Project Report

Project Report: Group 79

Sunday, October 22, 2023

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Attribute	Details
Group Name	Group79
Group Number	79
TA	[]

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1 Introduction

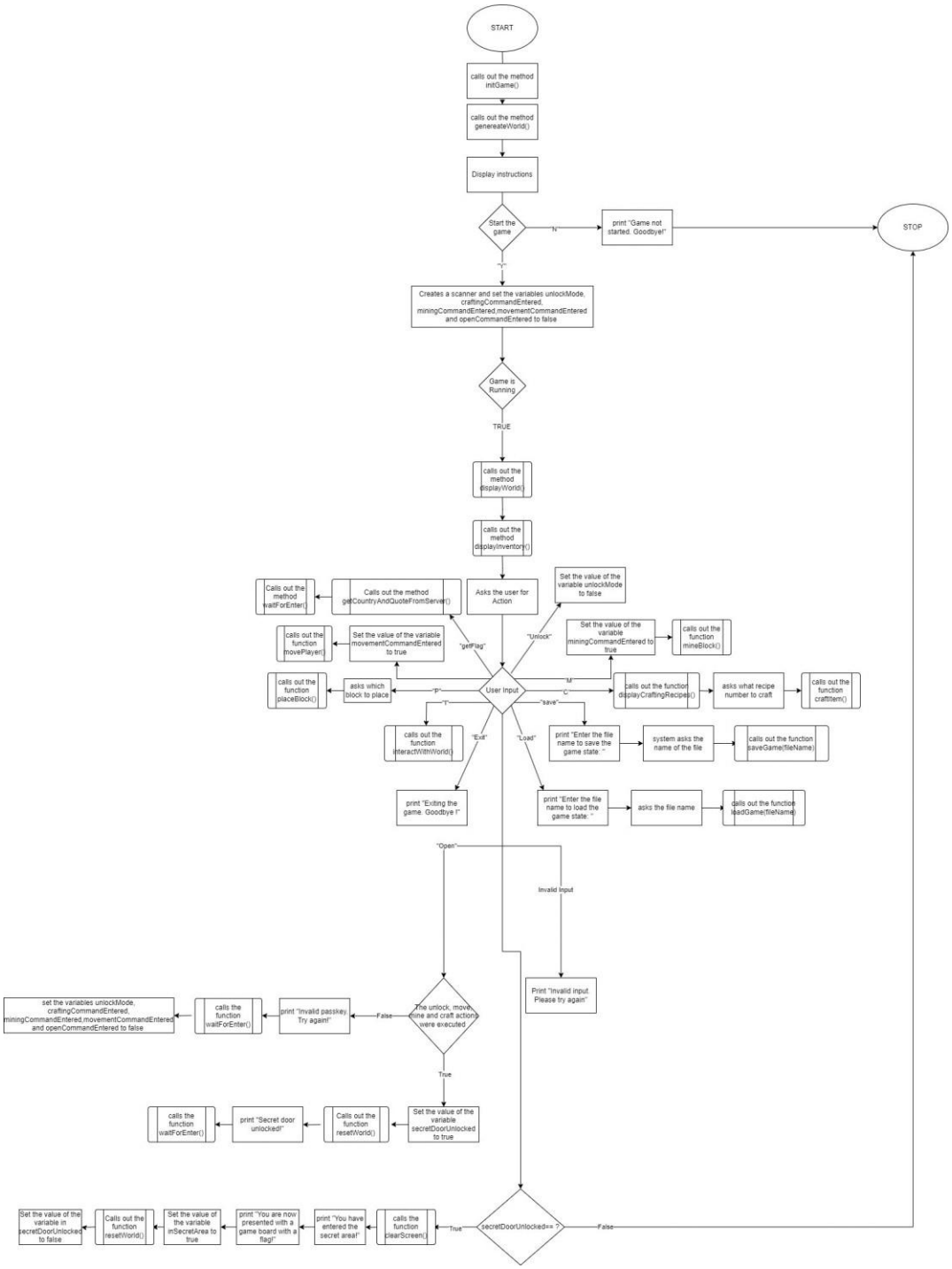
JavaCraft is a robust, text-based game project built entirely in Java that provides students with a holistic academic exercise in computer science, logical thinking, and collaboration skills. This project brings together over 35 Java functions to create a diverse gameplay experience that engages creativity, analytics, and technical expertise. We worked in a team of five to implement JavaCraft. Through this team-based approach, students develop key collaborative abilities such as communication, task delegation, and source control. The project has clearly defined learning outcomes covering core computer science concepts like system design, flow control, data structures, and object-oriented programming.

Who did what Overview :

Section	Student(s)
Introduction	Liam
JavaCraft's Workflow	Liam
Functionality Exploration	Mika (20%)/ Gustas (20%)/ Kennedy (20%)/ Liam (20%)/George (20%)
Secret Door (FSA) Design	Mika (70%)/ George (30%)
Git Collaboration & Version Control	Mika (20%)/ Gustas (20%)/ Kennedy (20%)/ Liam (20%)/George (20%)
Flowcharts/Pseudocodes of 15 functions	Mika (20%)/ Gustas (20%)/ Kennedy (20%)/ Liam (20%)/George (20%)
Extending the Game Code	Kennedy(33%)/Gustas(33%) Liam(33%)
Interacting with Flags API	Mika
Conclusion	Liam(50%)/George (25%)/Gustas(25%)
Report	Liam

2 JavaCraft's Workflow

- Flowchart For Game



Pseudocode For Game:

```
Initialize Game(width, height)
  Set worldWidth to width
  Set worldHeight to height
  Initialize world as a 2D array of size (width, height)
  Set playerX to width / 2
  Set playerY to height / 2
  Initialize inventory as an empty list
  Set unlockMode to false
  Set secretDoorUnlocked to false
  Set inSecretArea to false

Generate World()
  For each cell (x, y) in world
    Generate a random value
    Assign a block type based on the random value

Display World()
  Display the world map with symbols and colors
  Highlight the player's position

Move Player(direction)
  Update player's position based on the direction

Mine Block()
  Get the block type at the player's position
  If the block is not empty
    Add the block to the inventory
    Set the block at the player's position to empty

Place Block(blockType)
  If the block type is valid
```

If the block is in the inventory

Remove the block from the inventory

Place the block at the player's position

Craft Item(recipe)

Check the recipe number

If it matches a crafting recipe

Craft the corresponding item if resources are available

Interact with World()

Get the block type at the player's position

Perform an interaction based on the block type

Save Game(fileName)

Serialize game state data and write to the file

Load Game(fileName)

Deserialize game state data from the file and load into the program

Unlock Secret Door()

Check if certain conditions are met (unlockMode, actions performed)

Set secretDoorUnlocked to true

Reset the world

Get Country and Quote from Server()

Send a request to a server to get country and quote data

Parse the response and display country and quote

Main()

Initialize the game

Generate the world

Display instructions

Start the game loop

Handle user input and game logic

End the game loop

Exit the game

3 Functionality Exploration

List of key functionalities explored:

No. Function Name	Description
1 Main	This is the entry point of the program. It initializes the game, generates the game world, and handles user input to start the game or exit.
2 initGame	this function initializes the game loading up any initial information such as the welcome page as well as basic instructions on how to start up the program
3 generateWorld	this function generates a world, filling up the 2D array with different blocks based on a random value generator. Based on the value, each 'block' is filled with a certain element such as leaves
4 displayWorld	this method goes through the array and displays a certain character based on what value is stored in that part of the array. This repeats for each value until the boundaries 'worldHeight' and 'worldWidth' are reached
5 getBlockSymbol	this method 'gets' the block symbol depending on what value is stored within that space in the array.
6 getBlockChar	Returns the ASCII character for a given block type used in crafting recipes.
7 startGame	this function starts the game, this means that after the user inputs 'y', the game begins and the function startGame calls upon functions such as displayWorld and others in order to show and display the game
8 movePlayer	Moves the player's position based on the input direction (WASD or arrow keys).
9 mineBlock	Makes the player mine and obtain the block placed in the position of the player, if there is indeed a block this function will notify that the action has been successful and the type of block mined. In the same way, if there is no block that can be mined the system will tell it to the player
10 displayInventory	The system will display a section which is the player's inventory, containing every item and block the player has obtained, specifying the quantity of each
11 placeBlock	Allows the player to place a block from their inventory at their current position.
12 displayCraftingRecipes	The system will display a section which is the player's inventory, containing every item and block the player has obtained, specifying the quantity of each
13 craftItem	Crafts an item based on the selected recipe.

14 interactWithWorld	Allows the player to interact with different block types in the game world, adding them to the inventory.
15 saveGame	Saves the current game state, including world data, player position, and inventory, to a file.
16 loadGame	Loads a saved game state from a file and restores it to continue the game.
17 lookAround	Displays a limited view of the nearby blocks from the player's current position.
18 getCountryAndQuoteFromServer	Makes an HTTP request to a server to retrieve and display a country name and a quote.
19 waitForEnter	Pauses the game and waits for the player to press Enter.
20 resetWorld	Resets the game world to its initial state for the secret door unlock sequence.
21 clearScreen	Clears the console screen, providing a visual update for the player.
22 fillInventory	this method first clears the player's inventory, then it loops and 'fills up' the inventory of the player with the certain block type. This loop ends once inventory is full.
23 generateEmptyWorld	generates a new map with the a custom width and height ,as well as the default red block, white block and blue block amount, it also divides the height into 3 equal parts
24 getBlockName	this function gets the block name depending on the block type, it returns wood if the block type is wood etc etc
25 getCraftedItemFromBlockType	Converts a block type to its corresponding crafted item
26 getCraftedItemName	Returns the name of a crafted item based on its type.
27 craftWoodenPlanks	this method creates the item WoodenPlanks and adds it to your inventory. To do this you need to have the blocks needed to build it, that being 2 wood blocks. It also removes 2 wood blocks from your inventory.
28 craftStick	this method creates the item stick and adds it to your inventory. To do this you need to have the blocks needed to build it, that being 1 wood block. It also removes 1 wood block from your inventory.

29 craftIronIngot	this method creates the item ironIngot and adds it to your inventory. To do this you need to have the blocks needed to build it, that being 3 iron ore. It also removes 3 iron ore from your inventory.
30 getBlockTypeFromCraftedItem	depending on what type of block the user has the code lets the user print either wooden_planks, crafted_sticks or crafted_iron_ingot
31 getCraftedItemFromBlockType	Converts a block type to its corresponding crafted item.
32 displayLegend	this function allows the player to understand which block is represented by what symbol on the map. It shows colored text and says what type of block it shows
33 removeItemsFromInventory	this method removes a certain item as well as the amount you remove from a player's inventory
34 inventoryContains	using the name of the item as a parameter, this function checks if the inventory contains that item.
35 getBlockColor	this method is used in order to show the color of each block. For example, air is blank, wood is red, etc etc.
36 addCraftedItem	Adds a crafted item to the player's list of crafted items.

4 Finite State Automata (FSA) Design

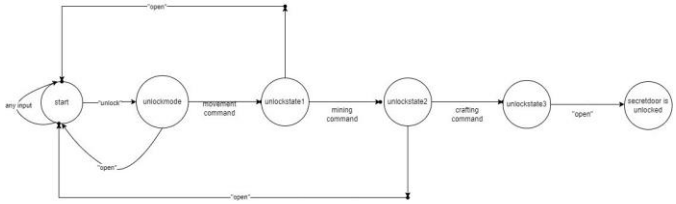
- Secret Door Logic Analysis:

The secret door and unlock logic allow the player to access a hidden "secret area" in the game world, but only if they perform the correct sequence of actions to unlock it.

How it works:

-There is a special "unlock mode" that tracks the player's actions -
The player enters "unlock" command to activate unlock mode -In
unlock mode, the following actions are tracked:
-Movement (with WASD or arrow keys)
-Mining a block (with M)
-Crafting an item (with C)
-Opening the door (with Open) -To
unlock the door, the player must:
-Enter unlock mode
-Perform movement
-Perform mining
-Perform crafting
-Then enter the Open command
-If the correct sequence is entered, the secretDoorUnlocked boolean is set to true -This
generates a new world and fills the player inventory to access the secret area

• FSA Illustration & Description:



NFA

NFA was chosen over DFA because this way we can use the 'guessing' aspects of an NFA to our advantage. To start off we have to type in the command "unlock" to get into "unlockmode" . From here on we have to try all of the following commands : movement, mining and crafting. If the NFA guesses right for every command it will eventually end up in unlockstate3 where we can type in the command "open" to unlock the secret door. Note that if we try the command "open" for any state that isnt unlockstate3 everything will be reset and we have to start over again.

5 Git Collaboration & Version Control

- Repository Link: https://gitlab.maastrichtuniversity.nl/bcs1110/javacraft.git
- Branch Details: Branch Group79, Members: Mika Hagenbeek, Liam Zerbi, Kennedy Fernandes, Gustas Vieversys, George Karaintros

6 Extending the Game Code (For Final Submission)

New Block Types:

- Sand (block id 5)

- Obsidian (block id 6)

New recipe:

A new recipe was added, it allows the player to combine 1 sand block and 1 stone block from their inventory to craft a sandstone block.

These new block types were added to represent sand and obsidian blocks in the game world. They have their own unique block symbols and colors

The new blocks and crafted items were integrated into existing game systems:

-Generating the world with a chance to spawn sand and obsidian blocks

-Recognizing the new blocks when displaying the world

-Allowing the new blocks to be mined and placed

-Adding the crafted sandstone to the player's inventory and allowing it to be placed

-Updating the legend, block info, and crafted item handling for the new types

```java
private static String getBlockSymbol(int blockType) {
    String blockColor;
    switch (blockType) {
        case AIR:
            return ANSI_RESET + "- ";
        case WOOD:
            blockColor = ANSI_RED;
            break;
        case LEAVES:
            blockColor = ANSI_GREEN;
            break;
        case STONE:
            blockColor = ANSI_BLUE;
            break;
        case IRON_ORE:
            blockColor = ANSI_WHITE;
            break;
        case SAND :
            blockColor = ANSI_YELLOW;
            break;
        case OBSIDIAN :
            blockColor = ANSI_PURPLE;
            break;
        default:
            blockColor = ANSI_RESET;
            break;
    }
    return blockColor + getBlockChar(blockType) + " ";
}
```

```java
public static void displayLegend() {
    System.out.println(ANSI_BLUE + "Legend:");
    System.out.println(ANSI_WHITE + "-- - Empty block");
    System.out.println(ANSI_RED + "\u2592\u2592 - Wood block");
    System.out.println(ANSI_GREEN + "\u00A7\u00A7 - Leaves block");
    System.out.println(ANSI_BLUE + "\u2593\u2593 - Stone block");
    System.out.println(ANSI_WHITE + "\u00B0\u00B0- Iron ore block");
    System.out.println(ANSI_YELLOW + "\u2593\u2593- Sand block");
    System.out.println(ANSI_PURPLE + "\u00A5\u00A5- Obsidian block");
    System.out.println(ANSI_BLUE + "P - Player" + ANSI_RESET);
}
```

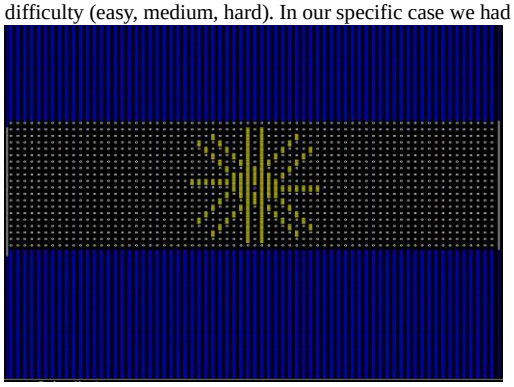
```java
private static char getBlockChar(int blockType) {
    switch (blockType) {
        case WOOD:
            return '\u2592';
        case LEAVES:
            return '\u00A7';
        case STONE:
            return '\u2593';
        case IRON_ORE:
            return '\u00B0';
        case SAND:
            return '\u2593';
        case OBSIDIAN:
            return '\u00A5';
        default:
            return '-';
    }
}
```

```java
public static void displayCraftingRecipes() {
    System.out.println(x:"Crafting Recipes:");
    System.out.println(x:"1. Craft Wooden Planks: 2 Wood");
    System.out.println(x:"2. Craft Stick: 1 Wood");
    System.out.println(x:"3. Craft Iron Ingot: 3 Iron Ore");
    System.out.println(x:"4. Craft Sandstone: 1 Sand block, 1 Stone");
}
```

```java
public static void craftSandStone() {
    if (inventoryContains(SAND, count:1) && inventoryContains(STONE, count:1)) {
        removeItemsFromInventory(SAND, count:1);
        removeItemsFromInventory(STONE, count:1);
        addCraftedItem(CRAFTED_SANDSTONE);
        System.out.println(x:"Crafted Sandstone.");
    } else {
        System.out.println(x:"Insufficient resources to craft Sandstone.");
    }
}
```

7 Interacting with Flags API (For Final Submission)

The Flags API was explored to incorporate flag rendering on the game grid. This feature adds an engaging and visually appealing element to the gameplay, allowing players to interact with flags from various countries. Each group could ask for a random flag classified by difficulty (easy, medium, hard). In our specific case we had to make the Argentinian Flag



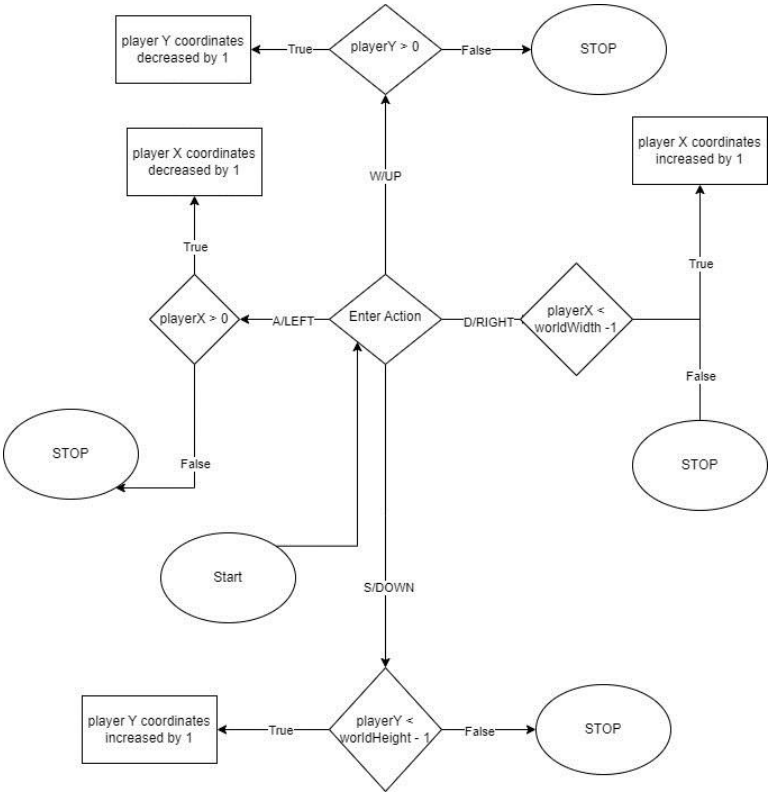
8 Conclusion (For Final Submission)

Overall, this project was a great learning experience that allowed us to enhance our programming skills. We familiarized ourselves with Object-Oriented Programming concepts and learned how to collaborate on a shared codebase using Git. Dividing responsibilities evenly took some trial-and-error, but we eventually found an effective rhythm.

We were able to understand and expand a code we didn't create and be coherent with it. Overall, this project gave us great experience taking an initial framework to a finished product as a team. The skills we've developed in terms of collaborating on existing code, project management, and modifying existing features will be invaluable for our future projects.

9 Appendix

playerMove function:

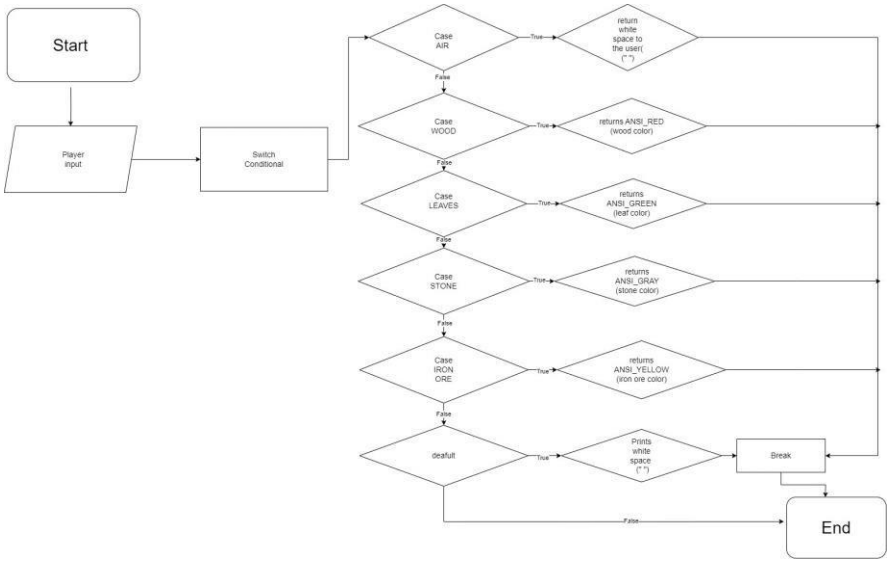


Flowchart:

Pseudocode:

```
Function playerMove(direction, playerX, playerY, worldWidth, worldHeight)
 Switch direction:
Case "W" or "UP":
   If playerY > 0:
      Decrement playerY by 1
Case "S" or "DOWN":
   If playerY < worldHeight - 1:
     Increment playerY by 1
Case "A" or "LEFT":
   If playerX > 0:
     Decrement playerX by 1
Case "D" or "RIGHT":
   If playerX < worldWidth - 1:
     Increment playerX by 1
 Default:
    Do nothing for invalid input.
```

getBlockColor function:

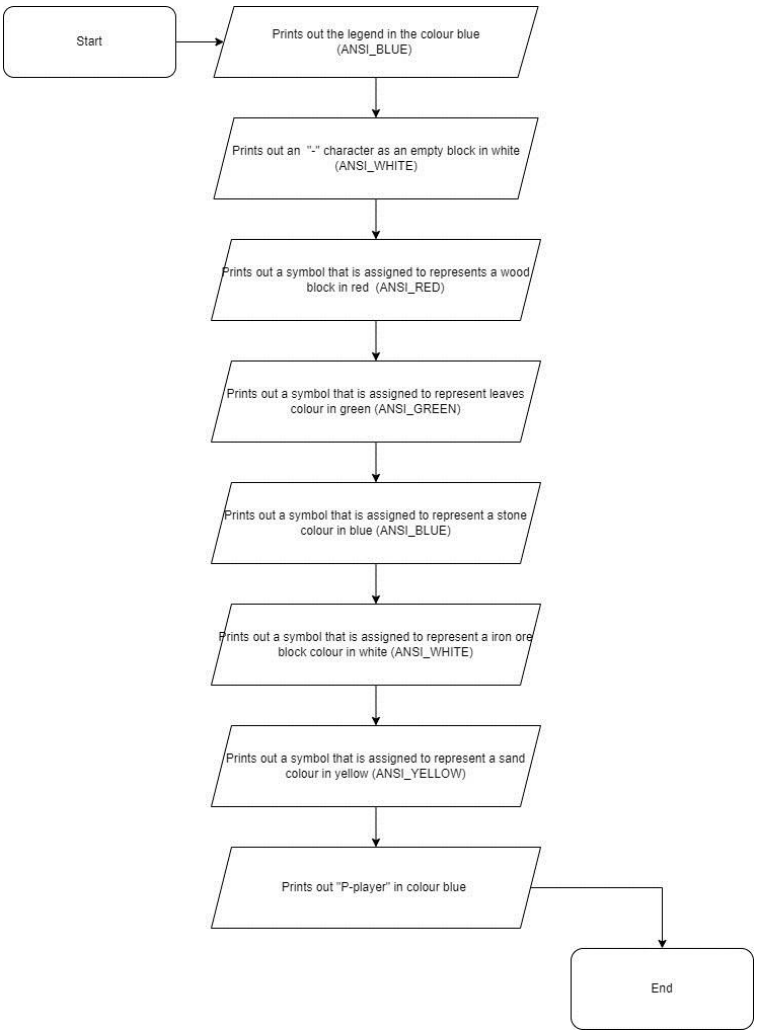


Flowchart:

PseudoCode:

```
function getBlockColor(blockType)
if blockType is AIR
  return "No Color"
else if blockType is WOOD
  return "Red"
else if blockType is LEAVES
  return "Green"
else if blockType is STONE
  return "Gray"
else if blockType is IRON_ORE
  return "White"
else if blockType is SAND
  return "Yellow"
else if blockType is OBSIDIAN
  return "Purple"
else
  return "Unknown Color"
```

displayLegend function :

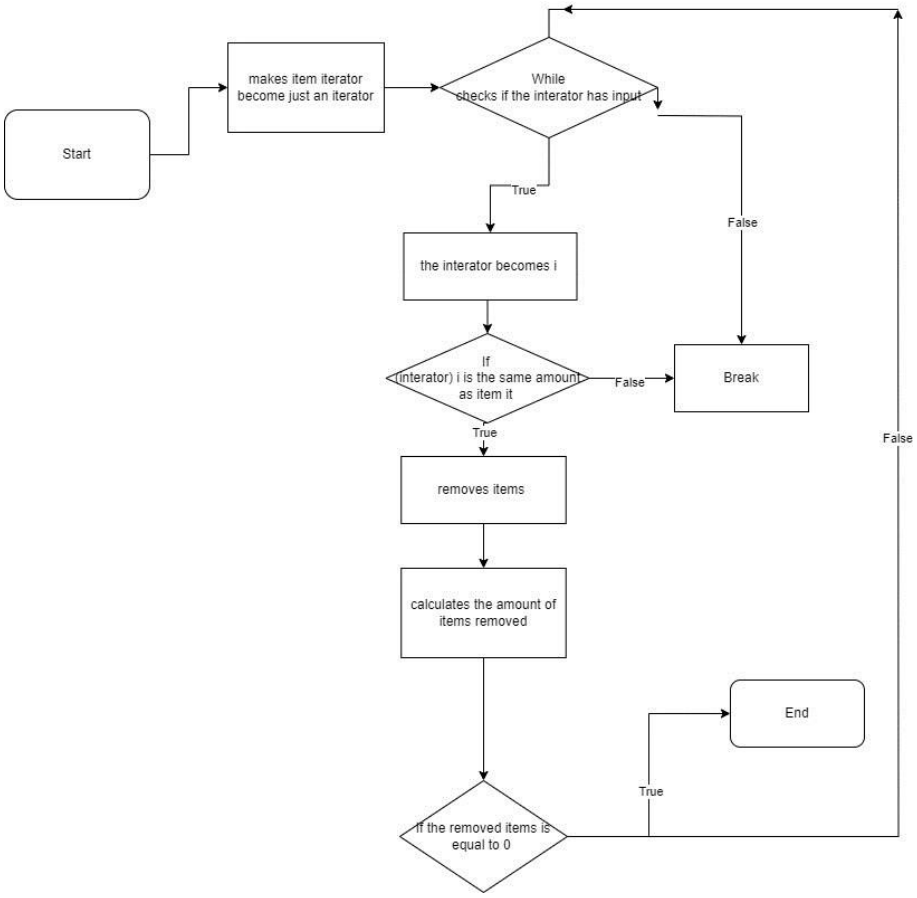


Flowchart :

PseudoCode :

```
function displayLegend()
print "Legend:"     print "-- -
Empty block"     print "?? -
Wood block"     print "## -
Leaves block"     print "[] -
Stone block"     print "@@ -
Iron ore block"     print "?? -
Sand block"     print " ¥ ¥ -
Obsidian block"     print "P  -
Player"
```

removeItem function :



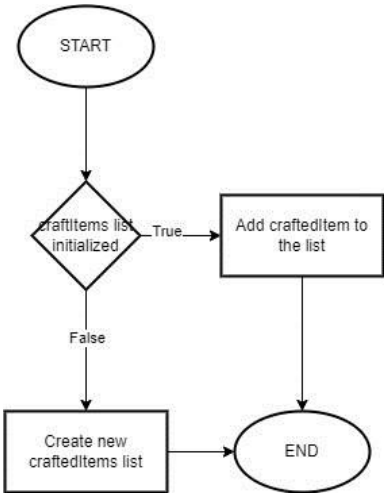
Flowchart :

PseudoCode :

```
function removeItem(item, count)
    Initialize itemCount to 0
    Initialize iterator to inventory.iterator()
    while iterator has next
        itemInInventory = iterator.next()
        if itemInInventory is equal to item
            Remove itemInInventory from inventory
            Increment itemCount by 1
            if itemCount is equal to count
                Exit loop
```

addCraftedItem function :

Flowchart :

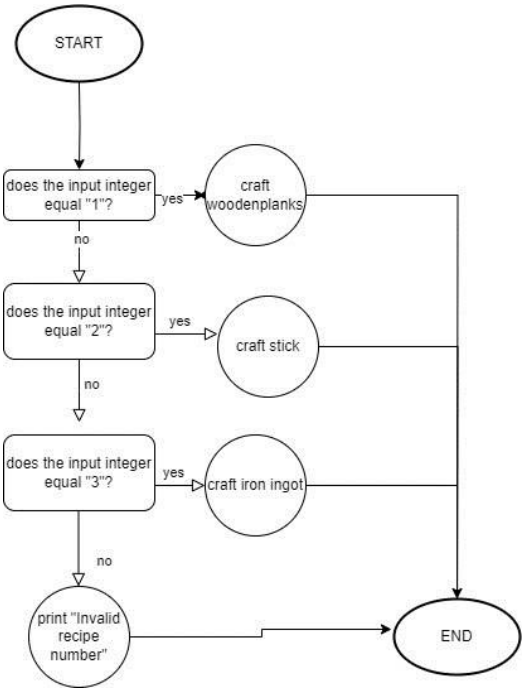


PseudoCode :

```
function addCraftedItem(craftedItem)
   if craftedItems is null
      Initialize craftedItems as an empty list
   Add craftedItem to craftedItems list
```

craftItem function :

Flowchart :

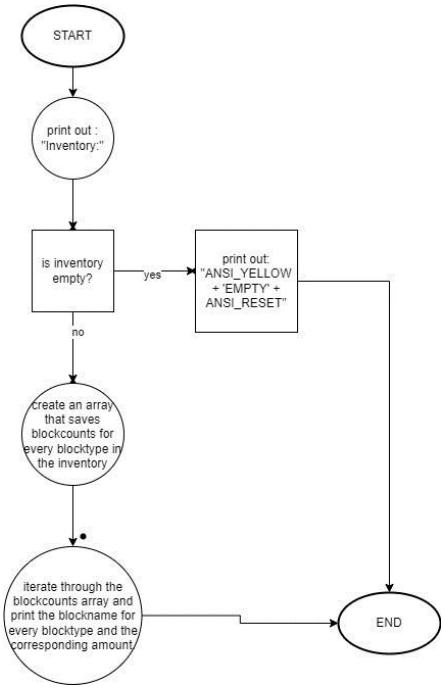


PseudoCode :

```
function craftItem(recipe)
    case recipe of
        1:
            craftWoodenPlanks()
        2:
            craftStick()
        3:
            craftIronIngot()
        4:
            craftSandStone()
        default:
            print "Invalid recipe number."
```

displayInventory function :

Flowchart :

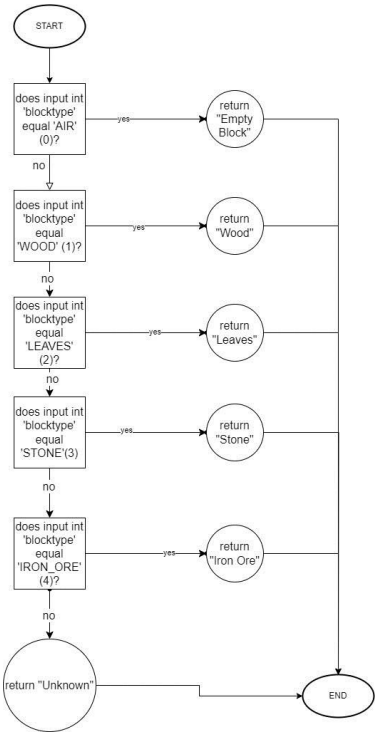


PseudoCode :

```
function displayInventory()
    print "Inventory:"
    if inventory is empty
        print "Empty"
    else
        Initialize blockCounts as an array of size 7, all elements set to 0
        for item in inventory
            Increment the corresponding element in blockCounts
        for blockType from 1 to 6
            occurrences = blockCounts[blockType]
            if occurrences is greater than 0
                print "Block: " + getBlockName(blockType) + " - Count: "
+occurrences
    print "Crafted Items:"
    if craftedItems is null or empty
        print "None"
    else
        for item in craftedItems
            print "Crafted Item: " + getCraftedItemName(item)
```

getBlockName function :

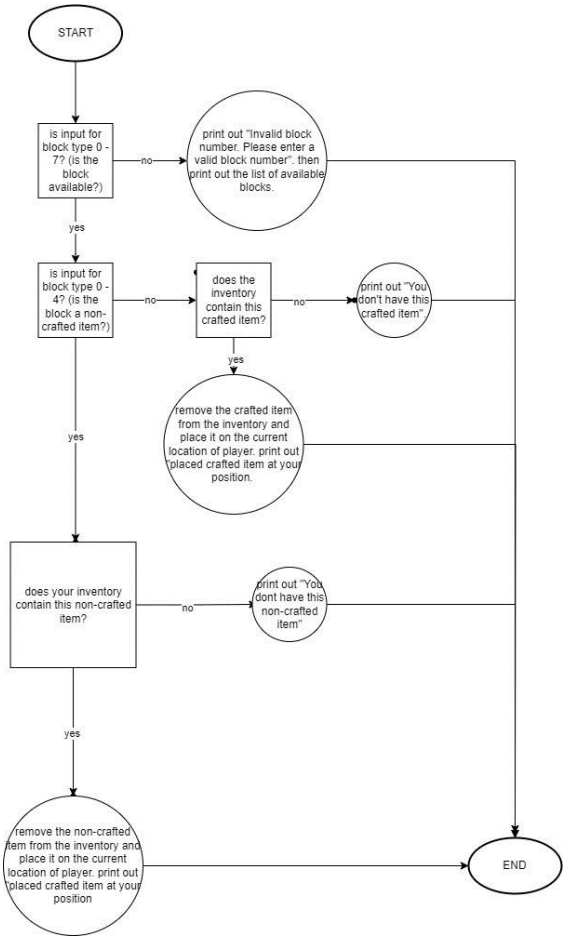
Flowchart :



PseudoCode :

```
function getBlockName(blockType)
   switch blockType
      case AIR:
         return "Empty Block"
      case WOOD:
         return "Wood"
      case LEAVES:
         return "Leaves"
      case STONE:
         return "Stone"
      case IRON_ORE:
         return "Iron Ore"
      case SAND:
         return "Sand"
      case OBSIDIAN:
         return "Obsidian"
      default:
         return "Unknown"
```

placeBlock function :



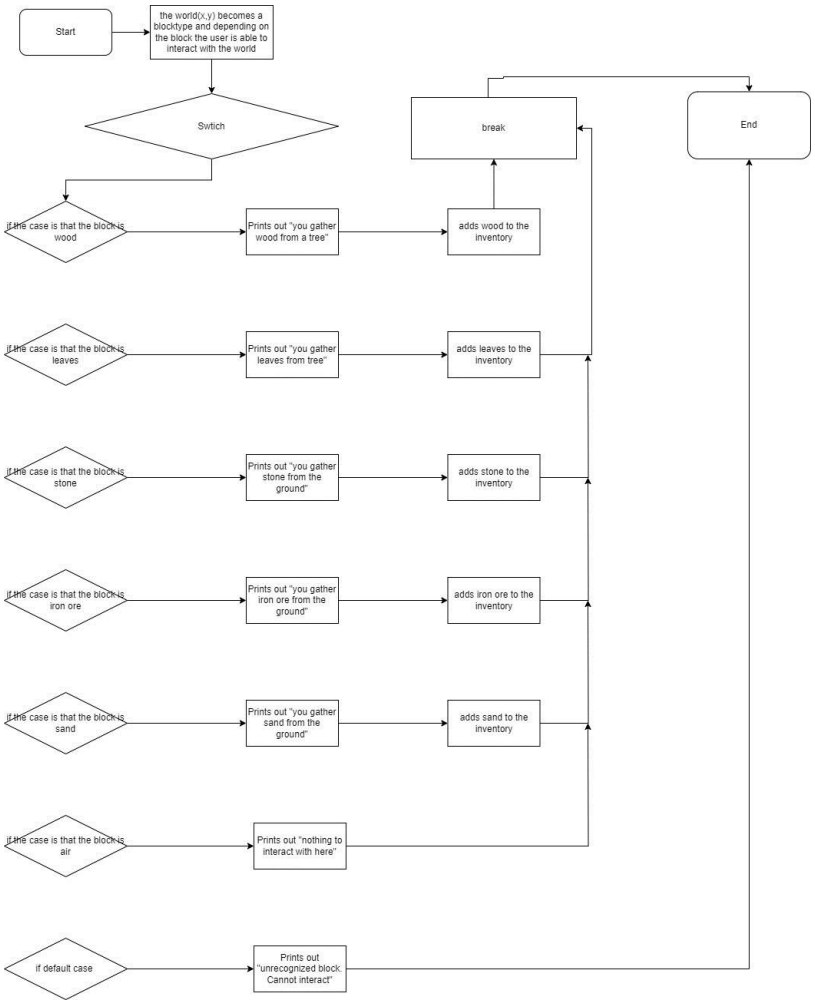
Flowchart :

PseudoCode :

```
Function placeBlock(blockType, inventory, world, playerX, playerY)
   If blockType is in range [0, 10]:
      If blockType <= 6:
         If inventory contains blockType:
            Remove blockType from inventory
            Set world[playerX][playerY] to blockType
            Output "Placed " + getBlockName(blockType) + " at your position."
         Else:
            Output "You don't have " + getBlockName(blockType) + " in your
inventory."
      Else:
         Set craftedItem to getCraftedItemFromBlockType(blockType)
         If craftedItems contains craftedItem:
            Remove craftedItem from craftedItems
            Set world[playerX][playerY] to blockType
            Output "Placed " + getCraftedItemName(craftedItem) + " at your
position."
         Else:
```

Output "You don't have " + getCraftedItemName(craftedItem) + " in your crafted items."
Else:
Output "Invalid block number. Please enter a valid block number."

interactWithWorld function :



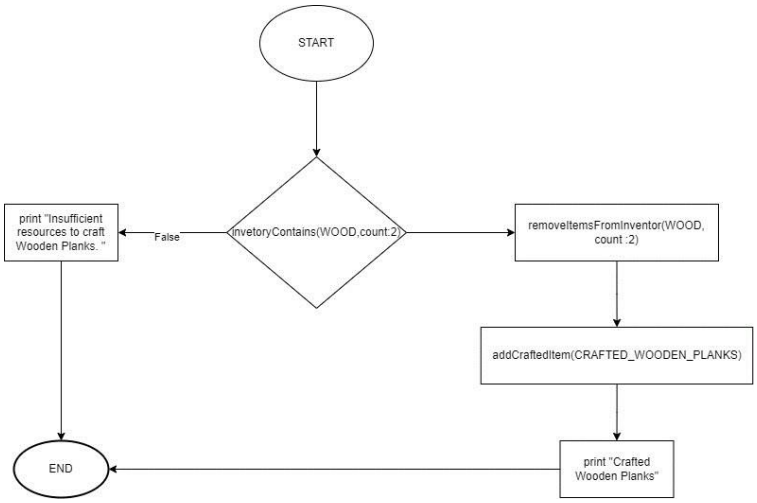
Flowchart :

PseudoCode :

```
Function interactWithWorld(blockType, inventory)
  Switch blockType:
    Case WOOD:
      Output "You gather wood from the tree."
      Add WOOD to inventory
    Case LEAVES:
      Output "You gather leaves from the tree."
      Add LEAVES to inventory
    Case STONE:
```

```
        Output "You gather stones from the ground."
        Add STONE to inventory
    Case IRON_ORE:
        Output "You mine iron ore from the ground."
        Add IRON_ORE to inventory
    Case SAND:
        Output "You grabbed sand from the ground."
        Add SAND to inventory
    Case OBSIDIAN:
        Output "You mined obsidian from the ground."
        Add OBSIDIAN to inventory
    Case AIR:
        Output "Nothing to interact with here."
    Default:
        Output "Unrecognized block. Cannot interact."
```

craftWoodenPlanks function:

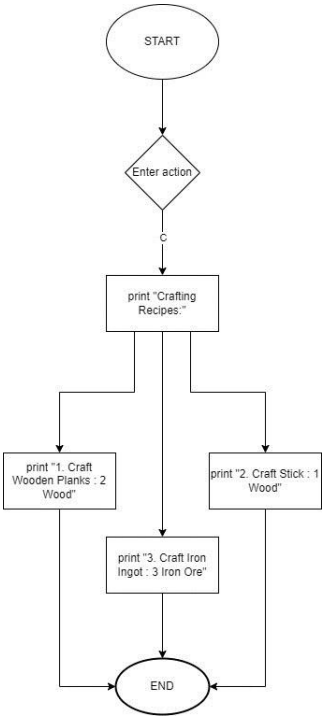


Flowchart :

PseudoCode :

```
Function craftWoodenPlanks(inventory, craftedItems)
    If inventoryContains(WOOD, 2):
        RemoveItemsFromInventory(WOOD, 2)
        AddCraftedItem(CRAFTED_WOODEN_PLANKS)
        Output "Crafted Wooden Planks."
    Else:
        Output "Insufficient resources to craft Wooden Planks."
```

displayCraftingRecipes function:



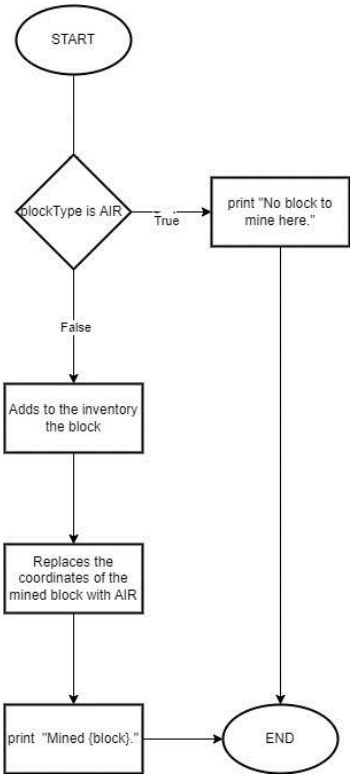
Flowchart :

PseudoCode :

```
Function displayCraftingRecipes()
    Output "Crafting Recipes:"
    Output "1. Craft Wooden Planks: 2 Wood"
    Output "2. Craft Stick: 1 Wood"
    Output "3. Craft Iron Ingot: 3 Iron Ore"
    Output "4. Craft Sandstone: 1 Sand block, 1 Stone"
```

mineBlock function :

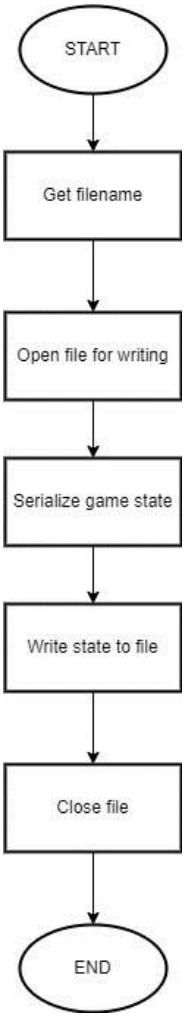
Flowchart :



PseudoCode :

```
Function mineBlock(blockType, inventory, world, playerX, playerY)
   If blockType is not AIR:
      Add blockType to inventory
      Set world[playerX][playerY] to AIR
      Output "Mined " + getBlockName(blockType) + "."
   Else:
      Output "No block to mine here."
```

saveGame function :



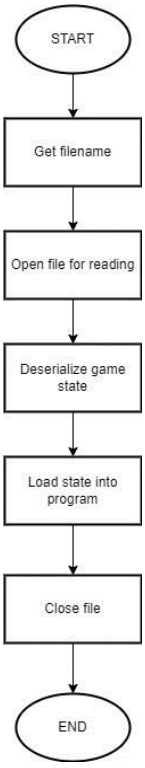
Flowchart :

PseudoCode :

```
Function saveGame(filename):
  open filename for binary writing
  serialize the following game state:
  world array
  player position
  inventory
  crafted items
  unlock mode

  write the serialized data to the file
close the file
```

loadGame :



Flowchart :

PseudoCode :

Function loadGame(filename)
open filename for binary reading
deserialize the game state including:
world array
player position
inventory
crafted items
unlock mode
load the deserialized state into the program:
set world grid
set player position
set inventory
set crafted items
set unlock mode

close file

10 References

1. Source Name - Description