Gebze Technical University
Computer Engineering

CSE 222 - 2018 Spring

HOMEWORK 5 Part 5 REPORT

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1 INTRODUCTION

1.1 Problem Definition

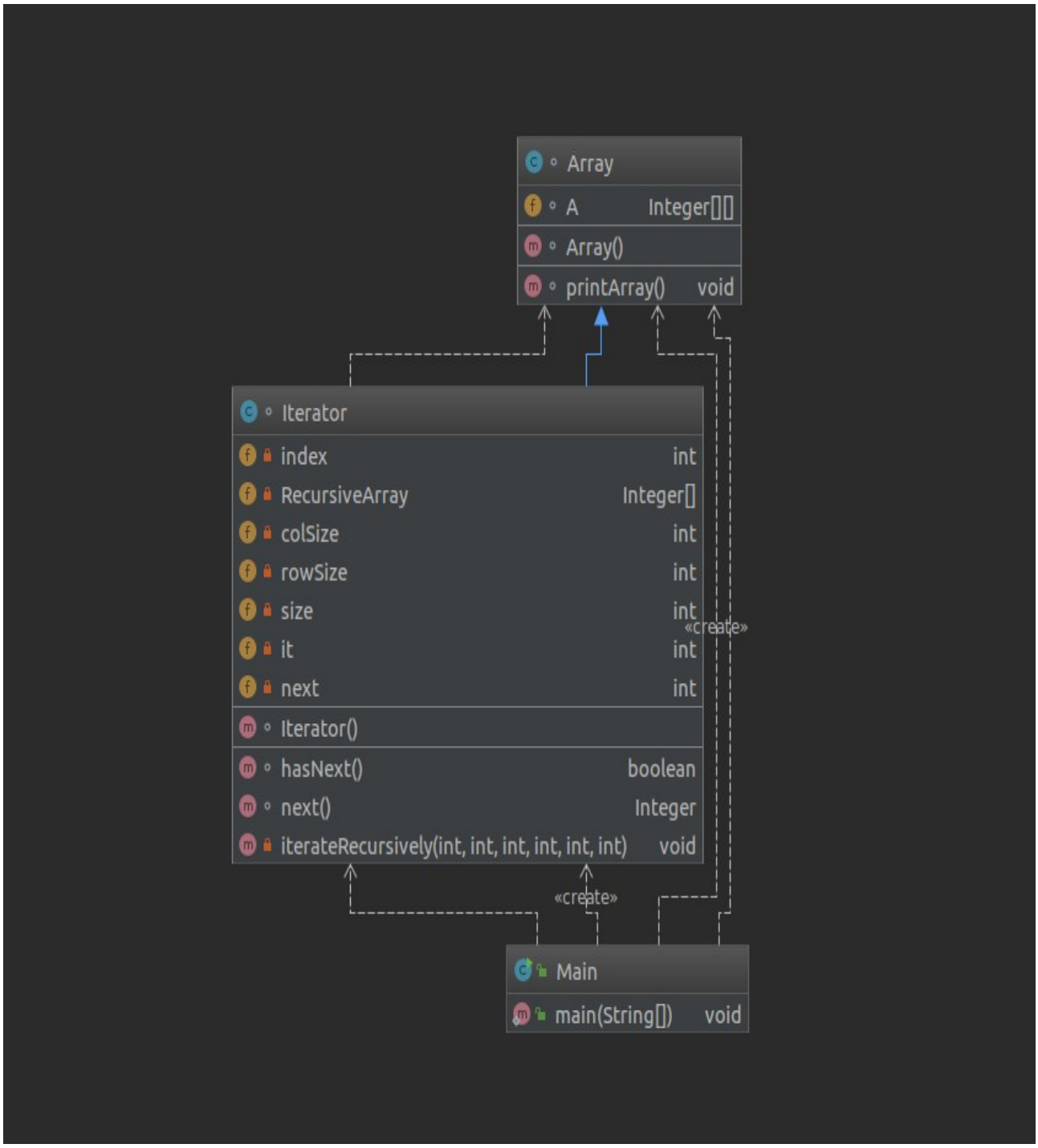
In that project, that asked for to try how to move on in 2D integer array using iterator but the iterator must move recursively and spirally clockwise turning.

1.2 System Requirements

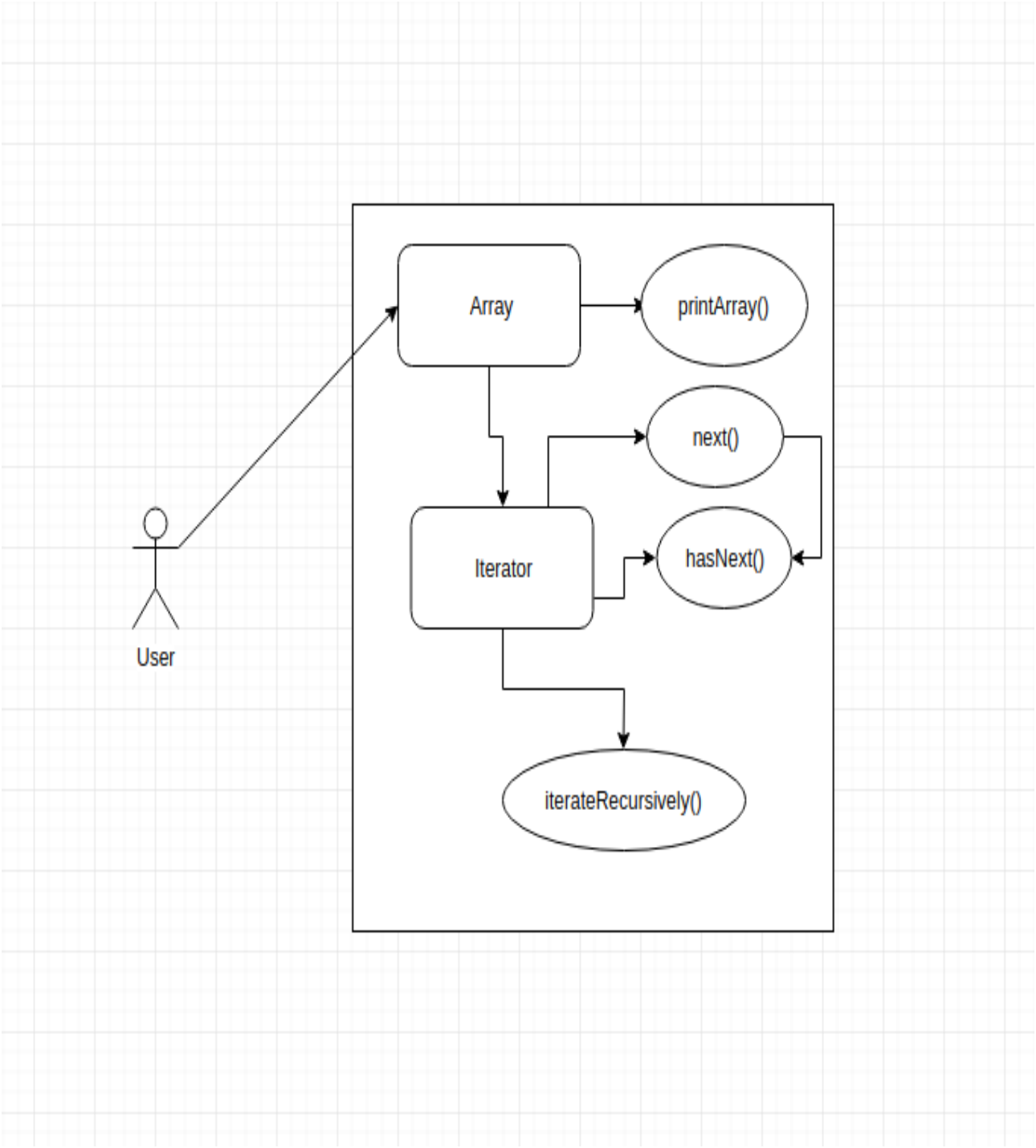
My solution doesn’t require a specific piece of hardware, or maybe a certain minimal amount of memory, or a certain operating system, or a software library to be installed in order to run properly. It built by IntelliJ IDEA and used java programming language. It might run correctly if you use Java Virtual Machine and JDK is at least 8. Will my program work with 128KB of memory? I don’t know, I didn’t work with 128KB of memory but maybe it can work. If your nephew’s smartphone’s operating system is Android then it must run on it.

2 METHOD

2.1 Class Diagrams



2.2 Use Case Diagrams



2.3 Problem Solution Approach

In my programme, I didn't used a data structure. It was hard to think algorithm about how to move on recursively in 2D integer array. Firstly I stored all datas in Integer two dimensional integer array. I used two main classes: Array and Iterator. I wrote both myself. In Array class it just initialize the 2D integer array and prints it to screen. In Iterator class I have three methods: **next()**, **hasNext()** and **iterateRecursively()**. The user must create an Array object. Then it can create Iterator object. In iterator class when the object created, in constructor of Iterator class iterateRecursively() method is called. That method saves the datas of 2D integer array into one dimensional integer array using recursive. While doing that it is ofcourse spirally clockwise checking happens.

Time Complexity

• next() : It just returns next data and calls hasNext() method. But constant. O(1).

• hasNext() : It just returns if next data is available. O(1).

• iterateRecursively() : It has recursive loop.

$$T(n) = 1 + 1 + colSize + rowSize + 1 + T(n-rowSize-colSize)$$

$$= T(n) + colSize + rowSize + 3 = T(n)$$

$$T(n) = aT(n/b) + n^d \Rightarrow a = 1, b = 1, d = 0$$

$$\Rightarrow 1 = 1^0 \Rightarrow \quad T(n) = \Theta(n^0 \log n) = \Theta(\log n)$$

• main() : It just creates array and iterates in 2D integer array. O(n).

Space Complexity

• next() : 1 + 4 + 4 + 1 = 9 bytes.

• hasNext() : 2 bytes.

• iterateRecursively() : 1 + 1 + 1+ columnSize * rowSize * 3 + 4 + 3 + 1

= 3 + 4 * 4 * 3 + 8 = 3 + 48 + 8 = 59 bytes.

• main() : 1 + columnSize * rowSize + 1 + columnSize * rowSize + 1

= 1 + 4 * 4 + 1 + 4 * 4 + 1 = 35 bytes.

3 RESULT

3.1 Test Cases

Main Test

- I declared a 2D integer array in Array constructor. It’s the sample of homework requirement. I created the instance object of Array class. Then while looping the array using iterator it printed the results to screen. Results are in 3.2 Running Results part.

3.2 Running Results