# Quellcode für Beispiel 01

Block:

public interface Block {  
  
}

EmitBlock:

//Only Observable  
public abstract class EmitBlock implements Block {  
  
 public abstract void create\_stream() throws Exception;  
  
 public abstract void create\_stream(String filename) throws Exception;  
  
}

IntermediateBlock:

public abstract class IntermediateBlock implements Block {  
  
 public abstract void process\_stuff(Object o) throws Exception;  
  
 protected Double[] splitAndTurn(Object o) {  
 //gets a line (string)  
 //assumption: the numbers are separated by ,  
 String s = String.*valueOf*(o);  
 //o.toString();  
 String[] arr = s.split(",");  
 Double[] doubles = new Double[arr.length];  
  
 //take three values and throw them into a container  
 for (int j = 0; j < arr.length; j++) {  
 arr[j] = arr[j].replace("[", "");  
 arr[j] = arr[j].replace("]", "");  
  
 doubles[j] = Double.*parseDouble*(arr[j]);  
 }  
  
 return doubles;  
 }  
  
}

TerminalBlock:

public abstract class TerminalBlock {  
  
 abstract public void show\_data(Observable source, Object o) throws Exception;  
  
}

FileReaderBlock:

public class FileReaderBlock extends EmitBlock implements Observable {  
  
 public FileReaderBlock() {}  
  
 private Set<Observer> registeredObservers = new HashSet<>();  
  
 //reads filename from user input  
 public void create\_stream() throws Exception {  
 try {  
 BufferedReader reader = new BufferedReader(new InputStreamReader(System.*in*));  
  
 create\_stream(reader.readLine());  
 } catch (IOException e) {  
  
 }  
 }  
  
 //overloaded version of create\_stream  
 public void create\_stream(String filename) throws Exception {  
 Scanner scanner = new Scanner(new File(filename));  
  
 //reads line by line  
 while (scanner.hasNext()) {  
 //send one line to next block  
 String line = scanner.nextLine();  
 //System.out.println(line);  
 this.notifyObservers(line);  
 }  
  
 scanner.close();  
 }  
  
 @Override  
 public void registerObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.add(observer);  
 }  
 }  
  
 @Override  
 public void unregisterObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.remove(observer);  
 }  
 }  
  
 @Override  
 public void notifyObservers(Object o) throws Exception {  
 for (Observer observer : registeredObservers) {  
 observer.update(this, o);  
 }  
 }  
}

BufferBlock:

//takes bufferSize of LINES and throws them at the next block  
public class BufferBlock extends IntermediateBlock implements Observer, Observable {  
  
 //bufferSize is per default 10  
 private int bufferSize = 10;  
 //savedValues is a list of Objects (gets Strings)  
 private List<Object> savedValues = new ArrayList<>();  
  
 private Set<Observer> registeredObservers = new HashSet<>();  
  
 //constructor for creating the bufferBlock  
 public BufferBlock(int bufferSize) {  
 this.bufferSize = bufferSize;  
 }  
  
 //functionalities from Observable  
 @Override  
 public void registerObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.add(observer);  
 }  
 }  
  
 @Override  
 public void unregisterObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.remove(observer);  
 }  
 }  
  
 @Override  
 public void notifyObservers(Object o) throws Exception {  
 for (Observer observer : registeredObservers) {  
 observer.update(this, o);  
 }  
 }  
  
 //functionality from Observer  
 @Override  
 public void update(Observable source, Object o) throws Exception {  
 //store the object  
 process\_stuff(o);  
 }  
  
 //functionality from IntermediateBlock  
 //gets a line and saves it, until the count reaches bufferSize  
 @Override  
 public void process\_stuff(Object o) throws Exception {  
 //count of elements is still smaller than bufferSize  
 if (this.savedValues.size() < this.bufferSize) {  
 this.savedValues.add(o);  
 } else { //the bufferSize is reached  
 //throw the list of elements to the registered Observer  
 notifyObservers(savedValues);  
 //clear the list  
 savedValues.clear();  
 }  
 }  
}

MedianBlock:

//gets buffered values and calculates median  
public class MedianBlock extends IntermediateBlock implements Observable, Observer {  
  
 //list of observers  
 private Set<Observer> registeredObservers = new HashSet<>();  
  
 //size of window, default 3  
 private int windowSize = 3;  
  
 public MedianBlock(int windowSize) {  
 this.windowSize = windowSize;  
 }  
  
 //funtionality from IntermediateBlock  
 @Override  
 public void process\_stuff(Object o) throws Exception {  
 //split string and turn to double  
 Double[] doubles = splitAndTurn(o);  
 //window with the values  
 Double[] window = new Double[windowSize];  
 //median will save all the medians  
 Double[] median = new Double[doubles.length];  
  
 int lower = 0;  
 int upper = windowSize - 1;  
 int edge = (int)(windowSize / 2);  
  
 //goes through the array of doubles and calculates the median  
 for (int i = 0; i < doubles.length; i++) {  
 //do not change lower/upper if at the edge of array  
 //e.g. windowSize = 3; (int)3/2 -> 1 > 0(do not change lower or upper)  
 if ((i + edge) < doubles.length - 1 && (i - edge) > 0) {  
 lower++;  
 upper++;  
 }  
  
 window = createSortedWindow(doubles, lower, upper);  
 median[i] = calculateMedian(window);  
 }  
  
 List<Object> values = new ArrayList<>();  
  
 for (int i = 0; i < median.length; i++) {  
 values.add(median[i]);  
 }  
  
 //now we have a Double[] with the median  
 //and now THROW IT AT THE NEXT BLOCK LIKE U DON'T CARE  
 //print(median);  
 notifyObservers(values);  
 }  
  
 //functionalities from Observable  
 @Override  
 public void registerObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.add(observer);  
 }  
 }  
  
 @Override  
 public void unregisterObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.remove(observer);  
 }  
 }  
  
 @Override  
 public void notifyObservers(Object o) throws Exception {  
 for (Observer observer : registeredObservers) {  
 observer.update(this, o);  
 }  
 }  
  
 //functionality from Observer  
 @Override  
 public void update(Observable source, Object o) throws Exception {  
 process\_stuff(o);  
 }  
  
 @Override  
 protected Double[] splitAndTurn(Object o) {  
 //gets a line (string)  
 //assumption: the numbers are separated by ,  
 String s = String.*valueOf*(o);  
 //o.toString();  
 String[] arr = s.split(",");  
 Double[] doubles = new Double[arr.length / 3];  
  
 int pos = 0;  
  
 //take three values and throw them into a container  
 for (int j = 0; j < arr.length; j += 3) {  
 arr[j] = arr[j].replace("[", "");  
 arr[j] = arr[j].replace("]", "");  
  
 doubles[pos] = Double.*parseDouble*(arr[j]);  
 pos++;  
 }  
  
 return doubles;  
 }  
  
 private Double[] createSortedWindow(Double[] doubles, int lower, int upper) {  
 Double[] sortedWindow = new Double[windowSize];  
  
 int count = lower;  
 int pos = 0;  
  
 //add the needed values to the array  
 while (count <= upper) {  
 sortedWindow[pos] = doubles[count];  
  
 pos++;  
 count++;  
 }  
  
 //sort the values  
 Arrays.*sort*(sortedWindow);  
  
 return sortedWindow;  
 }  
  
 private double calculateMedian(Double[] sortedWindow) {  
 double median = 0;  
  
 if (windowSize % 2 == 0) { //it's even  
 //median is the two values in the middle / 2  
 median = (sortedWindow[windowSize/2 - 1] + sortedWindow[windowSize/2]) / 2;  
 } else { //it's odd  
 //median is the middle value  
 //double is cast to int, anything after the decimal point is removed  
 median = sortedWindow[(int)(windowSize/2)];  
 }  
  
 return median;  
 }  
  
}

DifferentialBlock:

//uses differential methods  
public class DifferentialBlock extends IntermediateBlock implements Observer, Observable {  
  
 //list of observers  
 private Set<Observer> registeredObservers = new HashSet<>();  
  
 //functionality from IntermediateBlock  
 @Override  
 public void process\_stuff(Object o) throws Exception {  
 //gets a Double[] from MedianBlock  
 Double[] doubles = splitAndTurn(o);  
 Double[] diffs = differential(doubles);  
  
 List<Object> values = new ArrayList<>();  
  
 for (int i = 0; i < diffs.length; i++) {  
 values.add(diffs[i]);  
 }  
  
 //System.out.println(o);  
  
 //now throw it at the observers!  
 //print(diffs);  
 notifyObservers(values);  
 }  
  
 private Double[] differential(Double[] doubles) {  
 Double[] diffs = new Double[doubles.length - 1];  
  
 //one number is lost  
 for (int i = 0; i < doubles.length - 1; i++) {  
 diffs[i] = (doubles[i + 1] - doubles[i]);  
 }  
  
 return diffs;  
 }  
  
 //functionalities from Observable  
 @Override  
 public void registerObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.add(observer);  
 }  
 }  
  
 @Override  
 public void unregisterObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.remove(observer);  
 }  
 }  
  
 @Override  
 public void notifyObservers(Object o) throws Exception {  
 for (Observer observer : registeredObservers) {  
 observer.update(this, o);  
 }  
 }  
  
 //functionality from Observer  
 @Override  
 public void update(Observable source, Object o) throws Exception {  
 process\_stuff(o);  
 }  
}

MinBlock:

public class MinBlock extends IntermediateBlock implements Observable, Observer {  
  
 //list of observers  
 private Set<Observer> registeredObservers = new HashSet<>();  
  
 @Override  
 public void process\_stuff(Object o) throws Exception {  
 Double[] doubles = splitAndTurn(o);  
 double minVal = 100;  
  
 for (int i = 0; i < doubles.length; i++) {  
 if (doubles[i] < minVal) {  
 minVal = doubles[i];  
 }  
 }  
  
 notifyObservers(minVal);  
 }  
  
 //functionalities from Observable  
 @Override  
 public void registerObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.add(observer);  
 }  
 }  
  
 @Override  
 public void unregisterObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.remove(observer);  
 }  
 }  
  
 @Override  
 public void notifyObservers(Object o) throws Exception {  
 for (Observer observer : registeredObservers) {  
 observer.update(this, o);  
 }  
 }  
  
 //functionality from Observer  
 @Override  
 public void update(Observable source, Object o) throws Exception {  
 //store the object  
 process\_stuff(o);  
 }  
}

MaxBlock:

public class MaxBlock extends IntermediateBlock implements Observer, Observable {  
  
 //list of observers  
 private Set<Observer> registeredObservers = new HashSet<>();  
  
 @Override  
 public void process\_stuff(Object o) throws Exception {  
 Double[] doubles = splitAndTurn(o);  
 double maxVal = 0;  
  
 for (int i = 0; i < doubles.length; i++) {  
 if (doubles[i] > maxVal) {  
 maxVal = doubles[i];  
 }  
 }  
  
 notifyObservers(maxVal);  
 }  
  
 //functionalities from Observable  
 @Override  
 public void registerObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.add(observer);  
 }  
 }  
  
 @Override  
 public void unregisterObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.remove(observer);  
 }  
 }  
  
 @Override  
 public void notifyObservers(Object o) throws Exception {  
 for (Observer observer : registeredObservers) {  
 observer.update(this, o);  
 }  
 }  
  
 //functionality from Observer  
 @Override  
 public void update(Observable source, Object o) throws Exception {  
 //store the object  
 process\_stuff(o);  
 }  
}

AvgBlock:

public class AvgBlock extends IntermediateBlock implements Observer, Observable {  
  
 //list of observers  
 private Set<Observer> registeredObservers = new HashSet<>();  
  
 @Override  
 public void process\_stuff(Object o) throws Exception {  
 Double[] doubles = splitAndTurn(o);  
 double sum = 0;  
 double avg = 0;  
  
 for (int i = 0; i < doubles.length; i++) {  
 sum += doubles[i];  
 }  
  
 avg = sum / (doubles.length - 1);  
  
 notifyObservers(avg);  
 }  
  
 //functionalities from Observable  
 @Override  
 public void registerObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.add(observer);  
 }  
 }  
  
 @Override  
 public void unregisterObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.remove(observer);  
 }  
 }  
  
 @Override  
 public void notifyObservers(Object o) throws Exception {  
 for (Observer observer : registeredObservers) {  
 observer.update(this, o);  
 }  
 }  
  
 //functionality from Observer  
 @Override  
 public void update(Observable source, Object o) throws Exception {  
 //store the object  
 process\_stuff(o);  
 }  
}

FileWriterBlock:

//gets a signal from DifferentialBlock  
public class FileWriterBlock extends TerminalBlock implements Observer {  
  
 //per default output.csv  
 private String filename = "output.csv";  
  
 public FileWriterBlock(String filename) {  
 this.filename = filename;  
 }  
  
 @Override  
 public void show\_data(Observable source, Object o) throws Exception {  
 String[] strings = splitAndTurnToString(o);  
  
 FileWriter writer = new FileWriter(this.filename, true);  
  
 for (int i = 0; i < strings.length; i++) {  
 writer.write(strings[i]);  
  
 writer.write("\n");  
 }  
  
 writer.close();  
 }  
  
 @Override  
 public void update(Observable source, Object o) throws Exception {  
 show\_data(source, o);  
 }  
  
 //also has this cool function I totally did not steal  
 protected String[] splitAndTurnToString(Object o) throws Exception {  
 //gets a line (string)  
 //assumption: the numbers are separated by ,  
 String s = String.*valueOf*(o);  
 //o.toString();  
 String[] arr = s.split(",");  
  
 //take three values and throw them into a container  
 for (int j = 0; j < arr.length; j++) {  
 arr[j] = arr[j].replace("[", "");  
 arr[j] = arr[j].replace("]", "");  
 arr[j] = arr[j].replace(" ", "");  
 }  
  
 return arr;  
 }  
}

ConsoleBlock:

//only observer  
//takes data and throws it at the console  
public class ConsoleBlock extends TerminalBlock implements Observer {  
  
 @Override  
 public void show\_data(Observable source, Object o) {  
 System.*out*.println("Received value from " + source.toString() + ": " + o);  
 }  
  
 @Override  
 public void update(Observable source, Object o) {  
 show\_data(source, o);  
 }  
}

SumBlock:

//is both Observer and Observable  
//gets stuff from FileReaderBlock and throws it to ConsoleBlock  
public class SumBlock extends IntermediateBlock implements Observable, Observer {  
  
 private Set<Observer> registeredObservers = new HashSet<>();  
  
 @Override  
 public void process\_stuff(Object o) throws Exception {  
 //gets a line (string)  
 //assumption: the numbers are separated by ,  
 //can also be ;  
 String s = o.toString();  
 String[] arr = s.split(",");  
 double sum = 0;  
  
 for (int j = 0; j < arr.length; j++) {  
 sum += Double.*parseDouble*(arr[j]);  
 }  
 //also notify the observers after processing  
 notifyObservers(sum);  
 }  
  
 @Override  
 public void registerObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.add(observer);  
 }  
 }  
  
 @Override  
 public void unregisterObserver(Observer observer) {  
 if(observer != null) {  
 this.registeredObservers.remove(observer);  
 }  
 }  
  
 @Override  
 public void notifyObservers(Object o) throws Exception {  
 for (Observer observer : registeredObservers) {  
 observer.update(this, o);  
 }  
 }  
  
 @Override  
 public void update(Observable source, Object o) throws Exception {  
 //process stuff  
 process\_stuff(o);  
 }  
}

Observer:

public interface Observer {  
  
 void update(Observable source, Object o) throws Exception;  
  
}

Observable:

public interface Observable {  
  
 //attach Observer  
 void registerObserver(Observer observer);  
  
 //detach Observer  
 void unregisterObserver(Observer observer);  
  
 //notify  
 void notifyObservers(Object o) throws Exception;  
  
}

BlockTest:

public class BlockTest {  
  
 public static void main(String[] args) throws Exception {  
 *test05*();  
 }  
  
 //always used  
 public static void createBlocks(String filename) throws Exception {  
 FileReaderBlock b = new FileReaderBlock();  
 SumBlock s = new SumBlock();  
 ConsoleBlock c = new ConsoleBlock();  
  
 b.registerObserver(s);  
 s.registerObserver(c);  
  
 //if there was no filename  
 if (filename.equals("")) {  
 b.create\_stream();  
 } else {  
 b.create\_stream(filename);  
 }  
 }  
  
 public static void test01() throws Exception {  
 *createBlocks*("");  
 }  
  
 public static void test02() throws Exception {  
 *createBlocks*("IntegerTest.txt");  
 }  
  
 public static void test03() throws Exception {  
 *createBlocks*("IntegerTest2.txt");  
 }  
  
 public static void test04() throws Exception {  
 *createBlocks*("DoubleTest.txt");  
 }  
  
 public static void test05() throws Exception {  
 *createBlocks*("StringTest.txt");  
 }  
  
}

FancyBlockTest:

public class FancyBlockTest {  
  
 public static void main(String[] args) throws Exception {  
 *test05*();  
 }  
  
 //always used  
 public static void createBlocks(String filename) throws Exception {  
 FileReaderBlock b = new FileReaderBlock();  
 BufferBlock bu = new BufferBlock(10);  
 MedianBlock m = new MedianBlock(3);  
 DifferentialBlock d = new DifferentialBlock();  
 MinBlock min = new MinBlock();  
 MaxBlock max = new MaxBlock();  
 AvgBlock avg = new AvgBlock();  
 ConsoleBlock c = new ConsoleBlock();  
 FileWriterBlock f = new FileWriterBlock("signal.csv");  
  
 //delete file signal.csv  
  
 b.registerObserver(bu);  
 bu.registerObserver(m);  
 m.registerObserver(d);  
 d.registerObserver(min);  
 d.registerObserver(max);  
 d.registerObserver(avg);  
 d.registerObserver(f);  
 min.registerObserver(c);  
 max.registerObserver(c);  
 avg.registerObserver(c);  
  
 //if there was no filename  
 if (filename.equals("")) {  
 b.create\_stream();  
 } else {  
 b.create\_stream(filename);  
 }  
 }  
  
 public static void test01() throws Exception {  
 *createBlocks*("sample\_data.csv");  
 }  
  
 public static void test02() throws Exception {  
 FileReaderBlock f = new FileReaderBlock();  
 ConsoleBlock c = new ConsoleBlock();  
  
 f.registerObserver(c);  
  
 f.create\_stream("sample\_data.csv");  
 }  
  
 public static void test03() throws Exception {  
 FileReaderBlock f = new FileReaderBlock();  
 BufferBlock b = new BufferBlock(2);  
 ConsoleBlock c = new ConsoleBlock();  
  
 f.registerObserver(b);  
 b.registerObserver(c);  
  
 f.create\_stream("sample\_data.csv");  
 }  
  
 public static void test04() throws Exception {  
 FileReaderBlock f = new FileReaderBlock();  
 BufferBlock b = new BufferBlock(6);  
 MedianBlock m = new MedianBlock(3);  
 ConsoleBlock c = new ConsoleBlock();  
  
 f.registerObserver(b);  
 b.registerObserver(m);  
 m.registerObserver(c);  
  
 f.create\_stream("sample\_data.csv");  
 }  
  
 public static void test05() throws Exception {  
 FileReaderBlock f = new FileReaderBlock();  
 BufferBlock b = new BufferBlock(6);  
 MedianBlock m = new MedianBlock(3);  
 DifferentialBlock d = new DifferentialBlock();  
 ConsoleBlock c = new ConsoleBlock();  
  
 f.registerObserver(b);  
 b.registerObserver(m);  
 m.registerObserver(d);  
 d.registerObserver(c);  
  
 f.create\_stream("sample\_data.csv");  
 }  
  
}