LAPORAN PRAKTIKUM

ANALISIS ALGORITMA

Disusun Oleh:

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UNIVERSITAS PADJADJARAN

2020

Studi Kasus 4

$$T(n) = \{\Theta(1)\ T(n-1) + \Theta(n)$$

$T(n) = cn + cn-c +cn-2c + ... + 2c +c <= 2cn^2 + cn^2$

$= c((n-1)(n-2)/2) + c<= 2cn^2 + cn^2$

$= c((n^2-3n+2)/2) + c<= 2cn^2 + cn^2$

$= c(n^2/2)-c(3n/2)+2c <= 2cn^2 + cn^2$

$=O(n^2)$

$T(n) = cn + cn-c +cn-2c + ... + 2c +c <= 2cn^2 + cn^2$

$= c((n-1)(n-2)/2) + c<= 2cn^2 + cn^2$

$= c((n^2-3n+2)/2) + c<= 2cn^2 + cn^2$

$= c(n^2/2)-c(3n/2)+2c <= 2cn^2 + cn^2$

$= \Omega\ (n^2)$

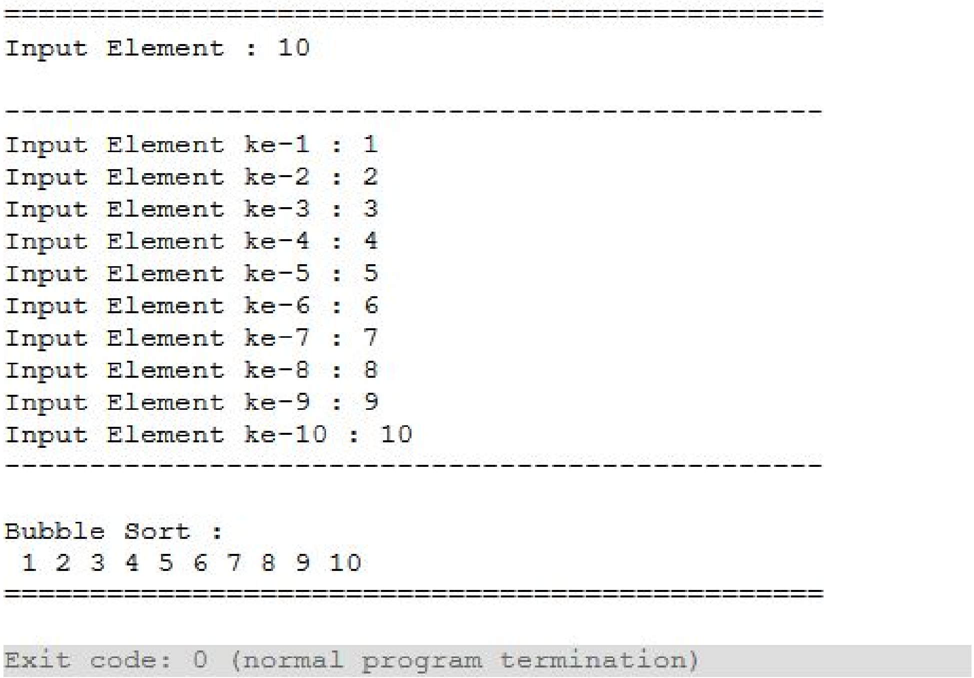
$T(n) = cn^2 + cn^2$

$= \Theta(n^2)$

Source Code:

```
/*
Nama        : Natasya Rizky Maharani
NPM         : 140810180004
Kelas       : B
Deskripsi   : Program ini menampilkan program Bubblesort
*/

#include <iostream>

using namespace std;

   int main(){
   int arr[100],n,temp;
   cout << "\n============================================"<<endl;
   cout<<"Input Element : ";cin>>n;
   cout << "\n------------------------------------------" << endl;

   for(int i=0;i<n;++i){
     cout<<"Input Element ke-"<<i+1<<" : ";cin>>arr[i];
   }

   for(int i=1;i<n;i++){
     for(int j=0;j<(n-1);j++){
               if(arr[j]>arr[j+1]){
                       temp=arr[j];
                       arr[j]=arr[j+1];
                       arr[j+1]=temp;
               }
     }
   }
   cout << "-----------------------------------------" << endl;
   cout<<"\nBubble Sort : "<<endl;
   for(int i=0;i<n;i++){
     cout<<" "<<arr[i];
```

```
    }
    cout << "\n========================================"<<endl;
}
```

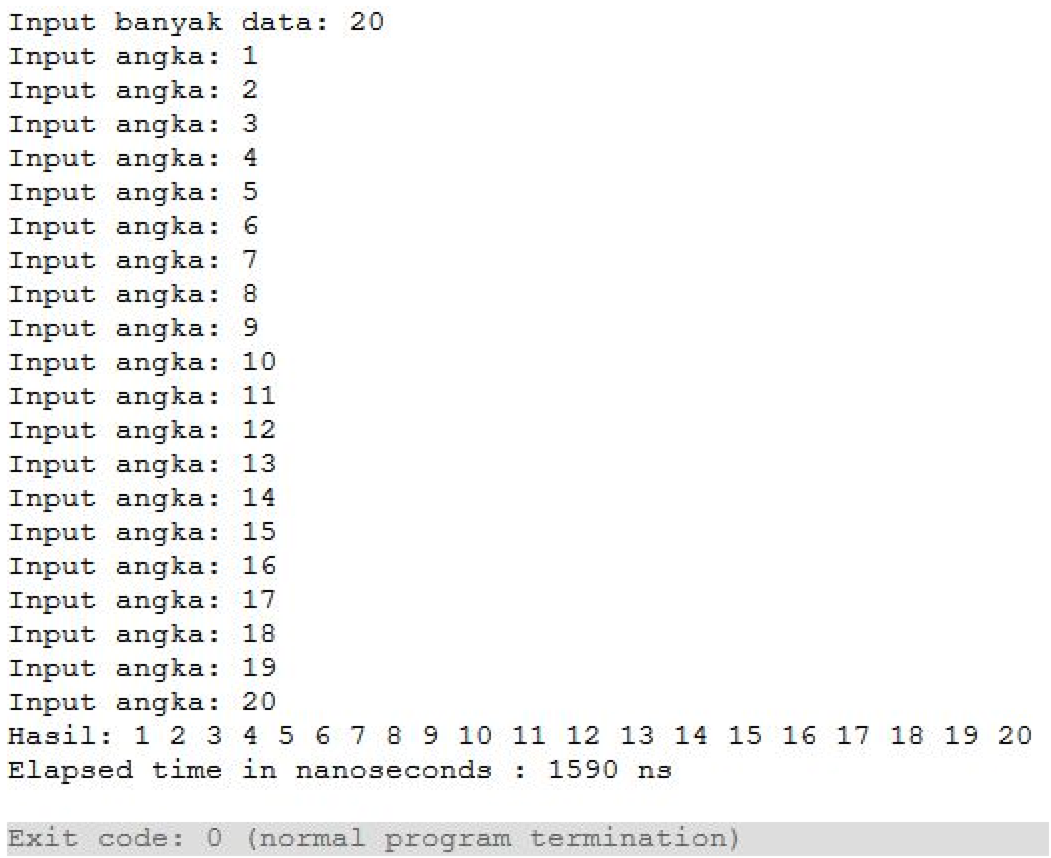


```
================================================
Input Element : 10

------------------------------------------------
Input Element ke-1 : 1
Input Element ke-2 : 2
Input Element ke-3 : 3
Input Element ke-4 : 4
Input Element ke-5 : 5
Input Element ke-6 : 6
Input Element ke-7 : 7
Input Element ke-8 : 8
Input Element ke-9 : 9
Input Element ke-10 : 10
------------------------------------------------

Bubble Sort :
 1 2 3 4 5 6 7 8 9 10
================================================

Exit code: 0 (normal program termination)
```

Studi Kasus 1

```
/*
Nama        : Natasya Rizky Maharani
NPM         : 140810180004
Kelas       : B
Deskripsi   : Program ini menampilkan program Mergesort
*/


#include <iostream>
#include <chrono>
using namespace std;

void satu(int* in, int p, int q,int r){
    int n1 = q-p+1;
    int n2 = r-q;
    int L[n1+1];
    int R[n2+1];
    for (int i=1; i<=n1; i++){
    L[i-1] = in[(p-1)+i-1];
    }

    for (int j=1; j<=n2; j++){
    R[j-1] = in[(q-1)+j];
    }

    int i=0;
    int j=0;
    L[n1]=2147483647;
    R[n2]=2147483647;

    for (int k=(p-1); k<r; k++){
    if(L[i]<=R[j]){
            in[k]=L[i];
            i = i+1;
    }
    else{
            in[k]=R[j];
            j = j+1;
    }
    }
}

void msort(int* in, int p, int r){
    int q;
    if(p<r){
    q = (p+r)/2;
    msort(in, p, q);
    msort(in, q+1, r);

    satu(in, p, q, r);
    }
}
```

```
void input(int* a, int& n){
    cout << "Input banyak data: "; cin >> n;
    for (int i=0; i<n; i++){
    cout << "Input angka: "; cin >> a[i];
    }
}

int main(){
    int in[100];
    int n;
    input(in,n);
    auto start = chrono::steady_clock::now();
    msort(in,1,n);
    auto end = chrono::steady_clock::now();
    cout << "Hasil: ";
    for(int i=0; i<n; i++){
    cout << in[i] << " ";
    }

    cout<<endl;
    cout << "Elapsed time in nanoseconds : "
     << chrono::duration_cast<chrono::nanoseconds>(end - start).count()
     << " ns" << endl;

    return 0;
}
```



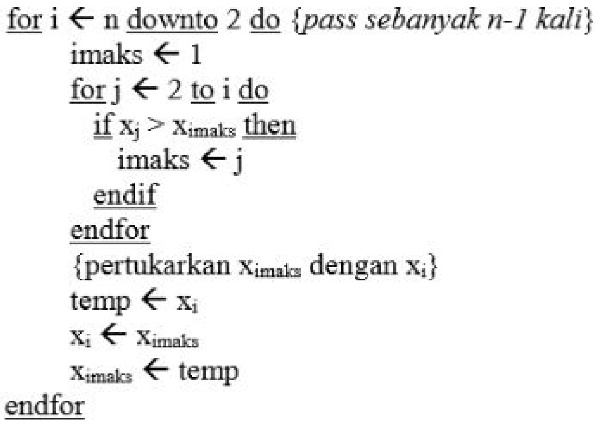
```
Input banyak data: 20
Input angka: 1
Input angka: 2
Input angka: 3
Input angka: 4
Input angka: 5
Input angka: 6
Input angka: 7
Input angka: 8
Input angka: 9
Input angka: 10
Input angka: 11
Input angka: 12
Input angka: 13
Input angka: 14
Input angka: 15
Input angka: 16
Input angka: 17
Input angka: 18
Input angka: 19
Input angka: 20
Hasil: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Elapsed time in nanoseconds : 1590 ns

Exit code: 0 (normal program termination)
```

Kecepatan computer pada 20 inputan data melalui program ada 3000 ns

Tapi jika menggunakan rumus O(n lg n). T(26)

Studi Kasus 2

Pseudocode:



```
for i ← n downto 2 do {pass sebanyak n-1 kali}
    imaks ← 1
    for j ← 2 to i do
      if $x_j > x_{imaks}$ then
        imaks ← j
      endif
    endfor
    {pertukarkan $x_{imaks}$ dengan $x_i$}
    temp ← $x_i$
    $x_i$ ← $x_{imaks}$
    $x_{imaks}$ ← temp
endfor
```

Subproblem = 1

Masalah setiap subproblem = n-1

Waktu proses pembagian = n

Waktu proses penggabungan = n

T(n) = cn + cn-c +cn-2c + ... + 2c +cn

= c((n-1)(n-2)/2) + cn

= c((n^2-3n+2)/2) + cn

= c(n^2/2)-(3n/2)+1 + cn

=O(n^2)

T(n) = cn + cn-c +cn-2c + ... + 2c +cn

= c((n-1)(n-2)/2) + cn

= c((n^2-3n+2)/2) + cn

= c(n^2/2)-(3n/2)+1 + cn

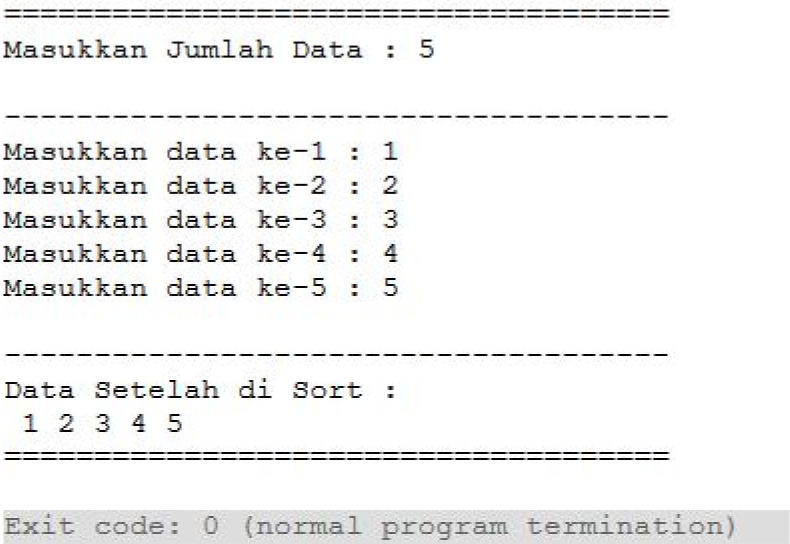
= Ω (n^2)

T(n) = cn^2

= Θ(n^2)

SourceCode:

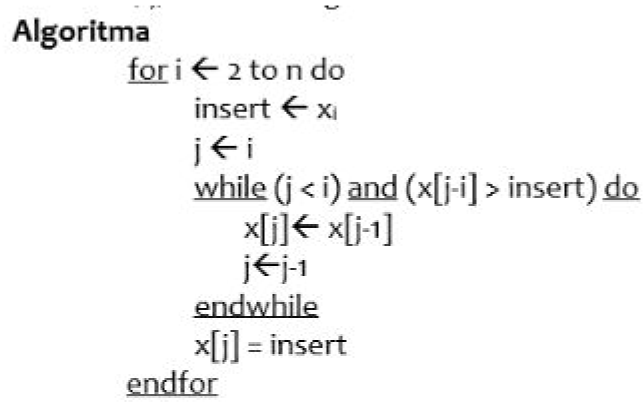
```
/*
Nama            : Natasya Rizky Maharani
NPM             : 140810180004
Kelas           : B
Deskripsi    : Program ini menampilkan program SelectionSort
*/


#include <iostream>

using namespace std;

int data[100],data2[100];
int n;

void tukar(int a, int b)
{
   int t;
   t = data[b];
   data[b] = data[a];
   data[a] = t;
}
void selection_sort()
{
   int pos,i,j;
   for(i=1;i<=n-1;i++)
   {
         pos = i;
         for(j = i+1;j<=n;j++)
         {
                  if(data[j] < data[pos]) pos = j;
          }
         if(pos != i) tukar(pos,i);
         }
}

int main()
{
   cout << "\n=====================================";
   cout<<"\nInput Jumlah Data : ";cin>>n;
   cout << "\n-------------------------------------" << endl;
   for(int i=1;i<=n;i++)
   {
          cout<<"Input data ke-"<<i<<" : ";
          cin>>data[i];
          data2[i]=data[i];
   }

   selection_sort();
   cout << "\n-------------------------------------" << endl;
   cout<<"Data Setelah di Sort : "<<endl;
   for(int i=1; i<=n; i++)
   {
          cout<<" "<<data[i];
   }

   cout << "\n=====================================\n";
}
```



```
=====================================
Masukkan Jumlah Data : 5

-------------------------------------
Masukkan data ke-1 : 1
Masukkan data ke-2 : 2
Masukkan data ke-3 : 3
Masukkan data ke-4 : 4
Masukkan data ke-5 : 5

-------------------------------------
Data Setelah di Sort :
 1 2 3 4 5
=====================================

Exit code: 0 (normal program termination)
```

Studi Kasus 3

PseudoCode:



```
Algoritma
        for i ← 2 to n do
            insert ← $x_i$
            j ← i
            while (j < i) and (x[j-i] > insert) do
                x[j]← x[j-1]
                j←j-1
            endwhile
            x[j] = insert
        endfor
```

Subproblem = 1

Masalah setiap subproblem = n-1

Waktu proses penggabungan = n

Waktu proses pembagian = n

T(n) = cn + cn-c +cn-2c + ... + 2c +cn <= 2cn^2 + cn^2

= c((n-1)(n-2)/2) + cn<= 2cn^2 + cn^2

= c((n^2-3n+2)/2) + cn<= 2cn^2 + cn^2

= c(n^2/2)-c(3n/2)+c+cn <= 2cn^2 + cn^2

=O(n^2)

T(n) = cn <= cn

= Ω (n)

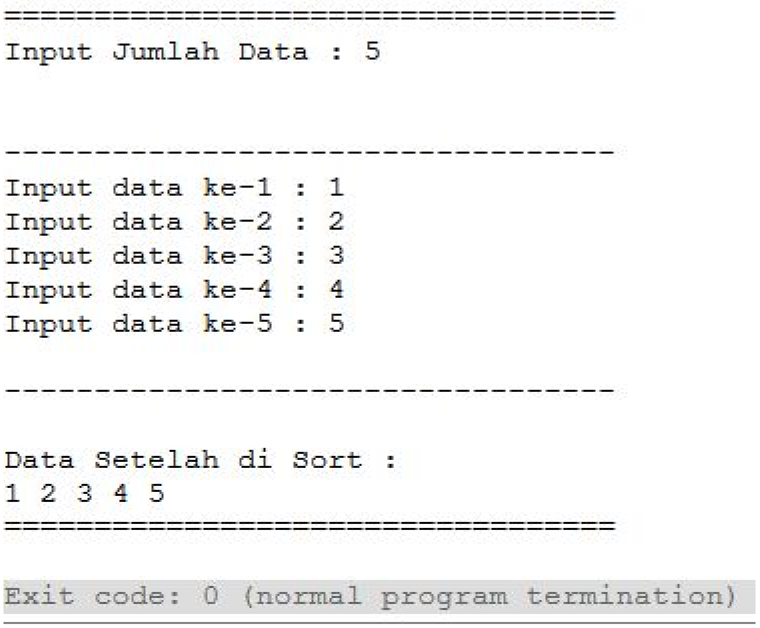
T(n) = (cn + cn^2)/n

= Θ(n)

SourceCode

```
/*
Nama            : Natasya Rizky Maharani
NPM             : 140810180004
Kelas           : B
Deskripsi    : Program ini menampilkan program InsertionSort
*/


#include <iostream>

using namespace std;

int data[100],data2[100],n;

void insertion_sort()
{
   int temp,i,j;
   for(i=1;i<=n;i++){
         temp = data[i];
          j = i -1;
         while(data[j]>temp && j>=0){
                    data[j+1] = data[j];
                   j--;
         }
         data[j+1] = temp;
   }
}
int main()
{
   cout << "\n====================================="<<endl;
   cout<<"Input Jumlah Data : "; cin>>n;
   cout<<endl;
   cout << "\n----------------------------------------" << endl;
   for(int i=1;i<=n;i++)
   {
     cout<<"Input data ke-"<<i<<" : ";
     cin>>data[i];
     data2[i]=data[i];
   }
   cout << "\n----------------------------------------" << endl;
   insertion_sort();
   cout<<"\nData Setelah di Sort : "<<endl;
```

```
    for(int i=1; i<=n; i++)
    {
     cout<<data[i]<<" ";
    }
    cout << "\n=================================="<<endl;
}
```



```
==================================
Input Jumlah Data : 5


----------------------------------
Input data ke-1 : 1
Input data ke-2 : 2
Input data ke-3 : 3
Input data ke-4 : 4
Input data ke-5 : 5

----------------------------------

Data Setelah di Sort :
1 2 3 4 5
==================================

Exit code: 0 (normal program termination)
```