자료구조

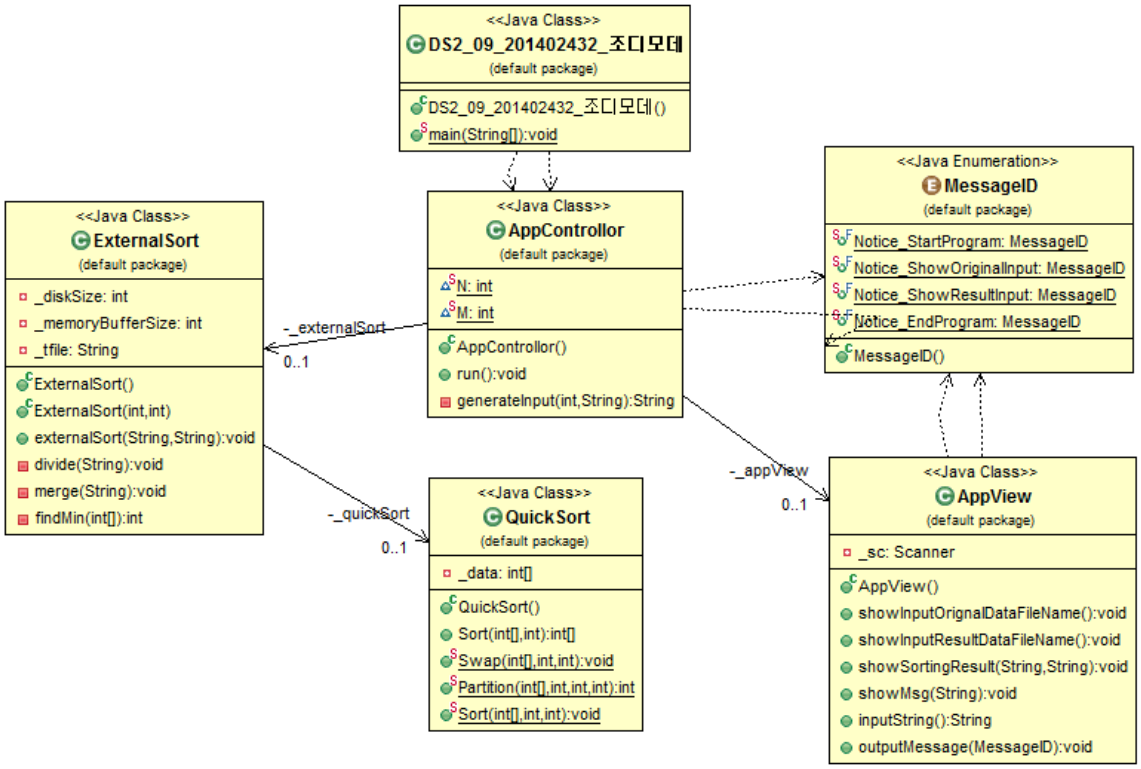
실습 보고서

[제 09주] 외부 정렬

제출일 : 2015.11.10

201402432 / 조디모데

1.프로그램설명서

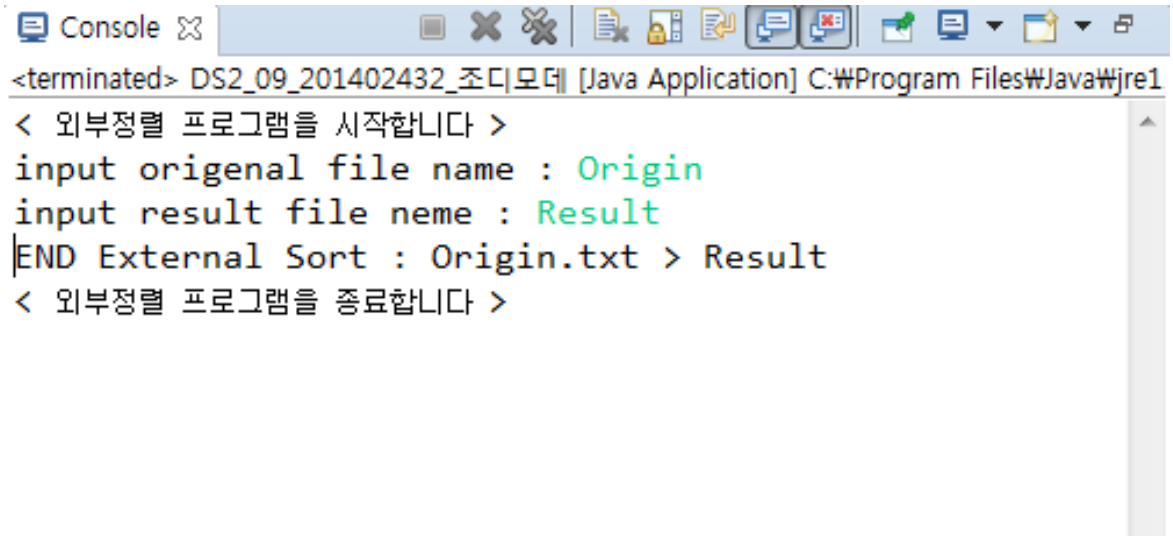


자료 구조 & 알고리즘 : Array, QuickSort, 외부 정렬, 분할 정렬

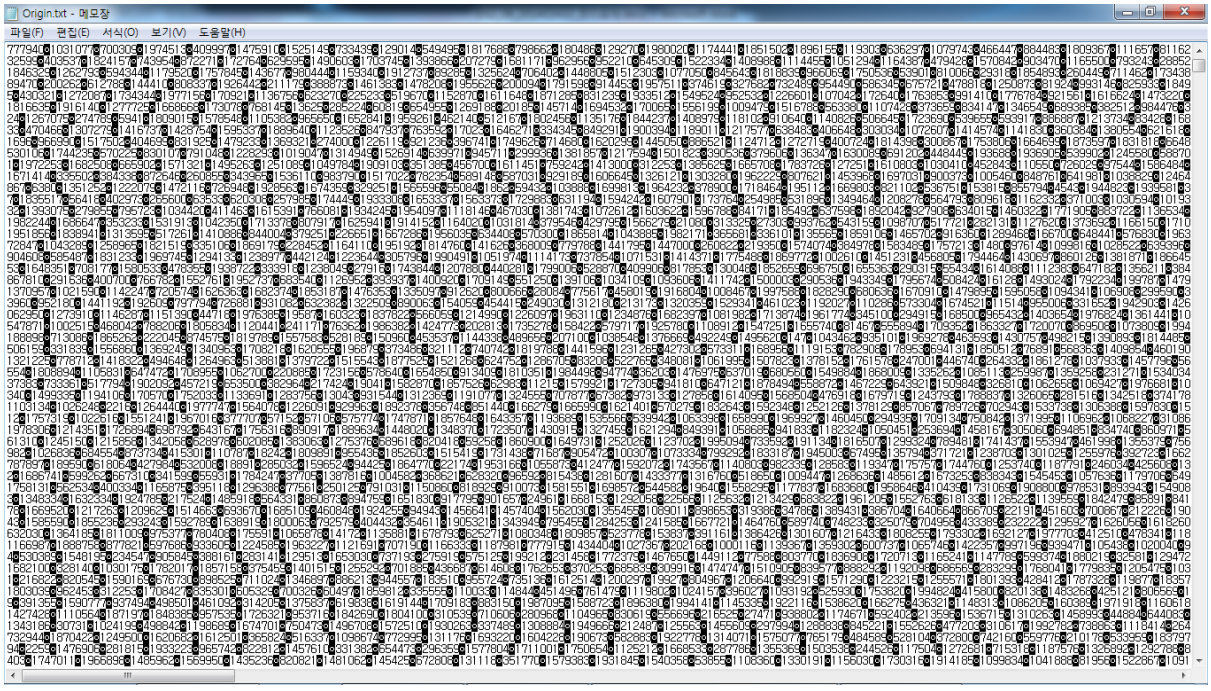
2.실행 결과 분석

1.입력과출력

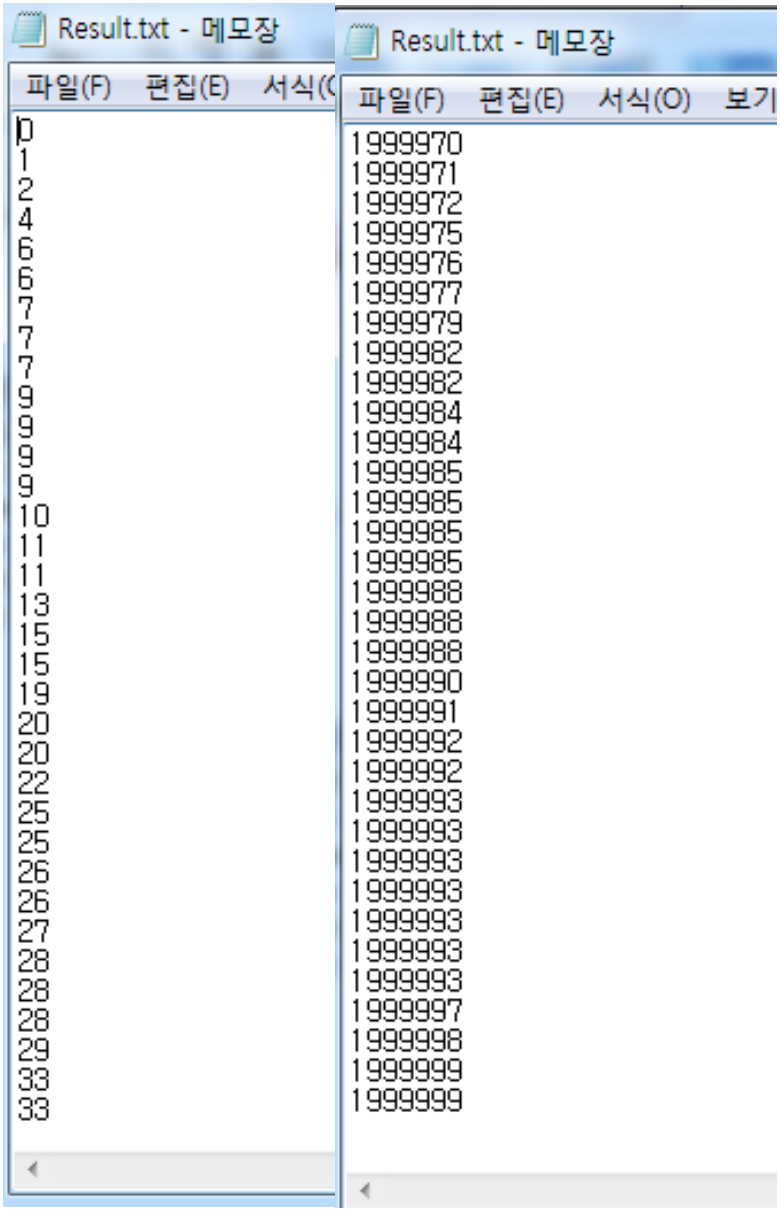
- 프로그램 실행 화면



- Origin.txt 파일 화면



- Result.txt 파일 화면



3.소스 코드

<main>

```
public class DS2_09_201402432_조디모데 {

	public static void main(String[] args) {

		AppControllor app = new AppControllor() ;
		app.run() ;
	}

}
```

<AppControllor>

```
import java.io.FileWriter;
import java.io.IOException;
import java.io.PrintWriter;
import java.util.Random;

public class AppControllor {

	static int N = 2000000; // size of the file in disk
	static int M = 100000; // max items the memory buffer can hold
	private AppView _appView;
	private ExternalSort _externalSort;
```

```
	public AppControllor(){

	}

	public void run(){
		this._appView= new AppView();
		this._externalSort= new ExternalSort(N, M);

	this._appView.outputMessage(MessageID.Notice_StartProgram);

	this._appView.outputMessage(MessageID.Notice_ShowOriginalInput);
		String orignalDataFileName= this.generateInput(N, this._appView.inputString());

	this._appView.outputMessage(MessageID.Notice_ShowResultInput);
		String resultDataFileName= this._appView.inputString();
```

```
        _externalSort.externalSort(orignalDataFileName,res
ultDataFileName);

        this._appView.showSortingResult(orignalDataFileN
ame, resultDataFileName);

        this._appView.outputMessage(MessageID.Notice_E
ndProgram);
        }

        private String generateInput(int n, String
inputString){
                Random r = new Random() ;
                FileWriter fileWriter ;

                try{

                        fileWriter = new FileWriter
(inputString+".txt") ;
```

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

        fileWriter.write(Integer.toString( r.nextInt(2000000)
  ) +"₩n" ) ;

                }catch(Exception e){
                        System.out.println(e.getMessage()) ;
                }

                return inputString+".txt" ;
        }

}
```

<AppView>

```
import java.util.* ;
public class AppView {
	private Scanner _sc ;
	public AppView(){
		this._sc = new Scanner(System.in) ;
	}
	public void showInputOrignalDataFileName(){
	}
	public void showInputResultDataFileName(){

	}
	public void showSortingResult(String orignalDataFileName,
String resultDataFileName){
		System.out.println("END External Sort : " +
orignalDataFileName+ " > " + resultDataFileName);
	}
	public void showMsg(String aString){
		System.out.println(aString);
	}
	public String inputString(){
		return this._sc.nextLine() ;
	}

	public void outputMessage(MessageID noticeStartprogram) {

		switch(noticeStartprogram){

		case Notice_StartProgram :
			System.out.println("< 외부정렬 프로그램을 시작합니다
>");
			break ;
		case Notice_ShowOriginalInput :
			System.out.print("input origenal file name : ");
			break ;
		case Notice_ShowResultInput :
			System.out.print("input result file neme : ");
			break ;
		case Notice_EndProgram :
			System.out.println("< 외부정렬 프로그램을 종료합니다
>");
			break ;
		default :
		}
	}
}
```

<ExternalSort>

```
import java.io.BufferedReader;
import java.io.FileNotFoundException;
import java.io.FileReader;
import java.io.FileWriter;
import java.io.IOException;
import java.io.PrintWriter;
import java.util.Arrays;
import java.util.Collections;
import java.util.Stack;

public class ExternalSort {

	private int _diskSize;
	private int _memoryBufferSize;
	private String _tfile = "temp";
	private QuickSort _quickSort ;

	public ExternalSort(){
	}

	public ExternalSort(int givenDiskSize, int givenMemorySize) {
		this._diskSize = givenDiskSize ;
		this._memoryBufferSize = givenMemorySize ;
	}

	public void externalSort(String dataName, String resultName){
		// Divide 와 merge작업 수행
		this.divide(dataName);
		this.merge(resultName);
	}

	private void divide(String dataName){
		// 정렬하려는파일을원하는개수만큼잘라서정렬하여저장
		int[] buffer = new int[this._memoryBufferSize <
this._diskSize ? this._memoryBufferSize : this._diskSize] ;
		this._quickSort = new QuickSort() ;

		try{
			FileReader fileReader = new FileReader(dataName) ;
			BufferedReader bufferedReader = new
BufferedReader(fileReader) ;
			int slices = (int)Math.ceil((double)this._diskSize
/ this._memoryBufferSize) ;

			int i, j ;
```

```
                  i = j = 0 ;
                  for(i = 0 ; i< slices ; i++){

                  String str ;
                        for(j = 0 ; j < (this._memoryBufferSize <
this._diskSize ? this._memoryBufferSize : this._diskSize) ; j++){
                              str = bufferedReader.readLine() ;
                              if(str==null)
                                    continue ;

                              buffer[j] = Integer.parseInt(str) ;
                        }

                        buffer = this._quickSort.Sort(buffer,
buffer.length);

                        FileWriter fileWriter = new FileWriter
(this._tfile + Integer.toString(i) + ".txt") ;
                        PrintWriter printWriter = new
PrintWriter(fileWriter) ;

                        for(int k = 0 ; k < buffer.length ; k++)
                              printWriter.println(buffer[k]) ;

                        fileWriter.close();
                        printWriter.close();
                  }


            }catch(Exception e){
                  e.printStackTrace() ;
            }

      }

      private void merge(String resultName){
            // 정렬되어있는파일들을모아서하나의출력파일을만들어냄
            int slices = (int)Math.ceil((double)this._diskSize /
this._memoryBufferSize) ;
            int[] top = new int[slices] ;

            FileReader fileReader ;
            BufferedReader[] bufferedReader = new
BufferedReader[slices] ;

            try{
                  FileWriter fileWriter = new FileWriter
("Result.txt") ;
```

```
                @SuppressWarnings({ "unused", "resource" })
                PrintWriter printWriter = new
PrintWriter(fileWriter) ;

                for(int i=0 ; i<slices ; i++){
                      fileReader = new
FileReader("temp"+Integer.toString(i)+".txt") ;
                      bufferedReader[i] = new
BufferedReader(fileReader) ;
                }

                String str ;

                int min = 0 ;
                for(int i=0 ; i<slices ; i++){
                      str = bufferedReader[i].readLine() ;
                      if(str==null)
                            continue ;

                      top[i] = Integer.parseInt(str) ;
                      if(top[min]!=Math.min(top[i], top[min]))
                                  min=i ;
                }

                while(true){


      printWriter.println( Integer.toString(top[min]) ) ;

                      str = bufferedReader[min].readLine() ;

                      if(str!=null){
                            top[min] = Integer.parseInt(str) ;
                            min = this.findMin(top) ;
                      }
                      else{
                            top[min]=Integer.MAX_VALUE ;

                            min = this.findMin(top) ;
                      }

                      boolean end = true ;
                      for(int x : top)
                            if(x!=Integer.MAX_VALUE)
                                  end = false ;

                      if(end){
```

```
                        printWriter.close() ;
                        fileWriter.close() ;
                        break ;
                    }

                }


            }catch(Exception e){
                e.printStackTrace() ;
            }
        }

        private int findMin(int[] num){
            int min = 0 ;
            for(int i=1 ; i<num.length ; i++){
                if(num[min]>num[i])
                    min = i ;
            }
            return min ;
        }
}
```

<MessageID>

```
public enum MessageID {
        Notice_StartProgram,
        Notice_ShowOriginalInput,
        Notice_ShowResultInput,
        Notice_EndProgram

}
```

<QuickSort>

```
public class QuickSort {
      private int[] _data ;

      public int[] Sort(int[] data, int length){
            this._data = data.clone() ;
            QuickSort.Sort(this._data, 0, length-1);
            return this._data ;
      }

    public static void Swap(int[] list, int idx1, int idx2) {
        int swapTmp = list[idx1];
        list[idx1] = list[idx2];
        list[idx2] = swapTmp;
    }

    public static int Partition(int[] list, int left, int right, int
pivot_idx) {
        int pivot = list[pivot_idx];
        Swap(list, pivot_idx, right);    //Move to end
        int split_idx = left;
        for(int i=left ; i<right ; i++) {
            if(list[i] <= pivot) {
                Swap(list, split_idx, i);
                ++split_idx;
            }
        }
        Swap(list, right, split_idx); //Move to split index
        return split_idx;
    }
    public static void Sort(int[] list, int left, int right) {
        if(right > left) {
            int pivot_idx = Partition(list, left, right, left);
            Sort(list, left, pivot_idx - 1);
            Sort(list, pivot_idx + 1, right);
        }
    }
}
```