

Intro to programming in Java

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- 1 **The riddle solution**
- 2 **Projects proposals**
 - Your ideas
 - My proposals
 - General plan for the future
- 3 **Java programming**
 - What is Java?
 - First program
 - Exercises
- 4 **The riddle**

Presentation Outline

- 1 **The riddle solution**
- 2 Projects proposals
- 3 Java programming
- 4 The riddle

The riddle

Two robotics enthusiasts meet:

- I am a happy man, I have built three wonderful robots!
- How many processors each of these robots has?
- The product of the number of their processors is my age, which is 36.
- Well, this tells me nothing...
- OK. Can you see the building at the other side of the street? The sum of their processors is equal to the number of windows in that building.
- It still says only a little.
- The most powerful robot looks like a cat.
- Aaaaa...! Now everything is clear. Nice work.

What is the number of processors each of the robots has.

All combinations

The prime factors of 36 are 2, 2, 3, 3 This gives the following triplets of possible solutions;

Table: All possible combinations

Processors 1	Processors 2	Processors 3	Sum
1	1	36	38
1	2	18	21
1	3	12	16
1	4	9	14
1	6	6	13
2	2	9	13
2	3	6	11
3	3	4	10

Presentation Outline

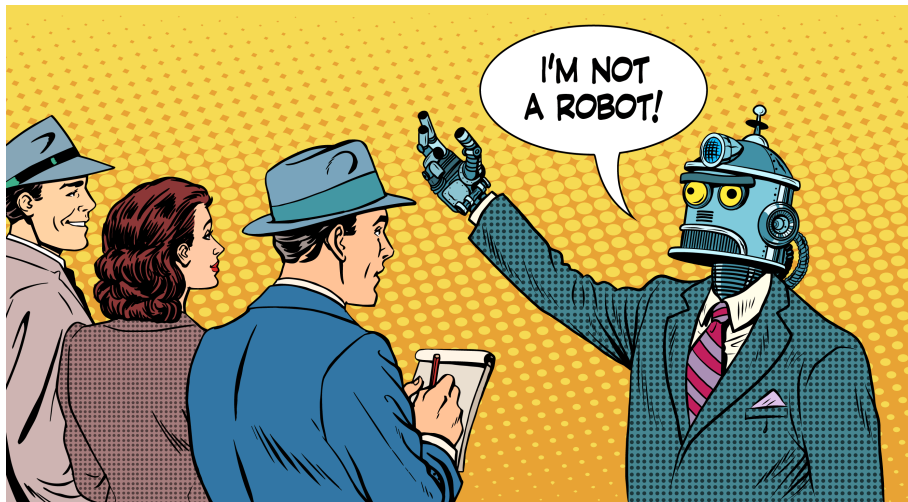
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Tracking lines



Conversational robot



Smart assistant



Smart assistant



Overall idea

- We will use Android devices and Lego Mindstorms as basic kit
- We will learn how to code in Java
- Complex topics will be provided scientific background (like image recognition, voice recognition).
- Every first Monday of the month, there will be talking. Next: *Ethics of AI*.

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The screenshot displays the Android Studio IDE with the following components:

- File Explorer (Left):** Shows a project structure for 'geist.re.mindroid' with subfolders like 'hardware', 'tasks', 'res', 'models', and 'sync'. The 'robot-commands.gram' file is selected.
- Code Editor (Center):** Displays the implementation of two methods:

```
@Override
public void commandProgram(){
    super.commandProgram();
    /***** START YOUR PROGRAM HERE *****/
    robot.executeMotorTask(robot.motorA.run(80));
    pause(1000);
    robot.executeMotorTask(robot.motorA.stop());
    robot.executeSyncTwoMotorTask(robot.motorA.run(30), robot.motorB.run(30));
    pause(1000);
    robot.executeSyncTwoMotorTask(robot.motorA.stop(), robot.motorB.stop());
}

@Override
public void onVoiceCommand(String message) {
    super.onVoiceCommand(message);
    /***** HANDLE VOICE MESSAGE HERE *****/

    if (message.equals("run forward")){
        robot.executeSyncTwoMotorTask(robot.motorA.run(30), robot.motorB.run(30));
    } else if (message.equals("stop")){
        robot.executeSyncTwoMotorTask(robot.motorA.stop(), robot.motorB.stop());
    } else if (message.equals("destroy yourself")){
        robot.executeSyncTwoMotorTask(robot.motorA.run(30), robot.motorB.run(-30));
        stopRecognizer();
        int i=0;
        while(i < 10) {
            playSound(ERROR);
            try {
                Thread.sleep(1000);
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
}
```
- Android Monitor (Bottom):** Shows a logcat entry for 'Samsung GT-I9100 00090d4249b18f [DISCONNECTED]' and 'geist.re.mindroid (29184) [DEAD]'.



Why is it important

Java key features

- Object oriented and easier than C++
- It is very popular (Android, Desktop, etc), has a good documentation and support by different IDEs.
- Not that difficult to learn
- AP exam is based on Java

Hello world

```
public class Main{  
    public static void main(String [] argv){  
        System.out.println(" Hello world!");  
    }  
}
```

Variables

```
public class Main{  
    public static void main(String [] argv){  
        String name = "Szymon";  
        double a = 5;  
        double b = 6;  
        System.out.println(" Hello "+name+". I know that "+  
            a+"+"+b+"="+(a+b));  
    }  
}
```

Exercise

Try other mathematical operations. What about power? Try different types: int, double, float, boolean?

Arrays

```
public class Main{
    public static void main(String [] argv){
        String name = "Szymon";
        double [] arrayOfNumbers = new double [4];

        arrayOfNumbers [0] = 6;
        System.out.println(" Hello "+name+
            ". The first element in the array " +
            " is "+arrayOfNumbers [0]);
    }
}
```

Exercise

Try print out other elements form the array.

If statements

```
public class Main{
    public static void main(String [] argv){
        String name = "Szymon";
        double [] arrayOfNumbers = new double [4];

        arrayOfNumbers [0] = 6;
        if(arrayOfNumbers [0] == 6){
            System.out.println("Yes, it is 6");
        }else if(arrayOfNumbers [0] != 6){
            System.out.println("No it is not 6");
        }
    }
}
```

Exercise

Try other if statements.

```
public class Main{
    public static void main(String [] argv){
        String name;
        int age;
        System.out.println("What is your name?");
        Scanner scanner = new Scanner(System.in);
        name = scanner.nextLine();
        System.out.println("What is your age?");
        age = scanner.nextInt();

    }
}
```

Exercise

Try to add statement that will ask for the value of π and print all the information out.

If statements

```
public class Main{
    public static void main(String [] argv){
        int age;
        Scanner scanner = new Scanner(System.in);
        System.out.println("What is your age?");
        age = scanner.nextInt();

        if(age < 18){
            System.out.println(" Access denied")
        }else{
            System.out.println(" Access granted")
        }
    }
}
```

Exercise

Try more if statements. (you are old, wrong number); Read password from the user and test if it is OK. This one is tricky.

Loops

```
public class Main{
    public static void main(String [] argv){
        int age;
        Scanner scanner = new Scanner(System.in);
        while(true){
            System.out.println("What is your age?");
            age = scanner.nextInt();

            if(age < 18){
                System.out.println(" Access denied")
            }else{
                System.out.println(" Access granted")
            }
        }
    }
}
```

Exercise

Try to condition the loop on the value of age.

Loops

```
public class Main{
    public static void main(String [] argv){
        double numbers [] = new double [5];

        Scanner scanner = new Scanner(System.in);
        for(int i = 0; i < numbers.length; i++){
            numbers[i] = scanner.nextInt();
        }
    }
}
```

Exercise

Use loop to print out the number that you read; Create a program that will print out multiplication table of given size;

Functions

```
public class Main{
    public static void main(String [] argv){
        double numbers [] = new double [5];
        double numbers2D [][] = new double [5][3];
        Scanner scanner = new Scanner(System.in);
        for(int i = 0; i < numbers.length; i++){
            numbers[i] = scanner.nextInt();
        }
        printOutTheArray(numbers);
    }

    public static void printOutTheArray(double [] array){
        for(int i = 0; i < array.length; i++){
            System.out.println(array[i]);
        }
    }
}
```

Exercise

Add statement that will prompt the user for the next number. Use loop to print out the number that you read; Create a program that will print out multiplication table of given size;

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Program for the riddle

The Challenge

Write a program that solves the riddle. But now, assume that the number of processors is 72.

Thank you for your attention!

Any questions?

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