

whack-a-mole-java

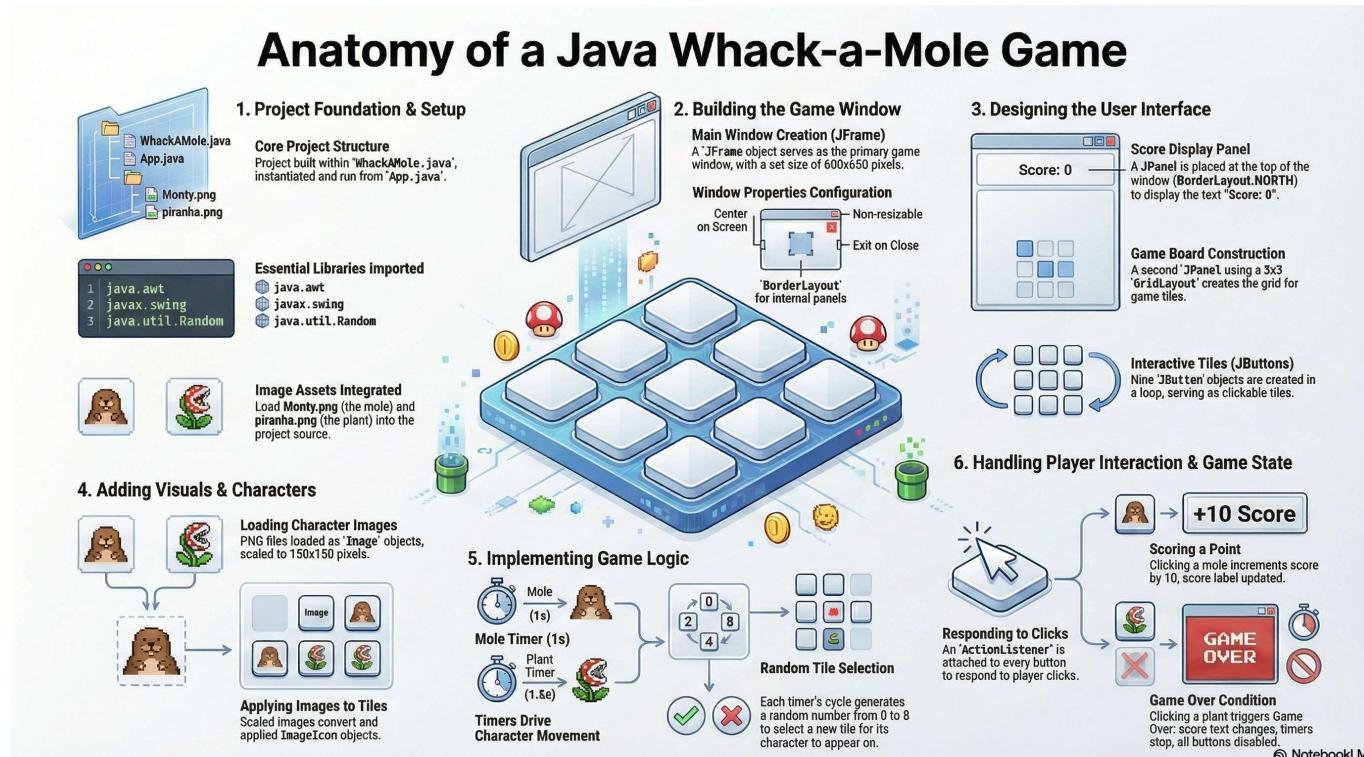
Whack-A-Mole - Java Swing Game using timed events and score logic

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Simple Java Swing desktop game implementing a 3x3 Whack-A-Mole with Modern-themed assets, timed mole and Plant movement, score tracking, and game-over logic.

TechStack: Java, Swing, AWT, javax.swing.Timer, ImageIcon, VS Code

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Disclaimer: The content presented here is a curated blend of my personal learning journey, experiences, open-source documentation, and invaluable knowledge gained from diverse sources. I do not claim sole ownership over all the material; this is a community-driven effort to learn, share, and grow together.

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Introduction

This Documentation teaches how to create a simple Whack-a-Mole game in Java with a graphical user interface (GUI). This is an excellent beginner project for those starting to learn Java and GUI development.

Game Overview

- **Game Elements:** Uses images from the Mario franchise
- **Game Board:** Nine tiles arranged in a 3x3 grid
- **Main Character:** A mole that hops around the tiles
- **Obstacle:** A Piranha Plant that also moves around the board
- **Objective:** Click on tiles with the mole to earn points
- **Losing Condition:** Clicking on the Piranha Plant results in "Game Over"

Project Setup

Development Environment

- **IDE:** Visual Studio Code
- **Language:** Java
- **Prerequisites:** Java setup in Visual Studio Code (Documentation available in video description)

Project Creation Steps

1. Open Visual Studio Code
2. Use keyboard shortcut: **Ctrl + Shift + P**
3. Select "Java: Create Java Project"
4. Choose "No build tools"
5. Create project on Desktop
6. Name the project: "whack-a-mole"
7. This creates a project folder with a **src** folder containing **App.java**

Initial Project Structure

```
whack-a-mole/
├── src/
│   ├── App.java
│   ├── WhackAMole.java (create this file)
│   ├── piranha.PNG (download)
│   └── monty.PNG (download)
```

Download Required Files

Before coding:

1. Visit GitHub link in video description
2. Download two image files:
 - [piranha.PNG](#) (Piranha Plant image)
 - [monty.PNG](#) (Mole image)
3. Drag both images into the `src` folder

Initial App.java Setup

Modify the default `App.java` file:

```
public class App {
    public static void main(String[] args) throws Exception {
        new WhackAMole();
    }
}
```

- Remove the default print statement
- Create an instance of the `WhackAMole` class
- Collapse the `App.java` file as main code goes in `WhackAMole.java`

Game Window Setup

Window Specifications

- **Width:** 600 pixels
- **Height:** 650 pixels
- **Note:** Game board is 600x600, but height is 650 to provide room for a score display text at the top

Creating the Window Frame

```
// Create variables
int boardWidth = 600;
int boardHeight = 650;
JFrame frame = new JFrame("Mario Whack-A-Mole");
```

Import Statements

Add these import statements at the top of WhackAMole.java:

```
import java.awt.*;
import java.awt.event.*;
import java.util.Random;
import javax.swing.*;
```

Frame Properties

Set frame properties in the constructor:

```
frame.setVisible(true);
frame.setSize(boardWidth, boardHeight);
frame.setLocationRelativeTo(null); // Opens window at center of screen
frame.setResizable(false);
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE); // X button
terminates program
frame.setLayout(new BorderLayout());
```

Important Note on Timing

Place `frame.setVisible(true)` at the very end of the constructor after all components are added. This ensures all components load before the window becomes visible, preventing slow loading of individual buttons.

Text Panel and Score Display

Creating the Text Panel

```
// Create text label
JLabel textLabel = new JLabel();

// Create text panel to hold label
JPanel textPanel = new JPanel();
```

Formatting the Text Label

```
textLabel.setFont(new Font("Arial", Font.PLAIN, 50));
textLabel.setHorizontalAlignment(JLabel.CENTER); // Centers text
horizontally
textLabel.setText("Score: 0");
textLabel.setOpaque(true); // Makes background visible
```

Adding to Frame

```
textPanel.setLayout(new BorderLayout());
textPanel.add(textLabel);
frame.add(textPanel, BorderLayout.NORTH); // BorderLayout.NORTH pushes
panel to top
```

Game Board Panel Setup

Creating the Board Panel

```
JPanel boardPanel = new JPanel();
boardPanel.setLayout(new GridLayout(3, 3)); // 3x3 grid of tiles
frame.add(boardPanel);
```

Optional Styling

```
boardPanel.setBackground(Color.BLACK); // Optional: makes background
visible during development
```

Creating Buttons for Tiles

Button Array Setup

Create an array to track all nine buttons:

```
JButton[] board = new JButton[9];
```

Creating and Adding Buttons

Use a for loop to create nine buttons:

```
for (int i = 0; i < 9; i++) {
    JButton tile = new JButton();
    board[i] = tile;
    boardPanel.add(tile);
}
```

Each button represents one tile on the game board.

Loading and Scaling Images

Image Files

The game uses two image files:

- **piranha.PNG** - Piranha Plant image
- **monty.PNG** - Mole (Monty from Mario) image

Loading and Scaling Images

The images must be scaled to fit the buttons (150x150 pixels). The process involves two steps:

```
// Load mole image
Image moleImage = new
ImageIcon(getClass().getResource("./monty.PNG")).getImage();
ImageIcon moleIcon = new ImageIcon(moleImage.getScaledInstance(150, 150,
Image.SCALE_SMOOTH));

// Load plant image
Image plantImage = new
ImageIcon(getClass().getResource("./piranha.PNG")).getImage();
ImageIcon plantIcon = new ImageIcon(plantImage.getScaledInstance(150, 150,
Image.SCALE_SMOOTH));
```

Explanation of Image Loading Process

1. **getClass().getResource()** - Loads the image file from the source folder
2. **getImage()** - Extracts the actual image from the ImageIcon
3. **getScaledInstance(150, 150, Image.SCALE_SMOOTH)** - Resizes image to 150x150 pixels with smooth scaling
4. **new ImageIcon()** - Converts scaled image back to ImageIcon for button display

Why Two-Step Process?

- Cannot directly set ImageIcon from file path with scaling
- Must first get the image, then scale it, then create ImageIcon from scaled image

Removing Button Focus Rectangle

Disable the focus rectangle that appears when buttons are clicked:

```
tile.setFocusable(false);
```

Variables for Game State

Create these instance variables to track game state:

```
 JButton currentMoleTile;           // Tracks which button currently has the mole
 JButton currentPlantTile;          // Tracks which button currently has the plant
 Random random = new Random();     // For random tile selection
 Timer setMoleTimer;               // Timer to move mole to new tiles
 Timer setPlantTimer;              // Timer to move plant to new tiles
 int score = 0;                   // Tracks player score
```

Moving the Mole

Mole Timer Setup

Create a timer that moves the mole every 1000 milliseconds (1 second):

```
setMoleTimer = new Timer(1000, new ActionListener() {
    public void actionPerformed(ActionEvent e) {
        // Remove mole from current tile
        if (currentMoleTile != null) {
            currentMoleTile.setIcon(null); // Remove image from button
            currentMoleTile = null;
        }

        // Select random tile
        int num = random.nextInt(9); // Random number 0-8
        JButton tile = board[num];

        // Check if plant is on this tile (avoid conflict)
        if (currentPlantTile == tile) {
            return; // Skip this turn
        }

        // Place mole on new tile
        currentMoleTile = tile;
        currentMoleTile.setIcon(moleIcon);
    }
});

setMoleTimer.start();
```

Why Use Intermediate Variable?

The code uses:

```
JButton tile = board[num];
```

Instead of:

```
currentMoleTile = board[num];
```

This is because there's an edge case that must be covered (conflict checking with plant tile).

Moving the Plant

Plant Timer Setup

Create a timer that moves the plant every 1500 milliseconds (1.5 seconds):

```
setPlantTimer = new Timer(1500, new ActionListener() {
    public void actionPerformed(ActionEvent e) {
        // Remove plant from current tile
        if (currentPlantTile != null) {
            currentPlantTile.setIcon(null); // Remove image from button
            currentPlantTile = null;
        }

        // Select random tile
        int num = random.nextInt(9); // Random number 0-8
        JButton tile = board[num];

        // Check if mole is on this tile (avoid conflict)
        if (currentMoleTile == tile) {
            return; // Skip this turn
        }

        // Place plant on new tile
        currentPlantTile = tile;
        currentPlantTile.setIcon(plantIcon);
    }
});

setPlantTimer.start();
```

Why Different Timer Values?

- Mole: 1000 milliseconds (moves every second)
- Plant: 1500 milliseconds (moves every 1.5 seconds)
- This creates variety in movement patterns

Handling Tile Conflicts

The Conflict Problem

Since there are only 9 tiles and two separate timers randomly placing mole and plant:

- High chance both timers select the same tile
- One icon overwrites the other

- Only one image displays on the shared tile
- Game logic becomes inconsistent

Solution: Tile Occupancy Check

When placing mole or plant, check if the target tile is occupied:

In Mole Timer:

```
if (currentPlantTile == tile) {  
    return; // Skip this turn if plant is here  
}
```

In Plant Timer:

```
if (currentMoleTile == tile) {  
    return; // Skip this turn if mole is here  
}
```

How It Works

1. If selected tile already has mole or plant, return early
2. The current icon remains on that tile
3. No overwriting occurs
4. Game logic remains consistent

Detecting Button Clicks

Adding Click Listeners to Tiles

In the for loop where buttons are created, add an action listener to each button:

```
for (int i = 0; i < 9; i++) {  
    JButton tile = new JButton();  
    board[i] = tile;  
    boardPanel.add(tile);  
  
    // Add click handler  
    tile.addActionListener(new ActionListener() {  
        public void actionPerformed(ActionEvent e) {  
            JButton clickedTile = (JButton) e.getSource();  
  
            // Check if clicked on mole  
            if (clickedTile == currentMoleTile) {  
                score += 10; // Add 10 points  
               .textLabel.setText("Score: " + Integer.toString(score));  
            }  
        }  
    });  
}
```

```
// Check if clicked on plant
else if (clickedTile == currentPlantTile) {
    textLabel.setText("Game Over");

    // Stop movement
    setMoleTimer.stop();
    setPlantTimer.stop();

    // Disable all buttons
    for (int i = 0; i < 9; i++) {
        board[i].setEnabled(false);
    }
}

});

}
```

Type Casting

```
JButton clickedTile = (JButton) e.getSource();
```

- `e.getSource()` returns an Object
- Must cast to JButton to access button-specific methods

Mole Click Behavior

- Increment score by 10 points
- Update score text display
- Mole continues moving (no stopping)
- Player can continue playing

Plant Click Behavior

- Display "Game Over" text
- Stop mole timer: `setMoleTimer.stop()`
- Stop plant timer: `setPlantTimer.stop()`
- Disable all buttons: `board[i].setEnabled(false)`
- Mole and plant stop moving
- Buttons become grayed out and unclickable

Complete Game Flow

Game Sequence

1. Window opens with 3x3 grid of buttons
2. Score displays at top as "Score: 0"
3. Mole randomly appears on one tile and moves every 1 second
4. Plant randomly appears on different tile and moves every 1.5 seconds

5. Player clicks on tiles containing mole to earn points (+10 each)
6. Player tries to avoid clicking on tile with plant
7. Clicking plant triggers "Game Over"
8. When game ends:
 - Timers stop
 - All buttons disabled
 - Text changes to "Game Over"

Important Implementation Details

- Mole and plant can never occupy same tile (prevented by checks)
- Score updates only when mole is clicked
- Game cannot be played after "Game Over" unless program is restarted
- Focus rectangles removed from buttons for cleaner appearance
- All components load before window becomes visible

Possible Enhancements

The basic game can be improved with these features:

Enhancement 1: Multiple Piranha Plants

- Add multiple plant instances
- Create additional plant tracking variables
- Currently only one plant exists

Enhancement 2: Reset Button

- Add button to reset the game
- Player can play multiple rounds without restarting program
- Implement reset logic to reinitialize game state

Enhancement 3: High Score Tracking

- Create variable to track all-time high score
- Display high score on screen
- Compare current score with high score
- Persist high score between games

Complete Code Structure

Class Variables (Instance Variables)

```
int boardWidth = 600;
int boardHeight = 650;
JFrame frame;
JPanel textPanel;
JLabel textLabel;
JPanel boardPanel;
```

```
 JButton[] board;
 ImageIcon moleIcon;
 ImageIcon plantIcon;
 JButton currentMoleTile;
 JButton currentPlantTile;
 Random random;
 Timer setMoleTimer;
 Timer setPlantTimer;
 int score;
```

Constructor Method

Contains all initialization code:

- Frame setup
- Component creation
- Image loading and scaling
- Button creation with event listeners
- Timer setup with movement logic
- Frame visibility set at end

Key Concepts Learned

GUI Components

- JFrame: Main window container
- JPanel: Layout containers (text panel, board panel)
- JButton: Interactive tiles
- JLabel: Text display

Layouts

- BorderLayout: For overall window layout (North for text panel)
- GridLayout: For 3x3 button grid

Event Handling

- ActionListener: Handles button clicks
- Timer: Handles repeating events (mole/plant movement)
- ActionEvent: Contains event information

Image Processing

- Loading images from files using getResource()
- Scaling images to specific dimensions
- Converting images to ImageIcons for display
- Using ImageIcon objects on buttons

Game Logic

- State tracking (current mole/plant position, score)
- Conflict prevention (checking tile occupancy)
- Game flow control (stopping timers, disabling buttons)
- User feedback (updating score display)

Development Notes

Performance Tip

Set `frame.setVisible(true)` at the very end of constructor to ensure all components load before window displays. This prevents UI components from appearing slowly one by one.

Testing Approach

- Test each component as it's added
- Verify image scaling displays correctly
- Check that mole and plant move independently
- Verify no conflicts occur on same tile
- Test click detection for both mole and plant
- Confirm game ends properly on plant click

Debugging

- Use `setBackground(Color.BLACK)` temporarily to visualize panel boundaries
- Watch console for any import errors
- Verify image file names match exactly (case-sensitive)
- Check that resource paths use correct file names with extensions

Conclusion

This Documentation covers all fundamental aspects of creating a GUI game in Java:

- Window and component creation
- Image loading and manipulation
- Event-driven programming with listeners and timers
- Game state management
- User interaction and feedback

The resulting game is fully functional and provides a solid foundation for learning GUI programming concepts.

End-of-File

The [KintsugiStack](#) repository, authored by Kintsugi-Programmer, is less a comprehensive resource and more an Artifact of Continuous Research and Deep Inquiry into Computer Science and Software Engineering. It serves as a transparent ledger of the author's relentless pursuit of mastery, from the foundational algorithms to modern full-stack implementation.