: 9

Enter extreme head position: 200

Enter processes in request order 38
 180
 130
 10
 50
 15
 190
 90
 150

Processing order:       0       10      15      38      50      90      130     150     180     190
   ^ head position
200|
   |
   |
   |                                                                                    * 190
   |
   |                                                                            * 180
   |
   |
   |
   |
   |
   |
   |                                                                    * 150
   |
   |
   |
   |                                                          * 130
   |
   |
   |
   |
   |
100|
   |
   |
   |                                                 * 90
   |
   |
   |
   |
   |
   |
   |
   |                                        * 50
   |
   |
   |                                * 38
   |
   |
   |
   |
   |
   |                     * 15
   |          * 10
   |
   ----------------------------------------------------------------------------------------------------> scheduling
```




Total Head Movement : 370

# Proposed Logic






Total Head Movement : 320

## Conclusion

In this paper, a new real-time optimized disk scheduling has been implemented which imposes almost no performance penalty over the non-real time optimal schedulers, when have sufficient slack time. With the help of our simulation and comparison of this proposed algorithm with existing algorithms, it is clear that the proposed algorithm reduces the total head movements. In this algorithm, sometimes the number of head movements is equal to SSTF or LOOK scheduling but it occurs very rarely. Worst case occurs when all the input blocks are concentrated near the extreme position or at the extreme position.

In this paper a lot of efforts have been done to improve the performance of disk I/O access, even there are tremendous scope for the improvement of disk I/O access.

The problem of prompt head service-calls and unnecessary head movement after initial processing was removed by our proposed changes by registering service calls in the queue in real time. Those head service calls are sorted in the next cycle and processed according to the Algorithm logic.

## References


- http://research.ijcaonline.org/volume93/number18/pxc3896046.pdf