

JavaCraft

Full Project Specification

Sunday, October 22, 2023

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1 Introduction

Welcome to JavaCraft, a multifaceted text-based Java game. This project is a holistic academic exercise in computer science, logical thinking, and collaboration. Working in teams of four, you will use your creativity, analytical skills, and technical skills. Please see the Project Overview for more information on the intended learning goals of the project.

2 Tasks

2.1 JavaCraft's WorkFlow

JavaCraft is a (*relatively*) complex Java program that brings together over 35 functions to create a diverse gameplay experience. This task is your chance to understand the core functionalities of JavaCraft, putting them together to form the game's overarching structure.

2.1.1 Sub-Tasks

- **Create a Flowchart:** Develop a detailed flowchart that broadly explains the gameplay. This flowchart should contain the main components of the game, illustrating how they interact and connect to create the gaming experience.
- **Write a Pseudocode:** Complement the flowchart with a pseudocode that outlines the main game logic, providing a textual representation of the game's flow and structure.

2.1.2 Deliverables:

- **Flowchart & Pseudocode Submission:** Include the flowchart and pseudocode in the final PDF document, showcasing your understanding of the game's overall architecture¹.

2.2 Functionality Exploration

Dive deep into the codebase of JavaCraft by exploring the 35+ functions that constitute the game's core:

¹There are two main submissions for this project, you can see the details of which task is part of which submission on the [Submissions](#) page.

2.2.1 Sub-Tasks

For each function, perform the following detailed analysis:

1. **Identify Key Components:** Recognize the essential parts of the function, focusing on what makes each function unique and how it contributes to the overall game.
2. **Recognize Patterns:** Delve into the code of each function to find patterns or repetitions, understanding the patterns.
3. **Break Down the Function:** Divide the function into logical steps or subproblems, providing a step-by-step analysis that reveals the function's inner workings.
4. **Represent the Function:** Develop a flowchart and pseudocode for each function, translating the textual analysis into visual and algorithmic representations².

2.2.2 Deliverables:

- **Project Documentation:** Prepare a project documentation that includes descriptions of **at least 35** functions within the code. Create flowcharts and pseudocodes for **at least 15** of these functions, showcasing your analytical skills and understanding of the game's mechanics. This documentation will be a part of the provisional and final PDF submission.

2.3 Finite State Automata (FSA) Design

Your next task is to design a Finite State Automata (FSA) for the secret (hidden) door logic:

2.3.1 Sub-Tasks

1. **Study the Secret Door Logic:** Examine the secret door's functionality in the provided code, understanding how the secret door operates within the game's context.
2. **Create an FSA:** Design an FSA (DFA or NFA) that mirrors the behavior of the secret door, ensuring that the FSA accurately captures every aspect of the secret door's functionality.
3. **Illustrate the FSA:** Draw a clear and well-structured FSA diagram, labeling states and transitions, making sure that the diagram is in line with what was covered in the lectures.
4. **Describe the FSA:** Write an explanation of the FSA's operation, detailing the conditions that lead to state changes, and how the FSA represents the secret door logic within the game.

²In 2.1, you designed a flowchart and pseudocode for the overall program, here you have to do it for individual functions in the program.

2.3.2 Deliverables:

- **FSA Documentation:** Include a detailed explanation of the secret door logic, a well-designed FSA, and concise documentation of the FSA's functioning and trigger conditions. This documentation will be part of the provisional and final PDF document, reflecting your ability to apply theoretical concepts to practical game elements.

2.4 Extending the Game Code

In this task, you apply your creativity and technical skills by extending JavaCraft's existing code:

2.4.1 Sub-Tasks

1. **Create New Block Types:** Design at least 2 unique block types, considering their defining attributes, interactions, appearances, and how they will integrate into the existing game dynamics.
2. **Formulate a New Craft Recipe:** Develop at least 1 crafting recipe that creatively integrates existing blocks to yield a new and distinct block.
3. **Integrate the Extension:** Incorporate the new block types and craft recipe into the existing game code, ensuring that the new elements work with the existing gameplay mechanics.

2.4.2 Deliverables:

- **Extension Documentation:** Provide a detailed and comprehensive blueprint of the new block types and craft recipe. Include this in the final PDF document, showcasing your ability to innovate within an existing codebase.

2.5 Git Usage

As a part of the project, you will learn Git, a powerful tool for version control, and apply it to the project.

2.5.1 Sub-Tasks

1. **Create a branch on the JavaCraft repository:** Create a branch on the [JavaCraft repository](#) on GitLab for your group, all the team members should have access to it. Re-read the lab from week 2 if you are still struggling with this.
2. **Make at least 1 commit per person:** Get each team member to make at least 1 commit on your branch. The commit can be as simple as adding their names to Readme file or adding a comment on the JavaCraft code.
3. **Handle Changes and Conflicts:** Use Git's capabilities to manage modifications and resolve conflicts.
4. **Upload the Final Code [either on GitLab or Canvas]:** Upload the completed code, including 2 new block types and 1 craft recipe, to the your Git branch, only one person needs to do it in your group ³.

2.5.2 Deliverables:

- **Git Summary:** Include a summary of your Git usage in the final PDF document. Detail the repository setup, task allocation, change management, and final submission.

2.6 Interacting with Flags API

Once you are done with unlocking the secret door and your intermediary submission⁴, you can move on to the last part. The challenge in this part is interacting with the Flags API ([flag.ashish.nl](#)). You use this API to know which flag you need to plot. You can choose different levels of difficulty.

2.6.1 Sub-Tasks

1. **Explore the Flags API:** Understand the Flags API (documentation at [flag.ashish.nl](#)), grasping how it can be utilized within the game.
2. **Draw the Flag:** Configure the difficulty (easy, medium, and hard) and draw the flag on a 50x30 grid, either manually or through automation⁵.

³If you have trouble uploading your completed code to GitLab, you can also alternatively submit your code along with your provisional report on Canvas. Please make sure you upload `.java` file if you do not want to use Git.

⁴Please see the submission guidelines for more information on this.

⁵To get you started, I have plotted a flag in the hidden door. You can see how I have automated the process of plotting the flag.

2.6.2 Deliverables:

Flags Documentation: Detail the Flags API's functionality and your flag drawing process in the final PDF document. Include the chosen difficulty level and how the flag drawing integrates into the game, reflecting your ability to work with external APIs.

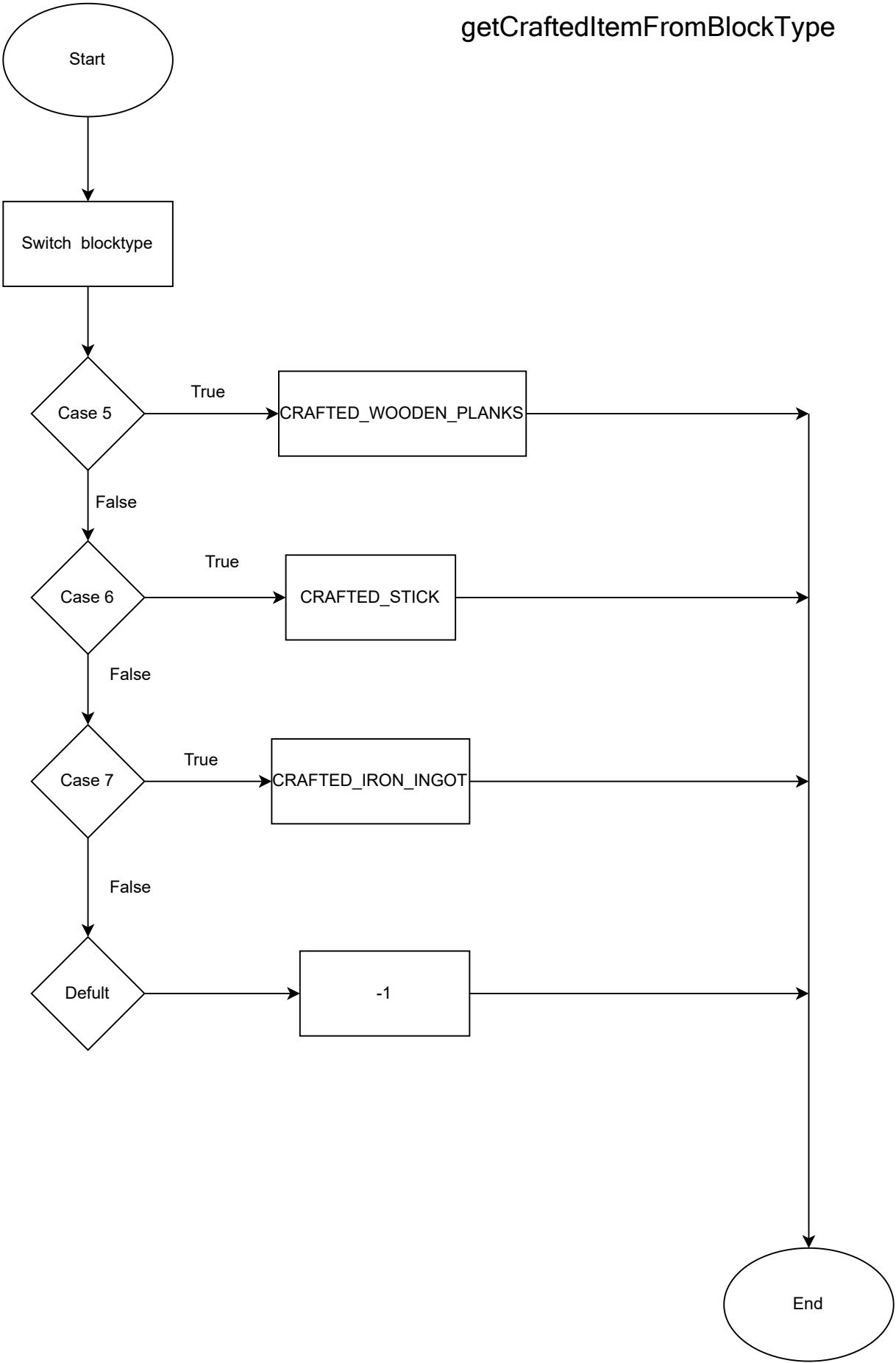
3 Final Deliverable

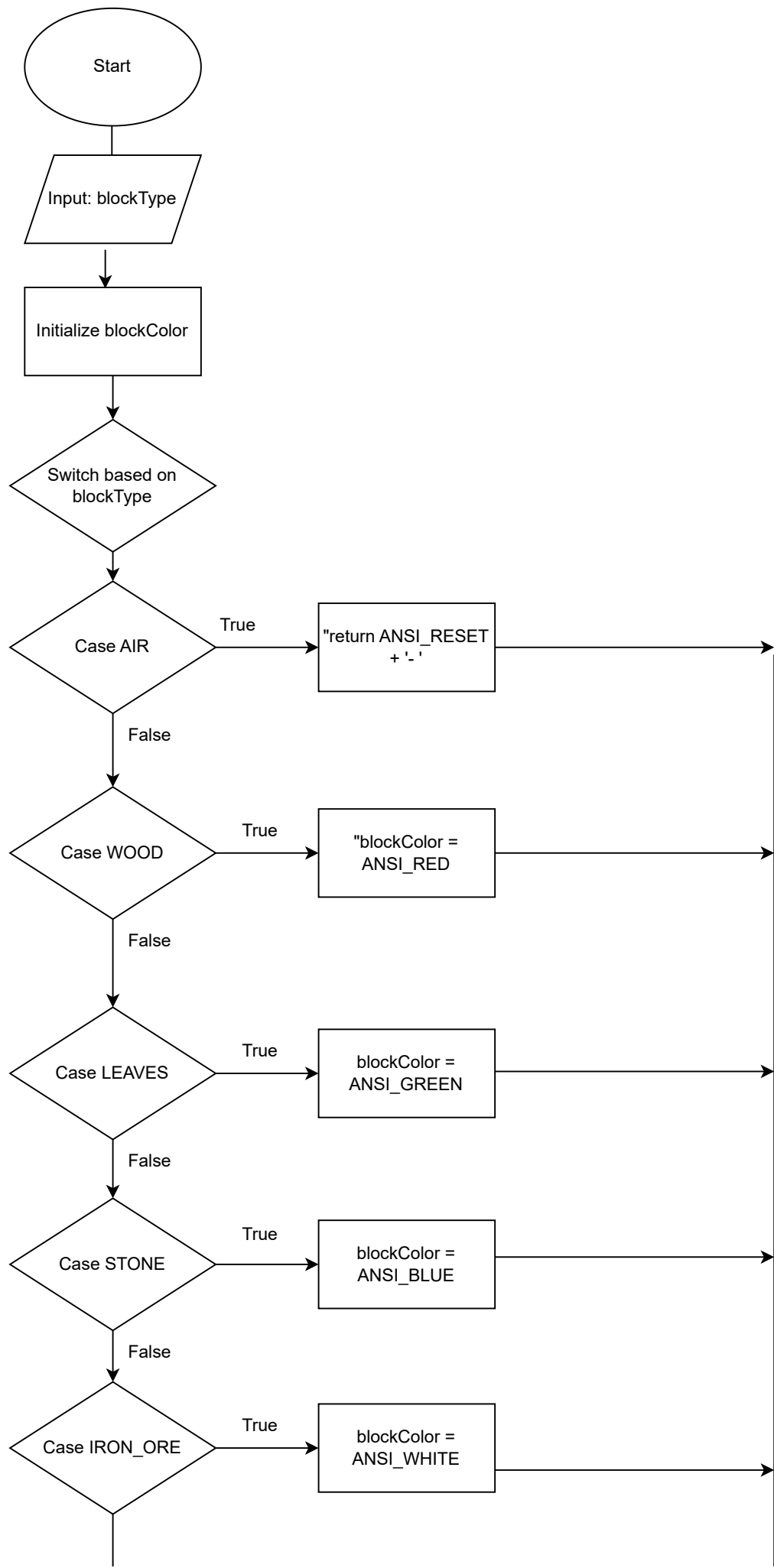
Compile a single PDF document, not exceeding 10 pages, detailing all the above steps in a structured and coherent format⁶. Include pseudocode and flowcharts for part 3 in the appendix, as lengthy as needed. Ensure that all deliverables mentioned are included in this document, except for the Git submission, which will be submitted separately to the TA's repository.

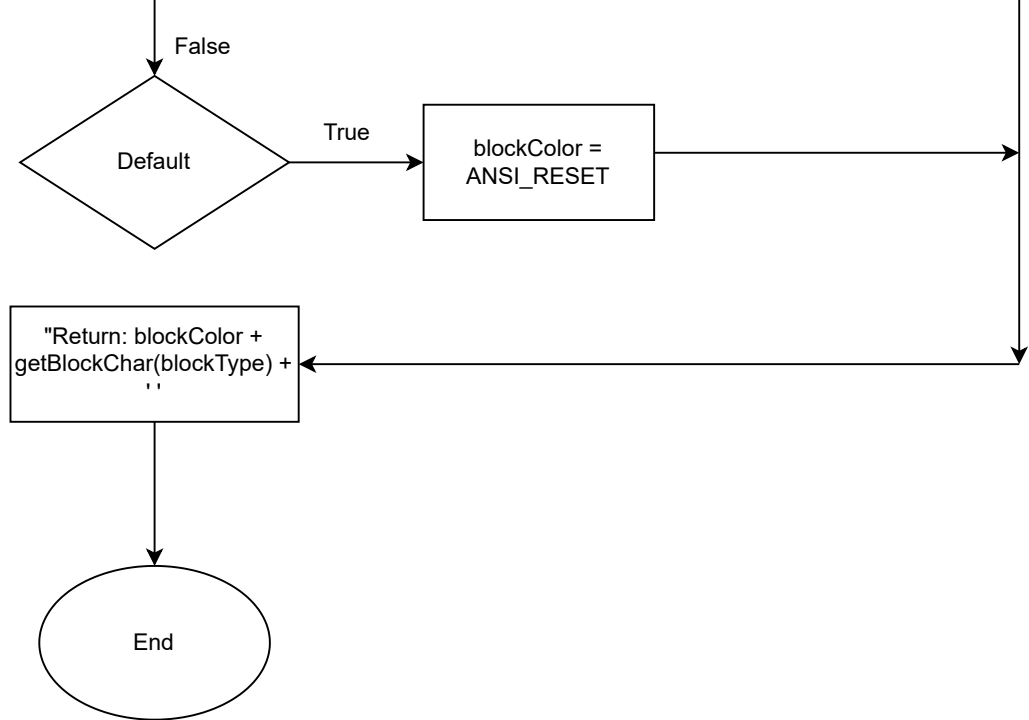
⁶You can use the template provided at bcs1110.ashish.nl.

Task 2.1.1 Flowcharts:

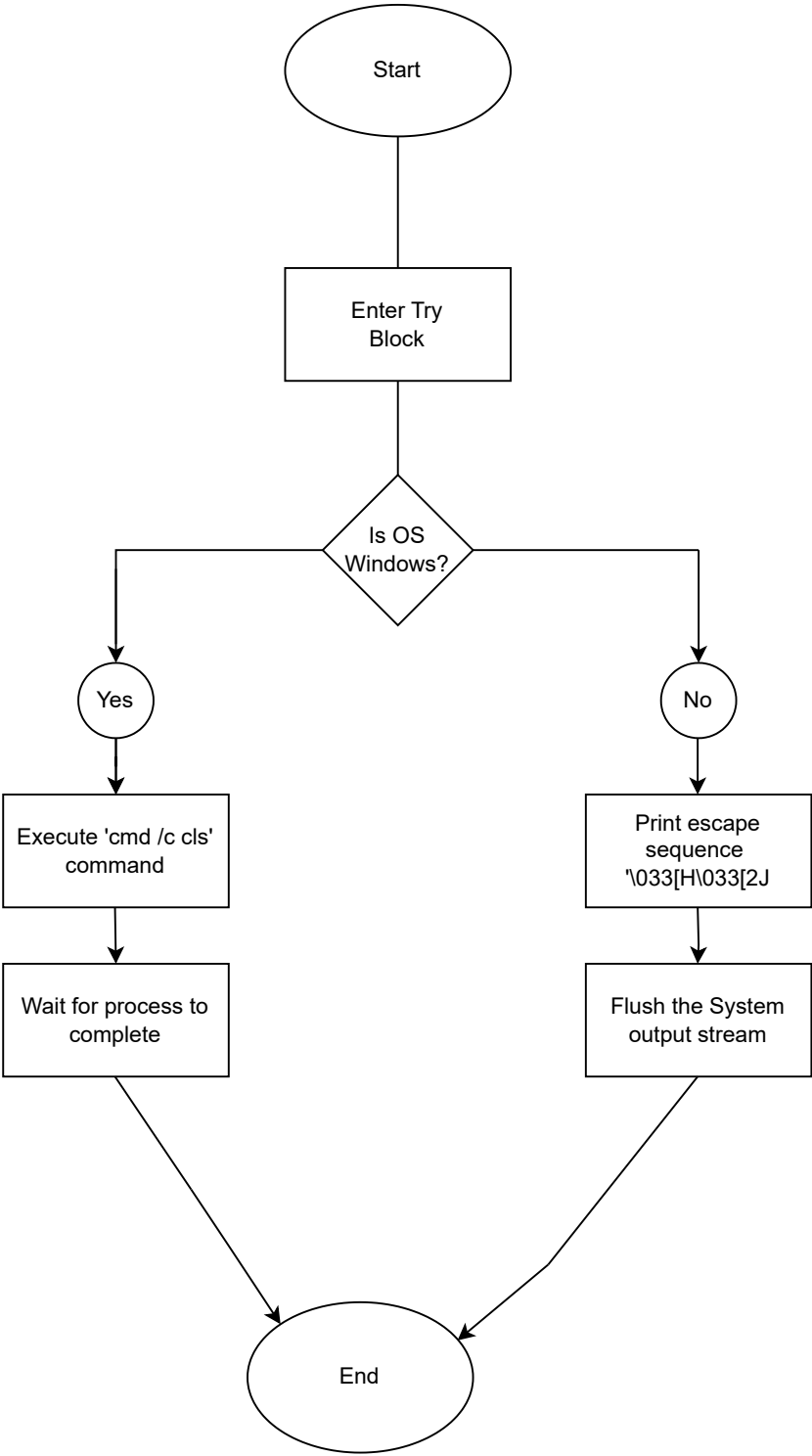
getCraftedItemFromBlockType



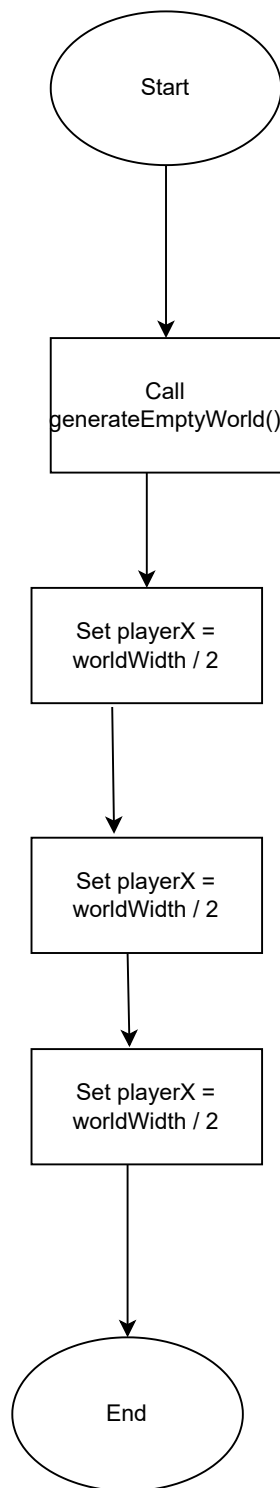




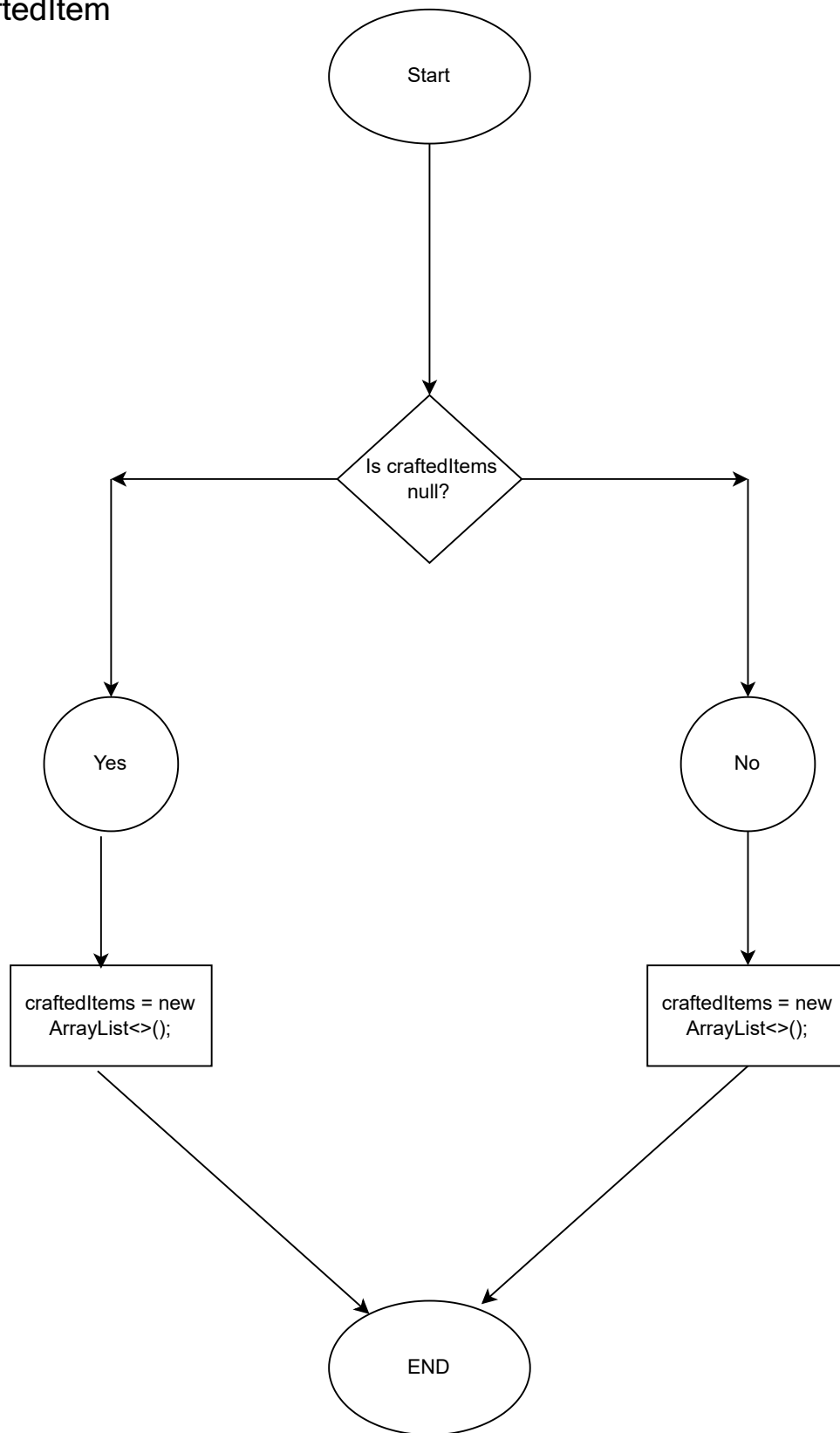
clearScreen()



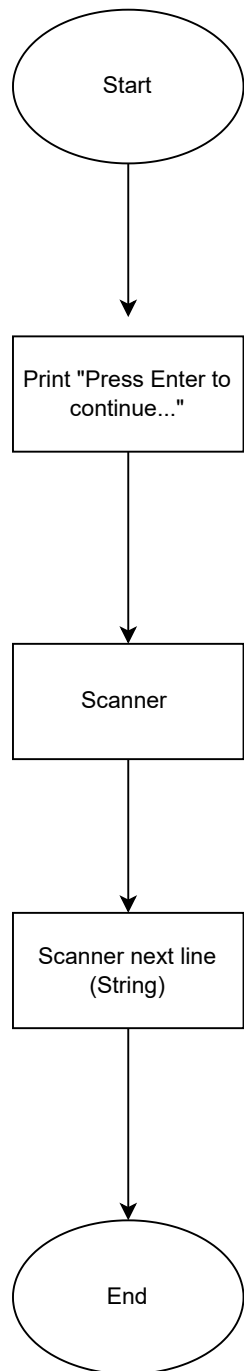
resetWorld



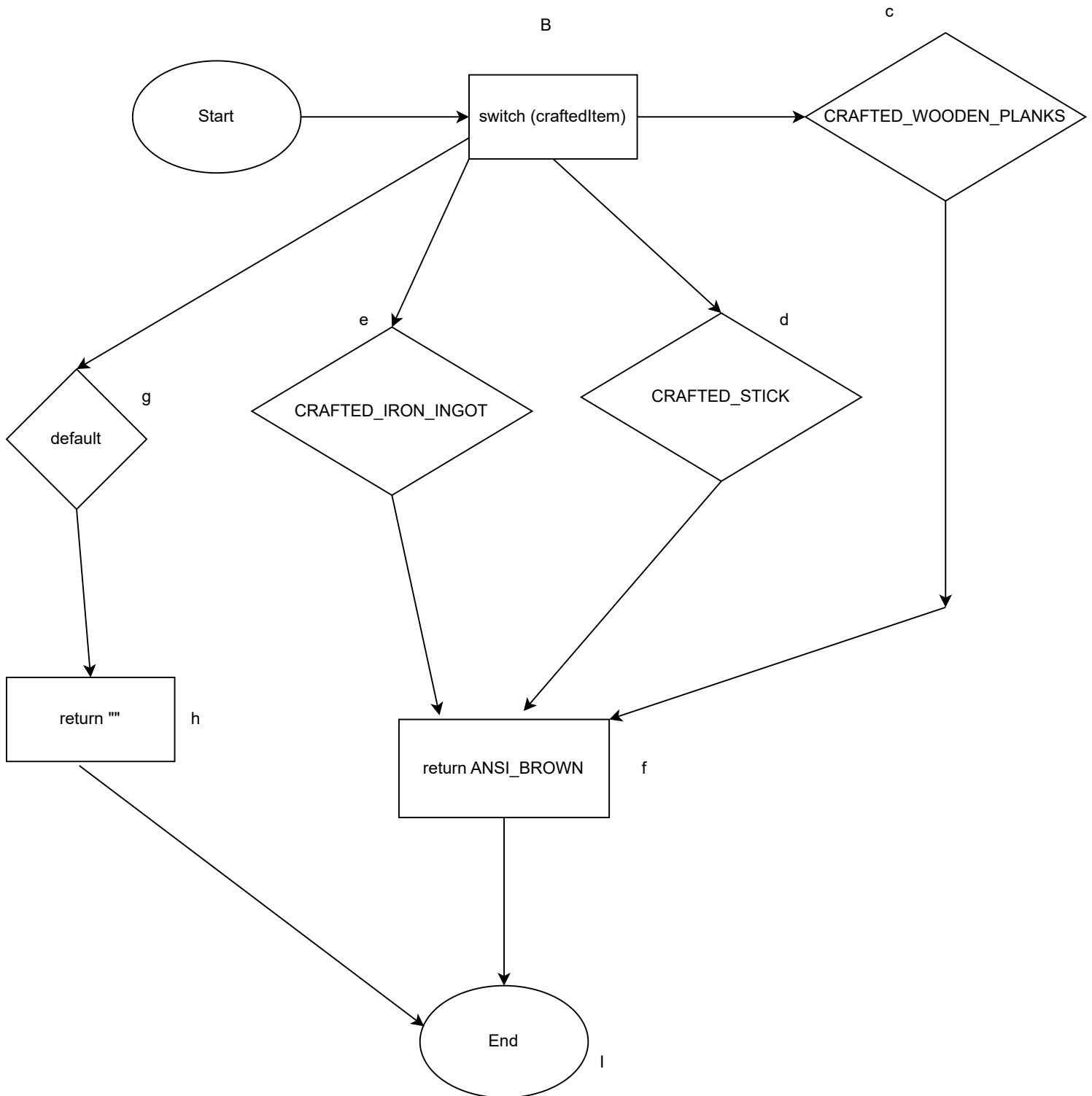
addCraftedItem



waitForEnter

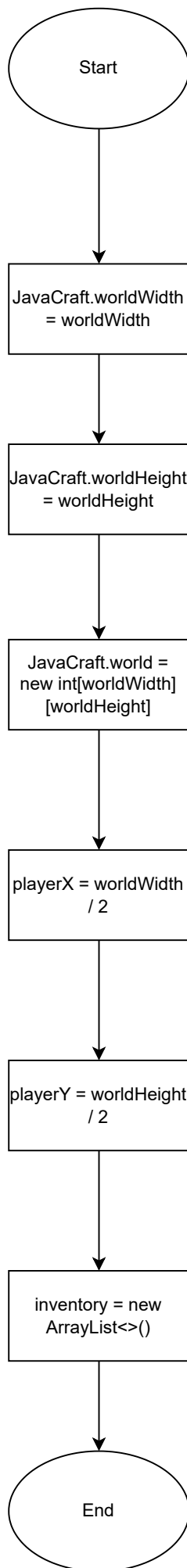


getCraftedItemColor

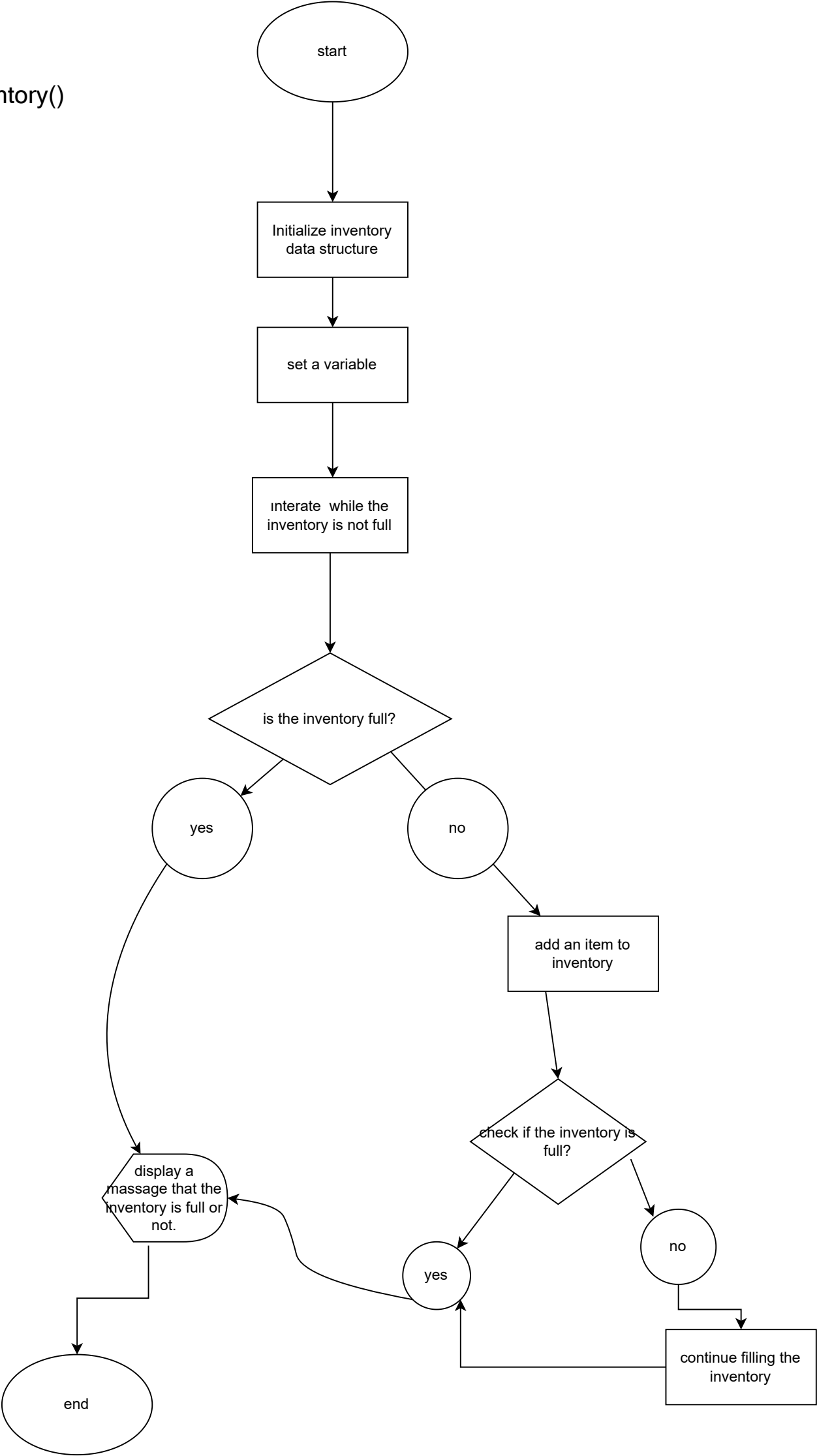


```
// A--> B
B --> C
B --> D
B --> E
C --> F
D --> F
E --> F
B --> G
G --> H
F --> I
H --> I
```

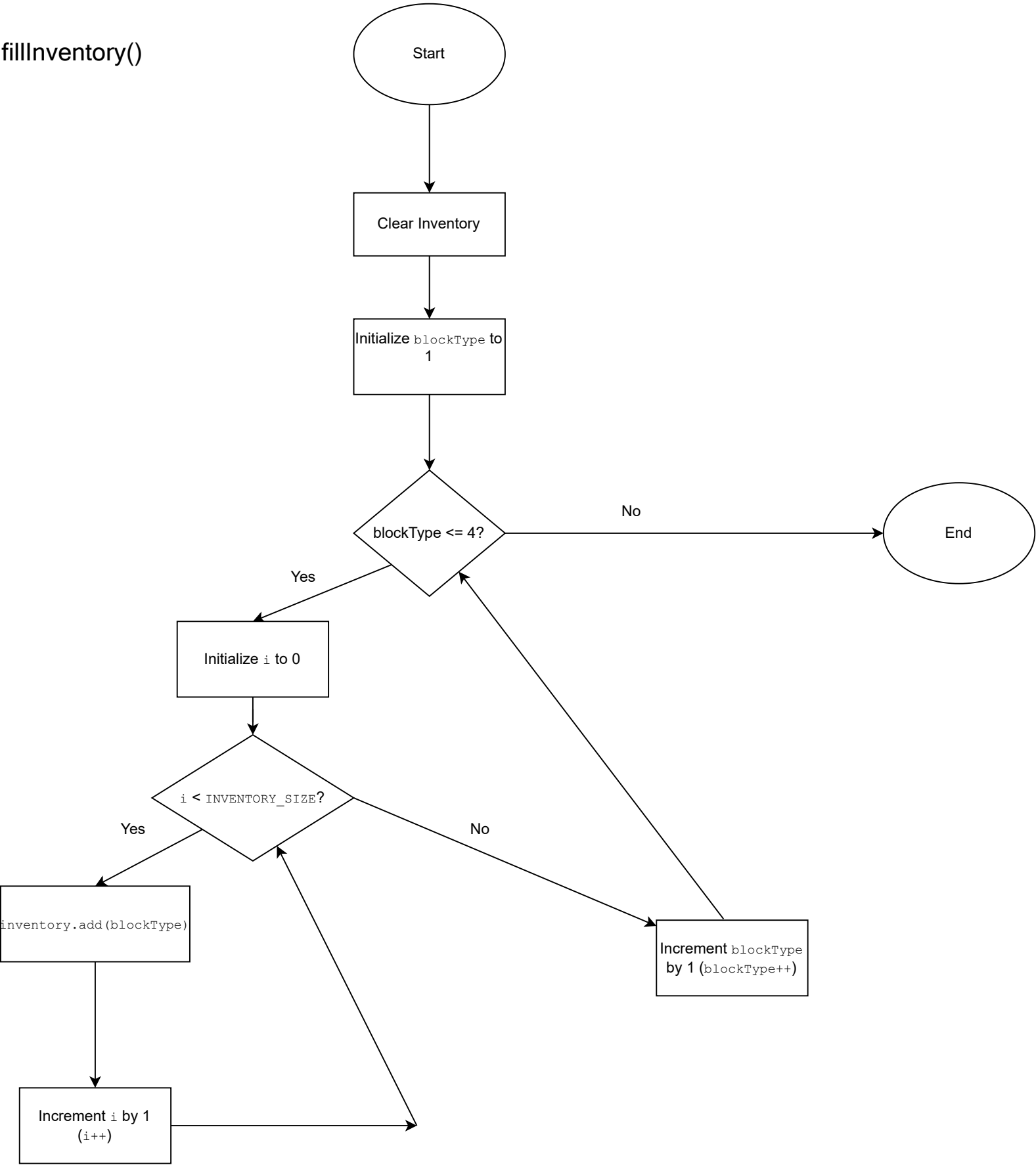
initGame



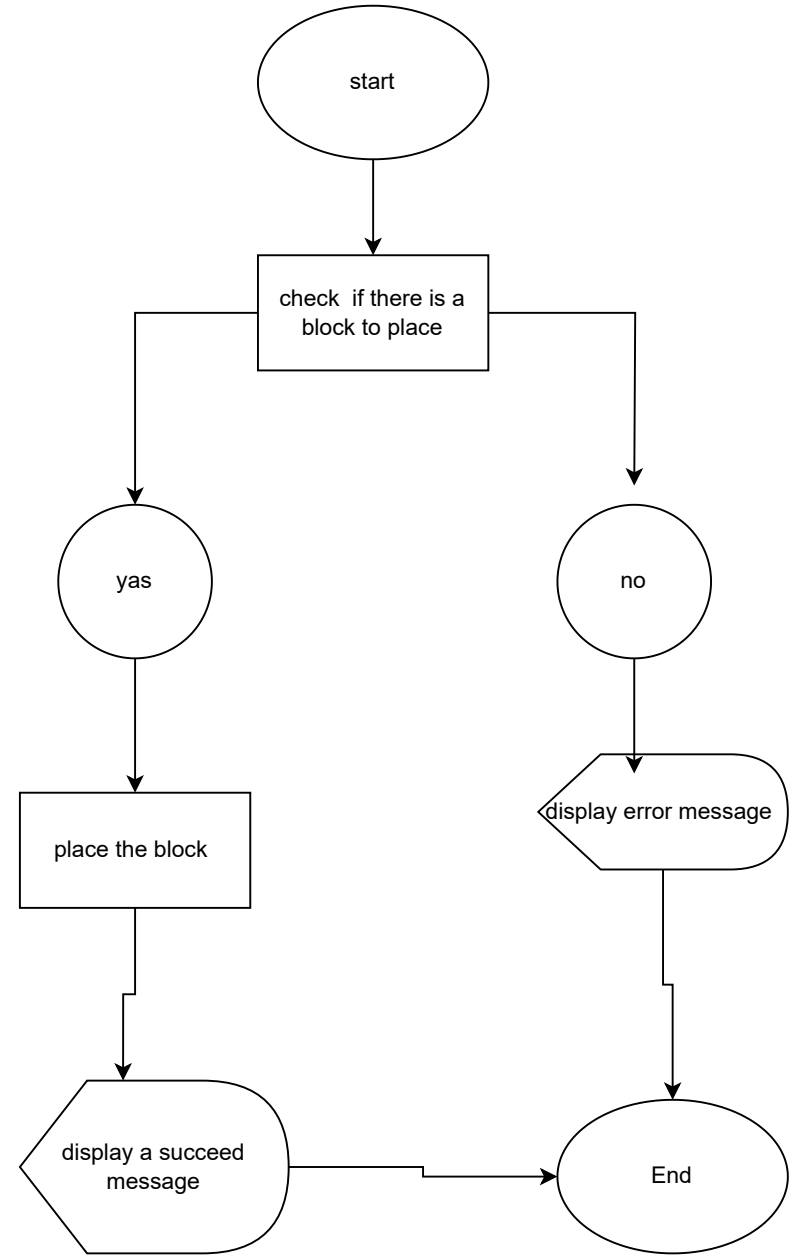
fillInventory()



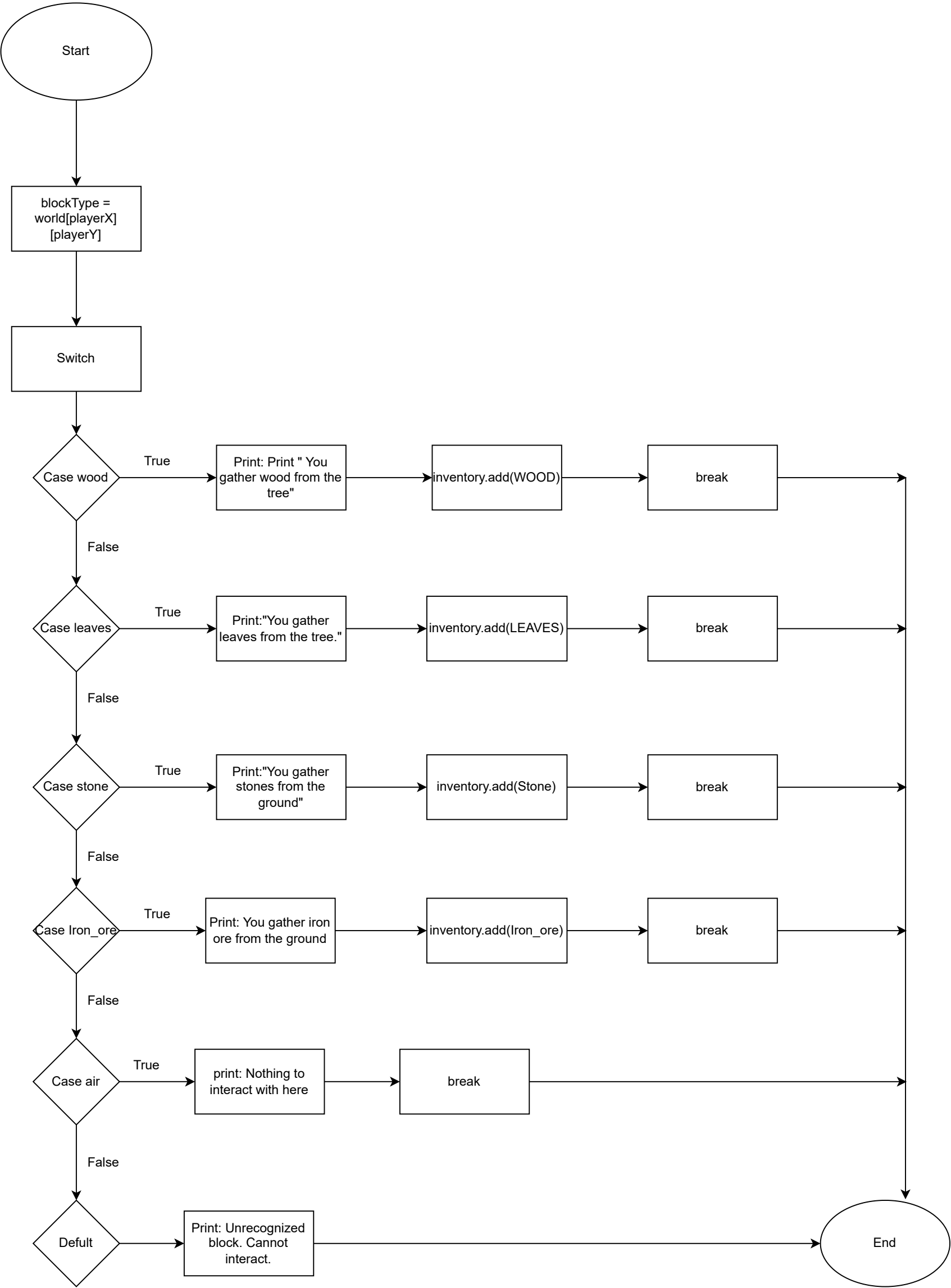
fillInventory()



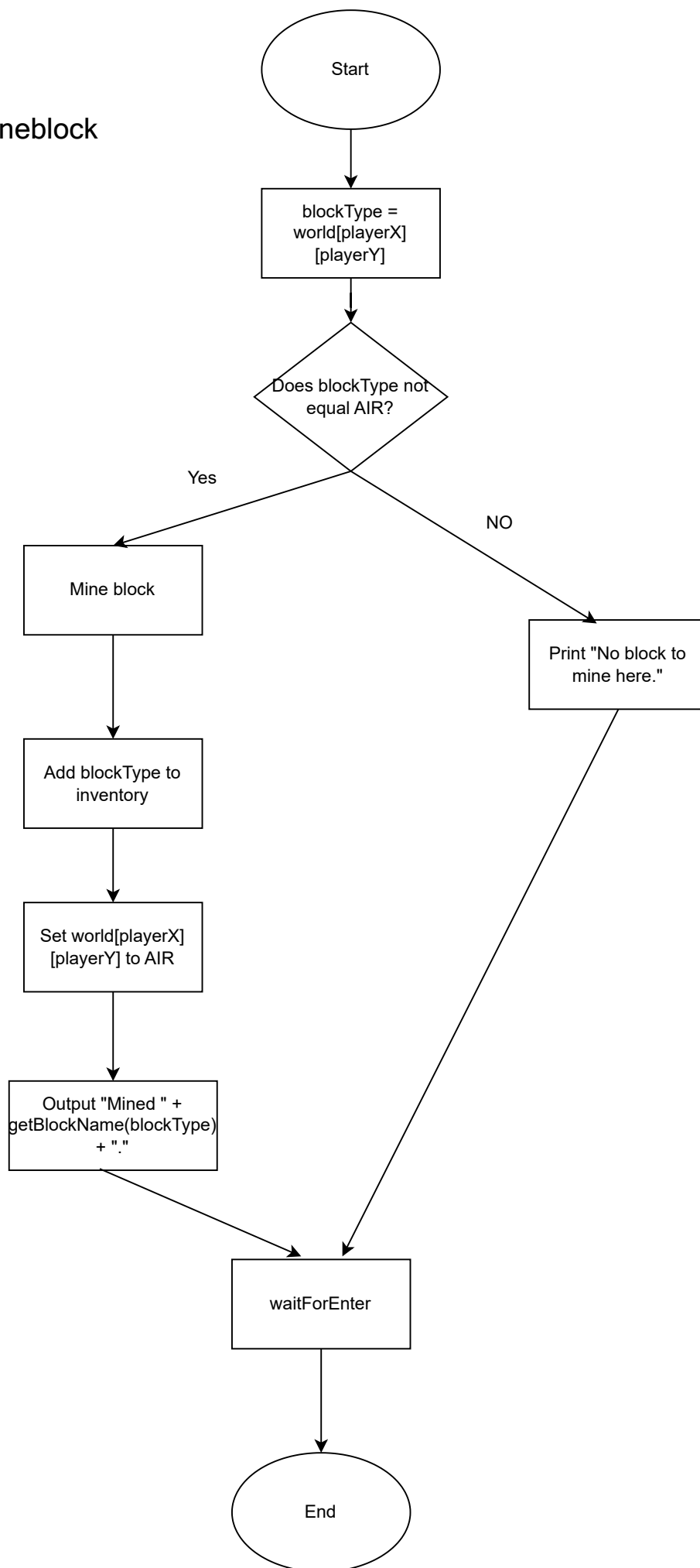
placeBlock()



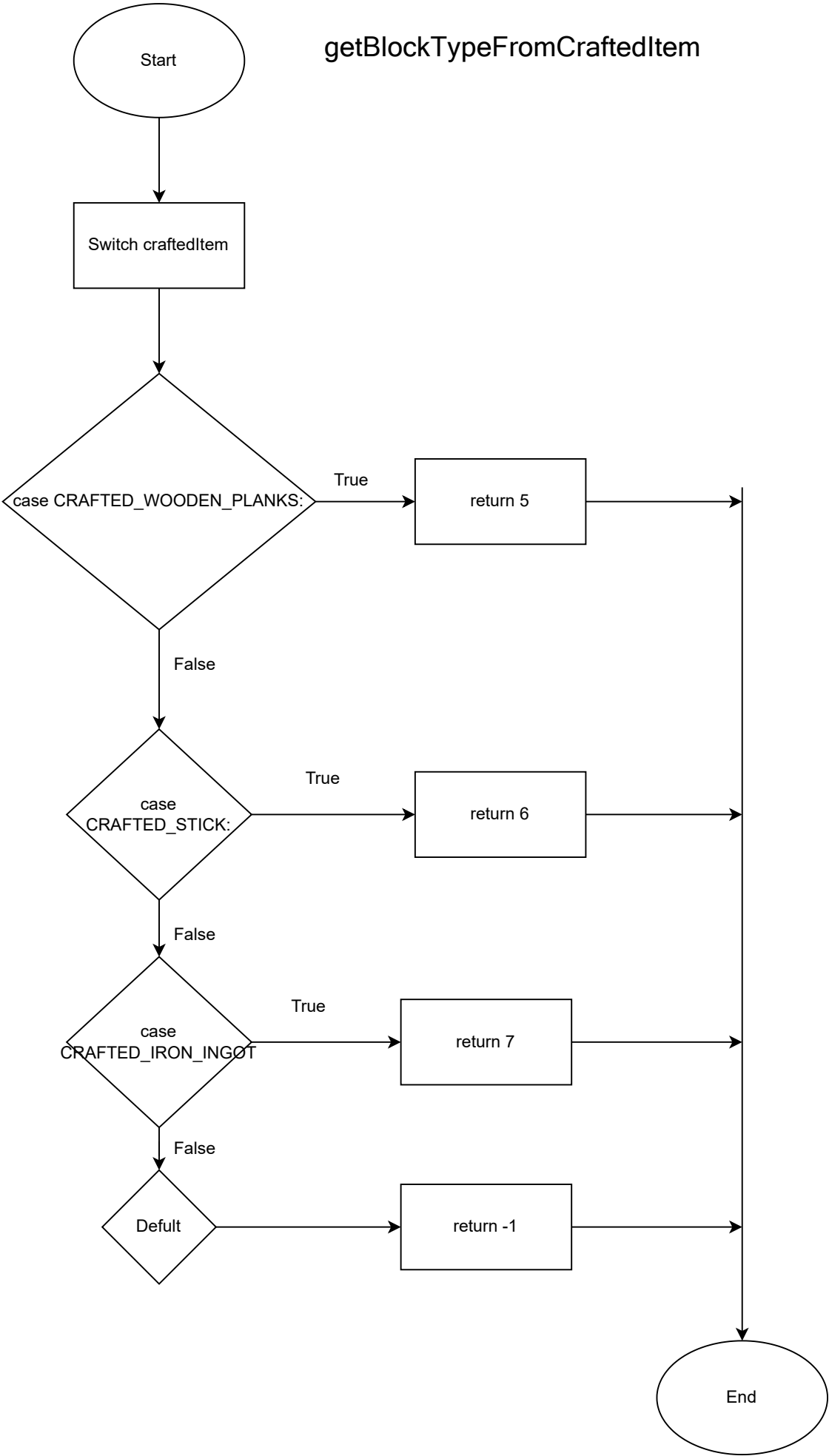
InteractWithWorld()



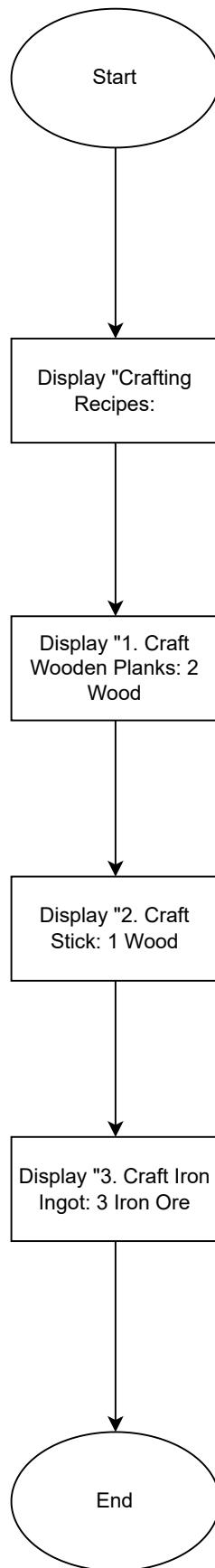
mineblock

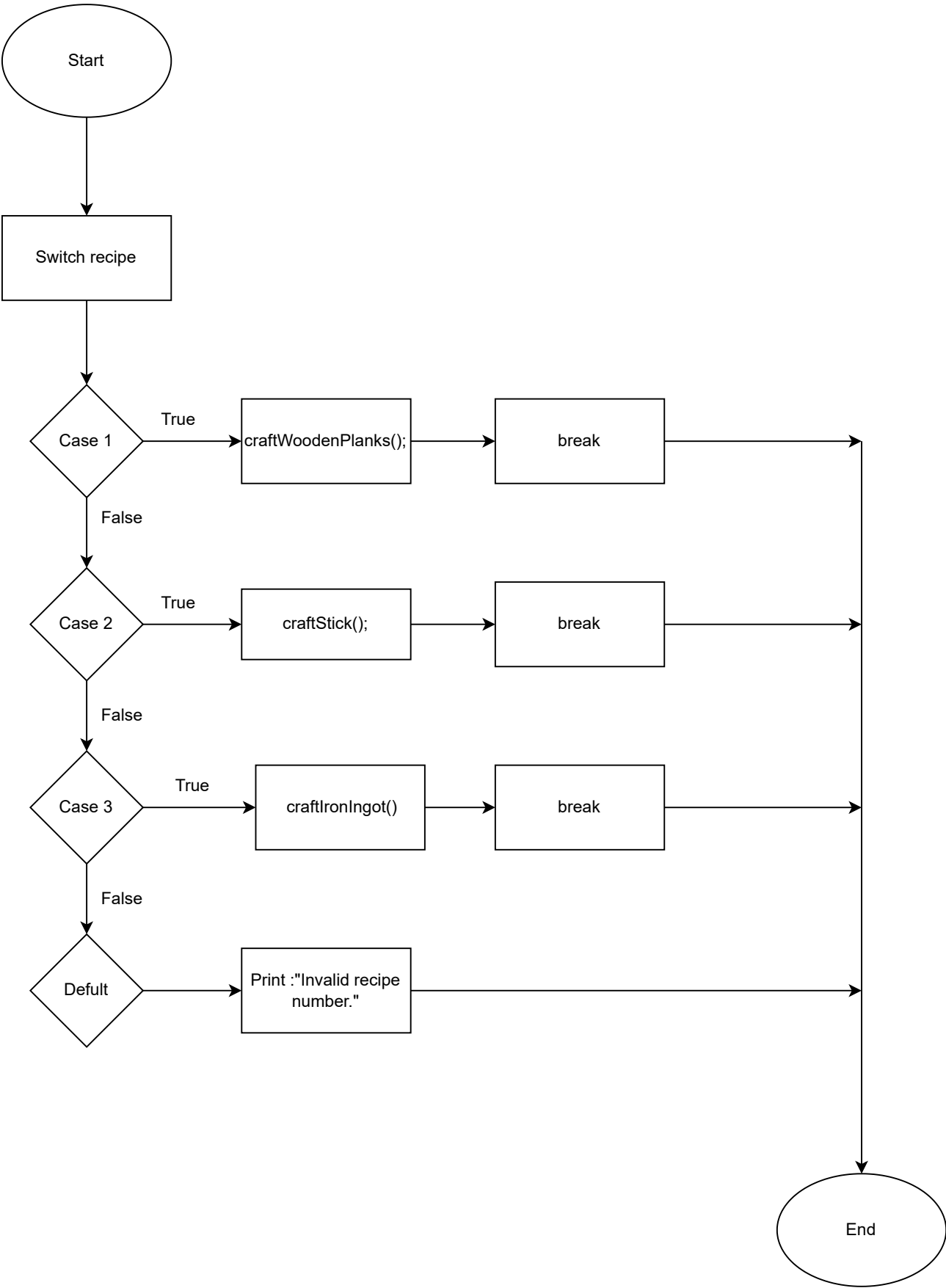


getBlockTypeFromCraftedItem



displayCraftingRecipes()





Task 2.1.1 Pseudocodes:

1. generateWorld()

Pseudocode:

```
FOR y = 0 to worldHeight
  FOR x = 0 to worldWidth
    randValue = random(0, 100)
    IF randValue < 20
      world[x][y] = WOOD
    ELSE IF randValue < 35
      world[x][y] = LEAVES
    ELSE IF randValue < 50
      world[x][y] = STONE
    ELSE IF randValue < 70
      world[x][y] = IRON_ORE
    ELSE
      world[x][y] = AIR
  END FOR
END FOR
```

Description: Generates the game world by randomly assigning block types based on probability.

2. displayWorld()

Pseudocode:

```
PRINT "World Map:"
PRINT top border
FOR y = 0 to worldHeight
  PRINT left border
  FOR x = 0 to worldWidth
    IF player at x,y AND not in secret area
      PRINT "P" with player color
    ELSE IF player at x,y AND in secret area
      PRINT "P" with secret color
    ELSE
      PRINT block symbol and color for world[x][y]
  PRINT right border
PRINT bottom border
```

Description: Displays the game world map with borders, coloring, player marker.

3. movePlayer(direction)

Pseudocode:

```
IF direction is UP AND playerY > 0
    playerY--
ELSE IF direction is DOWN AND playerY < worldHeight
    playerY++
ELSE IF direction is LEFT AND playerX > 0
    playerX--
ELSE IF direction is RIGHT AND playerX < worldWidth
    playerX++
```

Description: Moves the player in the specified direction if possible.

4. mineBlock()

Pseudocode:

```
block = world[playerX][playerY]
IF block is not empty
    add block to inventory
    set world[playerX][playerY] to empty
ELSE
    PRINT "No block to mine"
```

Description: Mines the block at the player position if not empty.

5. craftItem(recipe)

Pseudocode:

```
IF recipe is 1
    call craftWoodenPlanks()
ELSE IF recipe is 2
    call craftStick()
ELSE IF recipe is 3
    call craftIronIngot()
ELSE
    PRINT "Invalid recipe"
```

Description: Performs crafting of different items based on recipe number.

6. craftWoodenPlanks()

Pseudocode:

```
IF inventory has 2 wood
    remove 2 wood from inventory
    add crafted wooden planks to crafted items
ELSE
    PRINT "Insufficient resources"
```

Description: Crafts wooden planks if wood available.

7. getBlockName(block)

Pseudocode:

```
SWITCH block
    CASE WOOD: return "Wood"
    CASE LEAVES: return "Leaves"
    CASE STONE: return "Stone"
    CASE IRON_ORE: return "Iron Ore"
    CASE EMPTY: return "Empty Block"
    DEFAULT: return "Unknown"
```

Description: Returns name string for a block type.

8. displayInventory()

Pseudocode:

```
PRINT "Inventory:"
IF inventory empty
    PRINT "Empty"
ELSE
    FOR each block type
        PRINT block name and count
PRINT "Crafted Items:"
IF crafted items empty
    PRINT "None"
ELSE
    FOR each crafted item
        PRINT crafted item name
```

Description: Prints inventory contents and counts.

9. saveGame(filename)

Pseudocode:

- open file filename for writing
- serialize world array and write to file
- serialize playerX, playerY and write to file
- serialize inventory and write to file
- serialize craftedItems and write to file
- serialize unlockMode and write to file
- close file

Description: Saves entire game state to file using serialization.

10. loadGame(filename)

Pseudocode:

- open file filename for reading
- deserialize world array and read from file
- deserialize playerX, playerY and read from file
- deserialize inventory and read from file
- deserialize craftedItems and read from file
- deserialize unlockMode and read from file
- close file

Description: Loads entire game state from file using deserialization.

11. getCountryAndQuoteFromServer()

Pseudocode:

- send API request to server
- get JSON response
- parse response to get country and quote
- print country and quote

Description: Gets data from external API.

12. unlockSecretDoor()

Pseudocode:

IF in unlock mode AND craft/mine/move done

 unlock secret door

 generate secret world

 fill inventory

 reset unlock flags

ELSE

 print "Invalid passkey"

 reset unlock mode and flags

Description: Unlocks secret door if correct sequence of actions performed.

13. generateSecretWorld()

Pseudocode:

SET world dimensions to new values

FOR each stripe in world height

 Fill stripe with red/white/blue blocks

Description: Generates a world with red, white and blue stripes for the secret area.

14. fillInventory()

Pseudocode:

CLEAR inventory

FOR each block type

 FOR number of slots in inventory

 Add block type to inventory

Description: Fills inventory with blocks when entering secret area.

15. clearScreen()

Pseudocode:

IF Windows OS

 Execute 'cls' command

ELSE

 Print control characters to clear terminal

Print blank line

Description: Clears the terminal/console screen

Task 2.2:

1. `main()` - Main game loop, starts game (line 18)
2. `initGame()` - Initializes new game world (line 63)
3. `generateWorld()` - Randomly generates world grid (line 70)
4. `displayWorld()` - Prints world grid to console (line 84)
5. `getBlockSymbol()` - Gets display symbol for a block (line 104)
6. `getBlockChar()` - Gets character for a block type (line 114)
7. `startGame()` - Handles main game input loop (line 126)

8. fillInventory() - Fills inventory when entering secret area (line 223)
9. resetWorld() - Resets world grid and player position (line 233)
10. generateEmptyWorld() - Generates new empty world grid (line 242)
11. clearScreen() - Clears console screen (line 266)
12. lookAround() - Prints nearby blocks around player (line 273)
13. movePlayer() - Handles player movement on input (line 286)

14. mineBlock() - Handles mining block at player position (line 298)
15. placeBlock() - Handles placing block from inventory (line 307)
16. getBlockTypeFromCraftedItem() - Gets block type from crafted item (line 329)
17. getCraftedItemFromBlockType() - Gets crafted item from block type (line 338)
18. displayCraftingRecipes() - Prints available recipes (line 346)
19. craftItem() - Handles crafting items (line 353)
20. craftWoodenPlanks() - Crafts wooden planks (line 361)

- 21. `craftStick()` - Crafts stick (line 370)
- 22. `craftIronIngot()` - Crafts iron ingot (line 379)
- 23. `inventoryContains()` - Checks if inventory contains item (line 388)
- 24. `removeItemsFromInventory()` - Removes items from inventory (line 413)
- 25. `addCraftedItem()` - Adds crafted item to list (line 422)
- 26. `interactWithWorld()` - Handles world interactions (line 425)
- 27. `saveGame()` - Saves game state to file (line 443)
- 28. `loadGame()` - Loads game state from file (line 459)

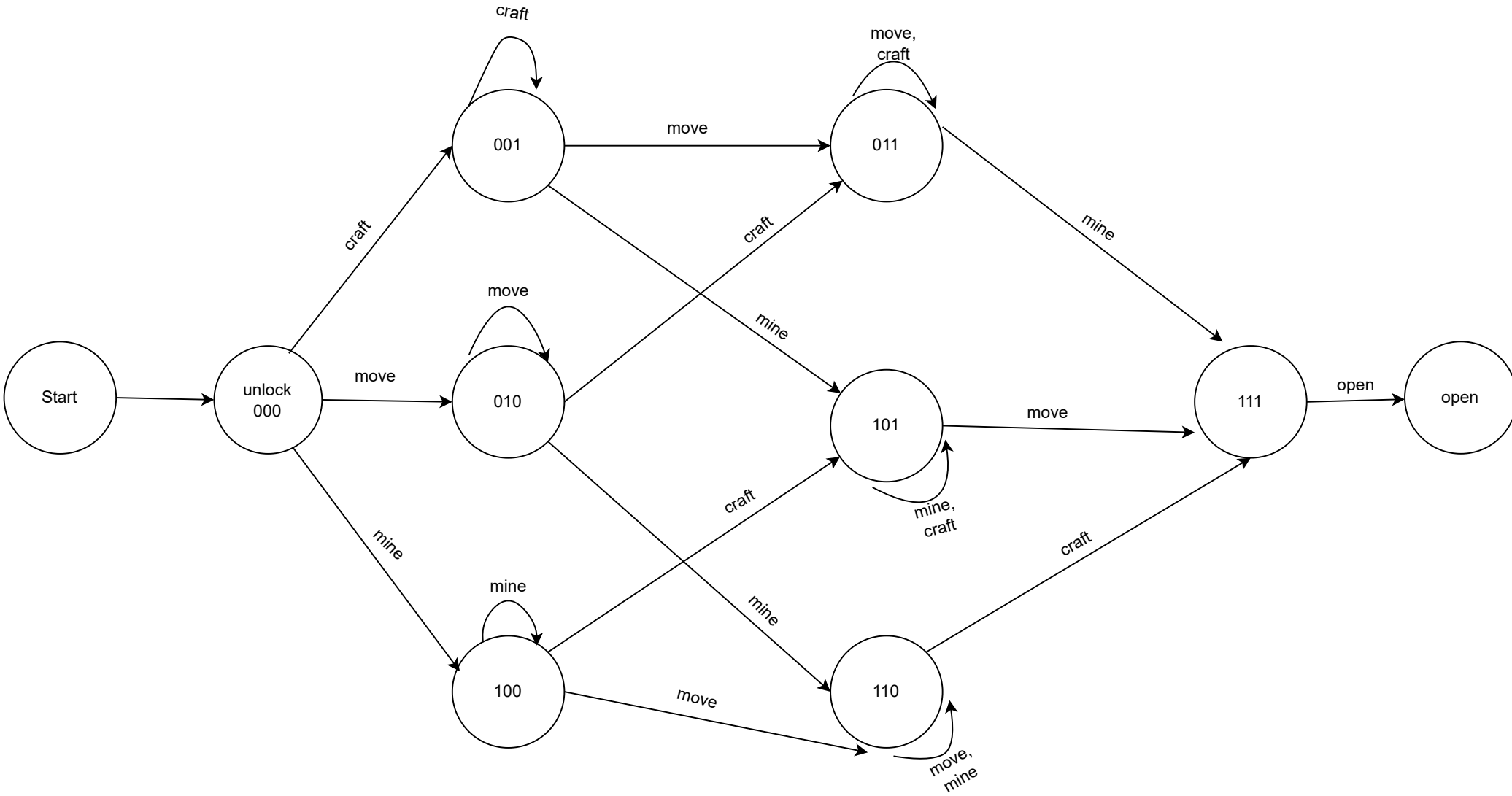
- 29. `getBlockName()` - Gets name string for block (line 472)
- 30. `displayLegend()` - Prints game legend/key (line 478)
- 31. `displayInventory()` - Prints player inventory (line 486)
- 32. `getBlockColor()` - Gets ANSI color code for block (line 514)
- 33. `waitForEnter()` - Waits for user input (line 517)
- 34. `getCraftedItemName()` - Gets name for crafted item (line 524)
- 35. `getCraftedItemColor()` - Gets color code for crafted item (line 533)
- 36. `getCountryAndQuoteFromServer()` - API call for data (line 536)

Task 2.3.1:

1: To access the door you need to follow a sequence of actions. This includes entering an "unlock mode" and performing tasks such as crafting, mining and moving. Once you successfully unlock the door you will be able to enter an area with a new game board. You will notice the flag of The Netherlands displayed on the map.

2:

DFA:



Who did what?:

Student Name	Provisional Report
Tolga Efe Savash	%50 of Flowchart, %33 of pseudocode, %33 of FSA design, %38 of Git
Mert Doğan	%20 of Flowchart, %33 of pseudocode, %33 of FSA design, %31 of Git
Metehan Bilir	%30 of Flowchart, %33 of pseudocode, %33 of FSA design, %31 of Git
Onur Özgen	%0 of Flowchart, %1 of Pseudocode, %1 of FSA design,