알고리즘 2주차

2020112038 엄태우

문제 1.

선택 정렬 최선의 경우 : (n-1) + (n-2) + ... + 1 = $\sum_{i=1}^{n-1}(n-i) = \frac{n(n-1)}{2} = \Omega(n^2)$

삽입 정렬 최선의 경우 : 1 + 1 + 1 + ... + 1 = $\sum_{i=1}^{n} 1 = (n-1) = \Omega(n)$

퀵 정렬 최선의 경우 : 비교연산 n , 재귀 호출 횟수 log n = $\Omega(n \log n)$

삽입정렬의 슈도코드

```
void insertion_sort(A[], n) {
for i <- 1; i < n; i++ {
value <- A[i]
j <- i
while (A[j – 1] > value and j > 0) {
                    A[j] <- A[j – 1]
                    j <- j – 1
                }
                A[j] <- value
        }
}
```

삽입정렬의 경우 정렬되어있는 배열에 대해서 최선의 시간 복잡도를 가진다. 모든 원소별로 한번씩만 비교를 하면 되므로 O(n)의 시간복잡도를 가지게된다.

$$\sum_{i=1}^{n} 1 = n$$

insertion_sort.py > insertion_sort

```python
import random as r

def insertion_sort(arr, n):
    for i in range(1, n):
        value = arr[i]          #삽입하고자 하는 원소를 지정
        j = i
        while(arr[j - 1] > value and j > 0):    #해당 원소보다 앞에 있는 값들과 비교
            arr[j] = arr[j - 1]                 #해당 원소보다 클 경우 뒤로 밀어냄
            j -= 1
        arr[j] = value                          #맞는 자리에 해당 원소 삽입
        print(arr)                              #한 턴 진행 후 출력
    return arr

arr = [r.randint(1, 100) for i in range(30)]
print("초기 배열 :",arr)
print("정렬된 배열 :",insertion_sort(arr, len(arr)))
```

```
taewoo@eomtaeuui-MacBookPro week2 % python3 insertion_sort.py
초기 배열 : [73, 20, 89, 19, 38, 21, 30, 3, 93, 64, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[73, 20, 89, 19, 38, 21, 30, 3, 93, 64, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[89, 73, 20, 19, 38, 21, 30, 3, 93, 64, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[89, 73, 20, 19, 38, 21, 30, 3, 93, 64, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[89, 73, 38, 20, 19, 21, 30, 3, 93, 64, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[89, 73, 38, 21, 20, 19, 30, 3, 93, 64, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[89, 73, 38, 30, 21, 20, 19, 3, 93, 64, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[89, 73, 38, 30, 21, 20, 19, 3, 93, 64, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[93, 89, 73, 38, 30, 21, 20, 19, 3, 64, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[93, 89, 73, 64, 38, 30, 21, 20, 19, 3, 96, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[96, 93, 89, 73, 64, 38, 30, 21, 20, 19, 3, 98, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 73, 64, 38, 30, 21, 20, 19, 3, 75, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 64, 38, 30, 21, 20, 19, 3, 73, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 64, 38, 30, 21, 20, 19, 3, 65, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 38, 30, 21, 20, 19, 3, 55, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 55, 38, 30, 21, 20, 19, 3, 9, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 55, 38, 30, 21, 20, 19, 9, 3, 55, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 55, 55, 38, 30, 21, 20, 19, 9, 3, 43, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 55, 55, 43, 38, 30, 21, 20, 19, 9, 3, 16, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 55, 55, 43, 38, 30, 21, 20, 19, 16, 9, 3, 43, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 55, 55, 43, 43, 38, 30, 21, 20, 19, 16, 9, 3, 30, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 55, 55, 43, 43, 38, 30, 30, 21, 20, 19, 16, 9, 3, 18, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 55, 55, 43, 43, 38, 30, 30, 21, 20, 19, 18, 16, 9, 3, 44, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 55, 55, 44, 43, 43, 38, 30, 30, 21, 20, 19, 18, 16, 9, 3, 60, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 60, 55, 55, 44, 43, 43, 38, 30, 30, 21, 20, 19, 18, 16, 9, 3, 36, 95, 76, 88, 16]
[98, 96, 93, 89, 75, 73, 73, 65, 64, 60, 55, 55, 44, 43, 43, 38, 36, 30, 30, 21, 20, 19, 18, 16, 9, 3, 95, 76, 88, 16]
[98, 96, 95, 93, 89, 75, 73, 73, 65, 64, 60, 55, 55, 44, 43, 43, 38, 36, 30, 30, 21, 20, 19, 18, 16, 9, 3, 76, 88, 16]
[98, 96, 95, 93, 89, 76, 75, 73, 73, 65, 64, 60, 55, 55, 44, 43, 43, 38, 36, 30, 30, 21, 20, 19, 18, 16, 9, 3, 88, 16]
[98, 96, 95, 93, 89, 88, 76, 75, 73, 73, 65, 64, 60, 55, 55, 44, 43, 43, 38, 36, 30, 30, 21, 20, 19, 18, 16, 9, 3, 16]
[98, 96, 95, 93, 89, 88, 76, 75, 73, 73, 65, 64, 60, 55, 55, 44, 43, 43, 38, 36, 30, 30, 21, 20, 19, 18, 16, 16, 9, 3]
정렬된 배열 : [98, 96, 95, 93, 89, 88, 76, 75, 73, 73, 65, 64, 60, 55, 55, 44, 43, 43, 38, 36, 30, 30, 21, 20, 19, 18, 16, 16, 9, 3]
taewoo@eomtaeuui-MacBookPro week2 %
```

문제2.

1. 비순환적 선택 정렬

슈도코드:

```
function selection_sort(array arr, integer n)

for(int i = 0; i < n; i++)

                    min <- i

                    for (int j = i; j < n; j++)

                    min <- j

                    Swap arr[min],arr[i]

                    print(arr)

          return arr
```

selection_sort.py > ...

```python
def selection_sort(arr, n):
    for i in range(0, n):
        min = i
        for j in range(i, n):
            if(arr[min] > arr[j]):
                min = j
        arr[min], arr[i] = arr[i], arr[min]
        print(arr)
    return arr


arr = [30, 20, 40, 10, 5, 10, 30, 15]
print(arr)
print(selection_sort(arr, len(arr)))
```

문제 출력 디버그 콘솔 터미널 포트 zsh

```
taewoo@eomtaeuui-MacBookPro week2 % python3 selection_sort.py
[30, 20, 40, 10, 5, 10, 30, 15]
[5, 20, 40, 10, 30, 10, 30, 15]
[5, 10, 40, 20, 30, 10, 30, 15]
[5, 10, 10, 20, 30, 40, 30, 15]
[5, 10, 10, 15, 30, 40, 30, 20]
[5, 10, 10, 15, 20, 40, 30, 30]
[5, 10, 10, 15, 20, 30, 40, 30]
[5, 10, 10, 15, 20, 30, 30, 40]
[5, 10, 10, 15, 20, 30, 30, 40]
[5, 10, 10, 15, 20, 30, 30, 40]
taewoo@eomtaeuui-MacBookPro week2 %
```

2. 순환적 선택 정렬

슈도코드 :

Function recursive_sel_sort(array arr, integer n, integer m)

    If n == m

        Return arr

min <- n

    for(int i = n + 1; i < m, i++)

        If arr[min] > arr[i]

        min <- i

Swap arr[n], arr[min]

print arr

recursive_sel_sort(arr, n+1, m)

selection_sort.py > ...

```python
import random as r

def recursive_sel_sort(arr, n, m):
    if(n == m):
        return arr
    min = n
    for i in range(n+1,m):
        if (arr[min] > arr[i]):
            min = i
    arr[n], arr[min] = arr[min], arr[n]
    print(arr)
    return recursive_sel_sort(arr, n+1, m)

arr = [30, 20, 40, 10, 5, 10, 30, 15]
print(arr)
print(recursive_sel_sort(arr, 0, len(arr)))
```

문제 출력 디버그 콘솔 터미널 포트 zsh

```
taewoo@eomtaeuui-MacBookPro week2 % python3 selection_sort.py
[30, 20, 40, 10, 5, 10, 30, 15]
[5, 20, 40, 10, 30, 10, 30, 15]
[5, 10, 40, 20, 30, 10, 30, 15]
[5, 10, 10, 20, 30, 40, 30, 15]
[5, 10, 10, 15, 30, 40, 30, 20]
[5, 10, 10, 15, 20, 40, 30, 30]
[5, 10, 10, 15, 20, 30, 40, 30]
[5, 10, 10, 15, 20, 30, 30, 40]
[5, 10, 10, 15, 20, 30, 30, 40]
[5, 10, 10, 15, 20, 30, 30, 40]
taewoo@eomtaeuui-MacBookPro week2 %
```