Sultan Qaboos University College of Science

Department of Computer Science

COMP5405 - Software Pattern-SP 25

Monkey in trouble

Project – Phase 1 (Project description)

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Introduction

In this project, we propose a game called "Monkey in Trouble," an engaging game where players control a monkey trapped in a mysterious world. The objective is to help the monkey collect three bananas and escape while overcoming challenges, including a stationary ghost, fire traps, and a moving trap. The game will be developed as both a

Windows-based and web-based application, ensuring accessibility across platforms. Players will navigate using arrow keys, solve puzzles, and avoid hazards to progress.

Motivations

- **Engaging Gameplay**: Combining puzzle-solving and platformer mechanics makes the game fun and challenging.
- **Structured Progression**: With three distinct areas, the game ensures a gradual increase in complexity while keeping players engaged.
- **Application of Software Patterns**: The design allows for the implementation of important software patterns, such as:
  - State Pattern (for monkey transformation).
  - Observer Pattern (for button interactions).
  - Singleton Pattern (for game management).
- **Manageable Scope**: The game includes a limited number of objects (4 to 7) while still providing a substantial challenge, making it feasible within the given timeframe.

Play Rules

- ➢ The monkey starts in a locked room and must press a button to open the door.
- ➢ The ghost remains stationary; if the monkey touches it, he dies.
- ➢ To defeat the ghost, the monkey must activate ghost mode by pressing a button in the second place.
- ➢ The game features three bananas, which the monkey must collect to progress.
- ➢ The second banana is locked behind a wall and can only be accessed by pushing a box onto a pressure button while avoiding fire.
- ➢ The monkey has three hearts; touching fire reduces one heart, and if all hearts are lost, the monkey dies and restarts.
- ➢ If the monkey falls into a trap or is killed by the ghost, he respawns at the initial position.
- ➢ The final banana is in the third place, where pressing a button unlocks a secret door leading to the escape route.
- ➢ The game ends when the monkey escapes through the secret door after collecting all three bananas.

By designing this game, we aim to create an engaging, structured, and technically well-developed experience that balances challenge and accessibility.

Requirements

1. Platform Compatibility

- Game must run as a Windows application and a web-based app.

2. Gameplay Mechanics

- Players control the monkey using arrow keys for movement.
- The monkey must collect three bananas to win.
- Includes hazards like a stationary ghost, fire traps, and a moving trap.
- The monkey has three hearts; touching fire or falling into traps reduces hearts.
- If killed, the monkey respawns at the start.

3. Level Design & Interactions

- The game includes three distinct areas with interactive elements.
- Buttons and push-button mechanisms must unlock doors and trigger actions.

4. User Interface & Display

- Banana counter and heart counter displayed on screen.
- Clear visual indicators for button activation and door unlocking.

5. Persistence & Data Handling

- At least one object must have persistent storage (e.g., progress tracking).

6. Performance & Accessibility

- Game must run smoothly on Windows PCs and web browsers.
- User-friendly controls and interface.

7. Failure & Restart Conditions

- The game resets on death or when the monkey loses all its hearts.
- Game ends when all bananas are collected and the monkey escapes.

8. Audio and Sound Effects

- Sound effects for interactions, background music, and death cues.
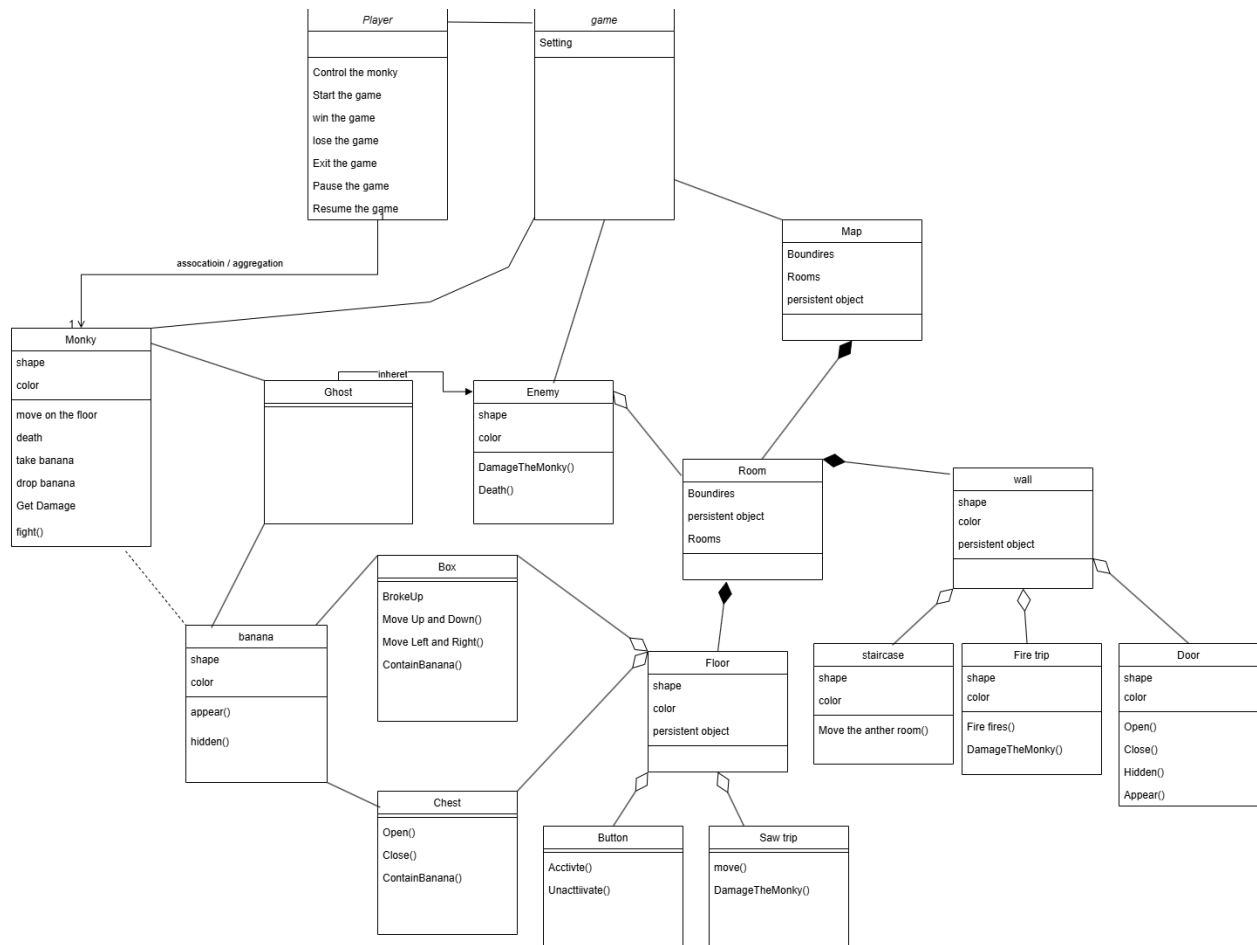
9. Graphics and Animations

- 2D sprite animations for the monkey, ghost, and objects.
- Smooth animations for movements and interactions.

Analysis

1. Class Diagram :
   a. Objects:
      i. User: the one who controls the monkey.
      ii. Monkey: the playable object that the user can control
      iii. Map:
         1. Room:
            a. Floor: which contains the trips and the blocks over which the monkey can move.
               i. Chest: that contains the banana.
               ii. Saw trip: damage the monkey when the saw and the monkey are in the same block at the same time.
               iii. Box: is a movable object, the monkey has the ability to move it, when it breaks the banana will drop.
            b. Wall: set the boundary of the room:
               i. Staircase: allow the monkey to move to another room.
               ii. Door: open and closed, that depends on solving the puzzle of the map, which represents the winning.
               iii. Fire trip: fire the fires to damage the monkey.
            c. Enemy: an object that fights the monkey when the monkey gets close to them.
               i. Ghost: one of these enemies in the map.
      iv. Banana: the object which the monkey should collect to win.

UML Class Diagram

Player
- Control the monky
- Start the game
- win the game
- lose the game
- Exit the game
- Pause the game
- Resume the game

game
- Setting

Map
- Boundires
- Rooms
- persistent object

assocatioin / aggregation

Monky
- shape
- color
- move on the floor
- death
- take banana
- drop banana
- Get Damage
- fight()

inheret

Ghost

Enemy
- shape
- color
- DamageTheMonky()
- Death()

Room
- Boundires
- persistent object
- Rooms

wall
- shape
- color
- persistent object

Box
- BrokeUp
- Move Up and Down()
- Move Left and Right()
- ContainBanana()

banana
- shape
- color
- appear()
- hidden()

Floor
- shape
- color
- persistent object

staircase
- shape
- color
- Move the anther room()

Fire trip
- shape
- color
- Fire fires()
- DamageTheMonky()

Door
- shape
- color
- Open()
- Close()
- Hidden()
- Appear()

Chest
- Open()
- Close()
- ContainBanana()

Button
- Acctivte()
- Unacttiivate()

Saw trip
- move()
- DamageTheMonky()

2. Analysis Patterns:

    a. Abstract Factory and Product Trader :

        i. Should use some abstraction classes to simplify the connections between the classes and inheritance relationship so the code will be reusable and easy to understand and modify in future phases, like :

            1. Use the wall as the super class of these classes
                a. Door
                b. Fire trip
                c. Staircase
            2. And floor for these classes:
                a. Saw trip
                b. Button

c. Box
d. Chest
3. Enemy:
a. The ghost will inherit from the enemy the attributes and functions.
b. Factory Methods:
i. Could use a method by implementing some interface rather than declaring a specific constructor for every object, like what we have in the above example, (like the wall, the floor, and the enemy)

3.Use Cases

- Start Game – The player starts the game.
- Move Monkey – The player moves the monkey using arrow keys.
- Press Button – The monkey presses a button to open a door or trigger an event.
- Transform to Ghost Mode (TTGM)– The monkey activates ghost mode to defeat the ghost.
- Fighting the ghost – After transforming to Ghost mode the monkey has now the ability to beat the ghost by pressing the k and j buttons.
- Push Box – The monkey moves a box onto a pressure button.
- Avoid Fire Trap – The monkey dodges fire traps while moving.
- Avoid Saw Trap – The player should choose a perfect timing to avoid gitting damage by the saw.
- Collect Banana – The monkey collects bananas to progress.
- Unlock Secret Door – The monkey activates a mechanism to open the secret door.
- Lose Health – The monkey takes damage from fire or obstacles.
- Die & Respawn – The monkey dies and restarts from the last checkpoint.
- Win Game – The monkey escapes through the secret door.

Use Case Diagrams
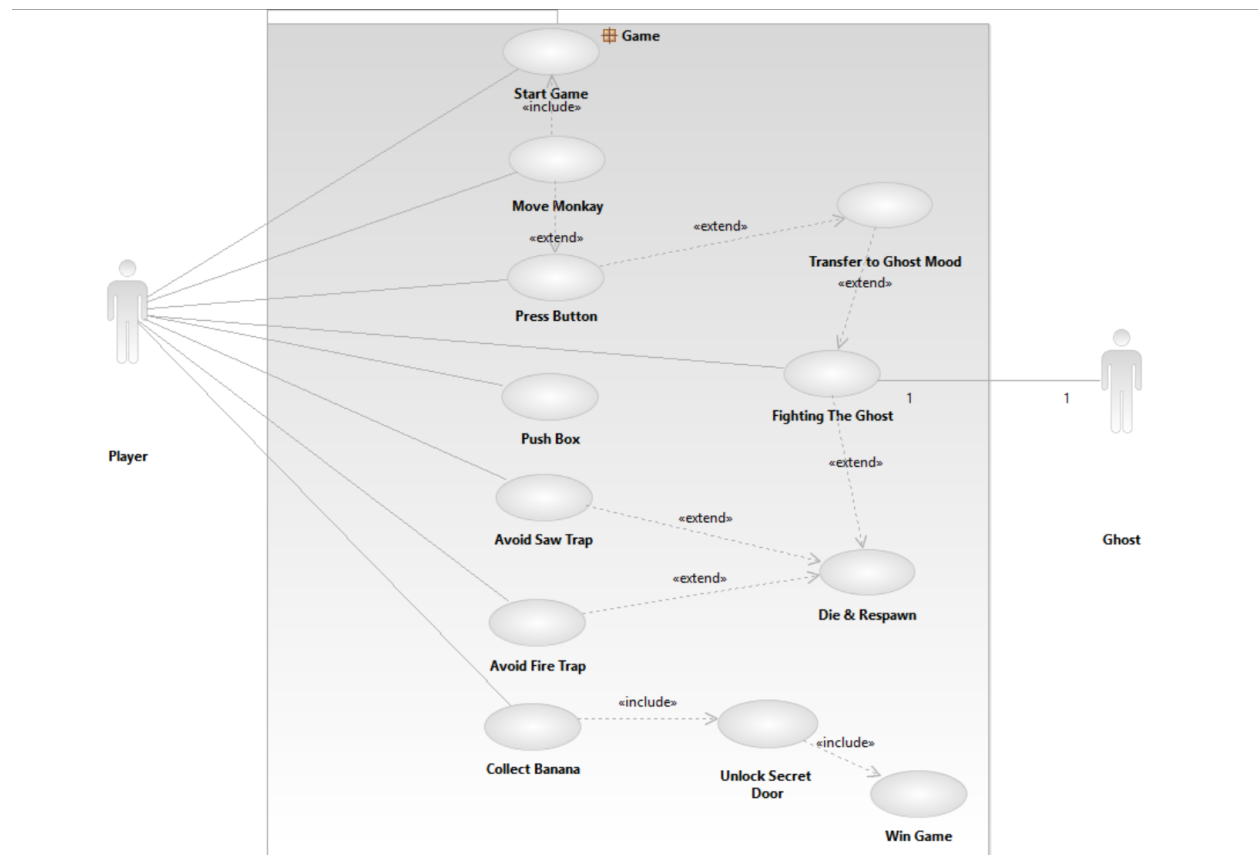
developed description:

Start Game

- Actors: Player

- Description: The player launches the game, and the monkey appears in the initial room.

- Preconditions: The game is installed and runs properly.

- Steps:

  1. The player starts the game.

  2. The main menu appears.

3. The player selects "Start."

4. The game world loads, and the monkey spawns in the initial room.

• Postconditions: The player is now controlling the monkey.

Move Monkey

• Actors: Player

• Description: The player moves the monkey using arrow keys.

• Preconditions: The game is running.

• Steps:

1. The player presses left/right arrow keys to move horizontally.

2. The player presses up/down to climb stairs or interact.

3. The monkey moves accordingly.

• Postconditions: The monkey's position updates.

Press Button

• Actors: Player

• Description: The monkey presses a button to activate an event (e.g., open door).

• Preconditions: The monkey is near a button.

• Steps:

1. The player moves the monkey near the button.

2. The player presses the interaction key.

3. The button activates (e.g., opens a door or triggers ghost mode).

• Postconditions: The triggered action occurs.

Transform to Ghost Mode

- Actors: Player

- Description: The monkey activates ghost mode to fight the ghost.

- Preconditions: The monkey is in the correct location to press the ghost-mode button.

- Steps:

  1. The player moves the monkey near the ghost-mode activation button.

  2. The player presses the button.

  3. The monkey enters ghost mode.

  4. The player can now defeat the ghost.

- Postconditions: The monkey is in ghost mode.

Push Box

- Actors: Player

- Description: The monkey pushes a box onto a button to open a door.

- Preconditions: The monkey is next to a movable box.

- Steps:

  1. The player moves the monkey near the box.

  2. The player presses the "push" button.

  3. The box moves in the pushed direction.

  4. If the box lands on a pressure plate, the plate activates.

- Postconditions: The door opens, allowing progress.

Avoid Fire Trap

- Actors: Player

- Description: The monkey avoids moving fire to stay alive.

- Preconditions: Fire traps exist in the level.

- Steps:

    1. The fire moves in a predictable pattern.

    2. The player observes and times movement.

    3. The player moves the monkey to avoid fire.

- Postconditions: The monkey survives and continues.

Collect Banana

- Actors: Player

- Description: The monkey collects bananas to progress.

- Preconditions: A banana exists in the level.

- Steps:

    1. The player moves the monkey near a banana.

    2. The player presses the collect key.

    3. The banana counter increases.

- Postconditions: The banana is removed from the level.

Unlock Secret Door

- Actors: Player

- Description: The monkey activates a mechanism to open the secret door.

- Preconditions: The monkey has collected the required bananas.

- Steps:

    1. The player moves the monkey near the unlock mechanism.

    2. The player interacts with it.

3.   The secret door unlocks.

- Postconditions: The door opens.

Lose Health

- Actors: Player

- Description: The monkey loses health when hit by hazards.

- Preconditions: The monkey touches fire, a ghost, or a trap.

- Steps:

    1.   The hazard makes contact with the monkey.

    2.   The monkey's health decreases.

    3.   If health reaches 0, the monkey dies.

- Postconditions: Health updates, or the monkey dies.

Die & Respawn

- Actors: Player

- Description: The monkey respawns after death.

- Preconditions: The monkey's health reaches 0.

- Steps:

    1.   The monkey dies.

    2.   The game reloads the monkey at the starting point.

    3.   Health resets.

- Postconditions: The player starts from the last checkpoint.

Win Game

- Actors: Player

- Description: The player wins by escaping through the secret door.

• Preconditions: The monkey has collected all bananas and unlocked the door.

• Steps:

1. The player moves the monkey to the secret door.

2. The monkey enters the door.

3. A "You Win" screen appears.

• Postconditions: The game ends.

Fighting the Ghost

• Actors: Player

• Description: After transforming into Ghost Mode, the monkey gains the ability to fight the ghost using the K and J buttons.

• Preconditions:

1. The monkey has activated Ghost Mode.

2. A ghost enemy is present in the level.

• Steps:

1. The player moves the monkey toward the ghost.

2. The player presses K or J to attack.

3. If the attack lands, the ghost's health decreases.

4. Once the ghost's health reaches zero, it disappears.

5. The monkey can now collect the banana that the ghost was guarding.

• Postconditions:

• The ghost is defeated, allowing the player to progress.

• The banana becomes available for collection.

Avoid Saw Trap

- Actors: Player

- Description: The player must time the monkey's movement carefully to avoid getting hit by a moving saw trap.

- Preconditions:

1. A saw trap is moving within the level.

2. The monkey has limited health.

- Steps:

1. The player observes the saw's movement pattern.

2. The player waits for an opening and moves the monkey at the right time.

3. If mistimed, the saw damages the monkey, reducing health.

4. If successful, the monkey safely passes the saw trap.

- Postconditions:

- If the player avoids the saw, they continue progressing in the level.

- If the player is hit, health decreases. If health reaches zero, the monkey respawns.

Prototype

Game Flow Explanation

Starting Scenario (Main Place - Room 1)

1. The monkey begins in a small room, trapped by a door.
2. Inside the room, there are:
   - Stairs leading to the second place.
   - A button that opens the door to the main hall.

Facing the Ghost

3. When the monkey opens the door, he encounters a ghost that can kill him if he fights it directly.
4. To defeat the ghost, he must:
   - Go up the stairs to the second place.
   - Press a button that transforms him into a ghost state, allowing him to fight and defeat the ghost.
5. Once the ghost is defeated, the monkey collects a banana.

Banana #2 (Push Button & Fire Trap)

6. After defeating the ghost, the monkey is now in the main hall.
7. The next banana is inside a box trapped behind a wall.
8. To open the wall, the monkey needs to:
   - Press a push-button located near a moving fire shot.
   - Since the button only works while something is on it, the monkey needs to:
     - Find a box in the same hall.
     - Push the box onto the button to keep it activated.
9. Once the box is on the button, the wall opens, allowing the monkey to collect the second banana.

Banana #3 (Third Place & Secret Door)

10. The monkey proceeds to another door in the main place.
11. He must avoid a moving trap to enter the third place.
12. Inside the third place, there is:
    - A fire trap.
    - A banana.
    - A button that opens a secret door in the main place.

13. The monkey collects the third banana and presses the button, which opens the secret door.
14. He then exits through the door in the third place, reappearing in the main place.
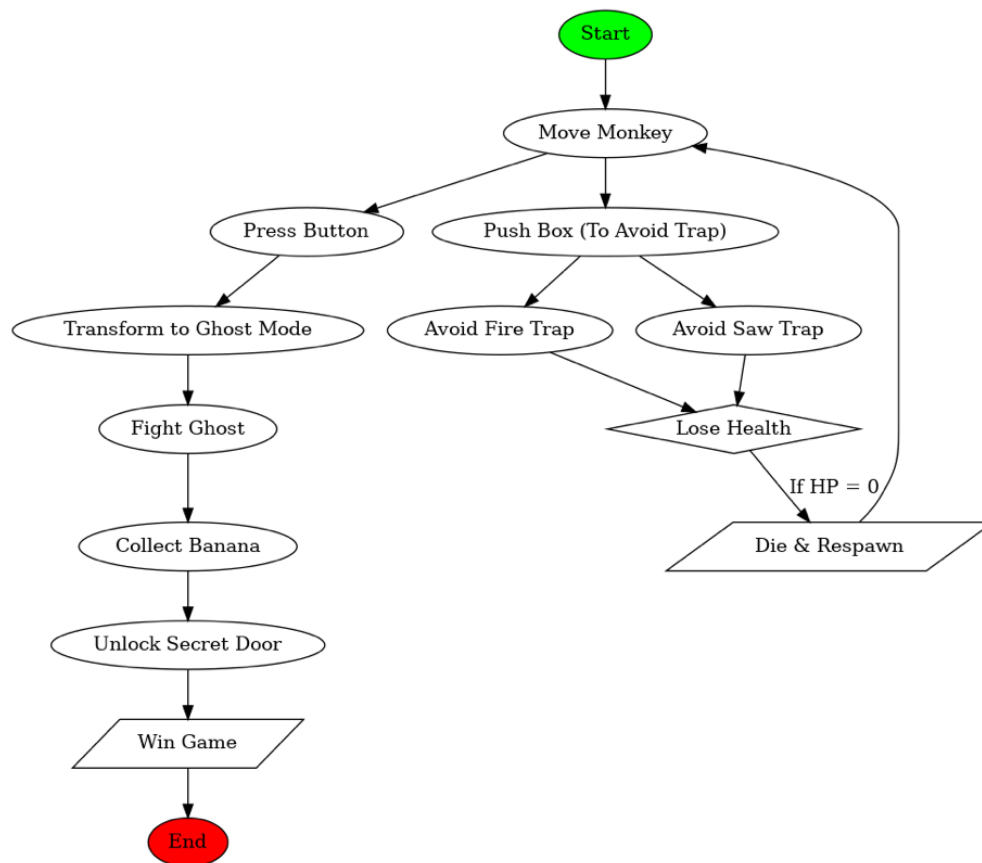
Winning the Game

15. Now, the secret door is open.
16. The monkey enters the secret door and escapes the world, winning the game.

Game Mechanics & Rules

- Monkey has 3 hearts, displayed on the top of the screen.
    - Each time fire touches him, he loses one heart.
    - If he loses all hearts, he dies and restarts from the beginning.
- The Banana counter is displayed at the top.
- If the monkey dies (fire, ghost, or falling into a trap), he respawns at the starting point.

```
                        Start
                          |
                          v
                     Move Monkey
                    /     |      \
           Press Button   Push Box (To Avoid Trap)
               |          /                  \
       Transform to      Avoid Fire Trap   Avoid Saw Trap
       Ghost Mode              \            /
           |                    Lose Health
       Fight Ghost              | If HP = 0
           |                    v
       Collect Banana       Die & Respawn
           |
       Unlock Secret Door
           |
       Win Game
           |
          End
```

The whole UI:

UI elements:

The monkey is the player's character, capable of moving through the dungeon in four directions: up, down, left and right. It has three hearts representing the player's health and possesses two states: the normal state and the ghost state.

A door and a red negative button represent the first obstacle for the player, as the door prevents access to the rest of the dungeon. The player must press the button to open the door.

The ghost is the enemy in this game. If the player touches it while in the normal state, he will immediately die. The ghost prevents further exploration of the dungeon, and the player must switch to the ghost state to fight it.

To switch to the ghost state, the player must return to the first room. At that point, they will enter a room containing two buttons, each marked with a positive sign in different colours: blue and brown. Pressing the blue button will transform the player into the ghost state, allowing them to confront the ghost.

After defeating the ghost, there will be a trap to the player's right, with a treasure behind it. The player will not be able to reach the treasure, which contains a banana inside.

To the left, the player will encounter a trap that drips lava. If the player touches the falling drops, they will lose some health. The player must time their movement carefully to avoid being hit. Pressing a nearby button will open the trap they previously passed, but as soon as they release the button, the trap will close again, preventing access to the treasure.

A box that the player can push in all four directions is needed to keep the button pressed, allowing access to the treasure. Additionally, the box holds a hidden secret.

A trap containing a blade that moves left and right requires the player to time their crossing carefully to avoid being hit and dying. This trap may also help the player uncover a hidden secret.
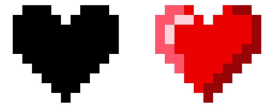

It is just a decorative piece.

A door that only opens once the player collects three bananas, leading to a room containing a button with a circle symbol. Pressing this button will open the exit to the dungeon.

The player health bar.

The banana bar and what the banana that the player will collect looks like.

Contribution table :

Team Member	Contribution
Al Basil Al Rawaihy	Project information -Requirement
Hatem Al Burtamani	Anaylisis Part 2 -Use Case with Use Cases Digram -Deploy Description
Mohameed Al Salmi	Anaylisis Part 1 -Class Digram -Anlysis Pattern
Mahmood Al Wahaibi	Prototype