Jump To Safety

Python Game Design

Time: 60 mins

Introduction

In this class, the student/s will learn to add gravity to Dr. Cleo and to detect the collision of Dr. Cleo with the platforms placed besides and below her. Student/s will also learn to make Dr. Cleo jump over the platform to take the safe path.

New Commands Introduced

● jump()	User-defined method jump() to move Dr. Cleo upward.
● applyGravity()	User-defined method applyGravity() to make Dr. Cleo fall down with the effect of gravity.
● standOnPlatform(Sprite)	User-defined method standOnPlatform() to check the collision between Dr. Cleo and the platform Sprite and allow Dr. Cleo to stand on the platform.
● copy(object)	Allows creating a copy of a mutable object.

Note: Methods jump(), applyGravity(), and standOnPlatform() are defined in the class Player().

Vocabulary

- **Gravity** is the force that pulls objects toward a planet.
- **Collision** occurs when two objects touch each other.
- **Bug:** When a code runs but gives an unexpected result, it is said to have a bug.
- **Debugging:** Finding and removing bugs from the code is called debugging.

Learning Objectives

Student/s(s) should be able to:

- ***Recall*** how to handle key events.
- ***Demonstrate*** how to add gravity to a game character.
- ***Describe*** how to detect collision between two game objects.
- ***Simulate*** Dr. Cleo's jump over the platform using gravity and collision detection to take the safe path.

Activities

1. **Class Narrative:** *(2 mins)*

- Brief the student/s that while going around the city, Dr.Cleo notices that the mysterious gas has been turning people into zombies. Dr. Cleo is alarmed when a zombie obstructs her path. She can escape the zombie by jumping on the safe path under construction!

2. **Concept Introduction Activity:** *(5 mins)*
   - Let the student/s play the explore activity and observe that while Dr. Cleo jumps over a platform, a miscalculated jump causes her to fall off the platform.
   - Using the slides, explain:
     - how to move Dr. Cleo vertically upward using the up arrow key and fall down with the gravity effect
     - how to detect collision
     - how to debug the horizontal collision code to avoid midair jumps for the game character

3. **Activity 1: Move Dr. Cleo Vertically:** *(10 mins)*

   Teacher Activity: *(5 mins)*
   - Explain to the student/s how to define the method jump() in the class Player and call it in the keyPressed() function within main.py.
   - Explain to the student/s how to update the y-position of Dr. Cleo by adding its vertical velocity to its current vertical position to move Dr. Cleo vertically in the updatePosition() method.
   - Highlight to the student/s that Dr. Cleo is moving upwards but doesn't fall down on jumping.

   Student Activity: *(5 mins)*
   - Guide the student/s to define the method applyGravity() in the class Player and call it in the draw() function to make Dr. Cleo fall down while jumping.
   - Allow the student/s to experiment with the values assigned to the variable gravity.

4. **Activity 2: Add Collision Detection:** *(12 mins)*

   Teacher Activity: *(5 mins)*
   - Recall to the student/s how to detect collision between game objects using the user-defined function isTouching().
   - Explain to the students that isTouching will be True for either horizontal or vertical collision and setting velY = 0 on collision won't let Dr. Cleo jump again. Let's solve this by:
     - Creating a copy of Dr. Cleo's object using **copy()** function to detect a collision,
     - Updating the y-position of the copy of Dr. Cleo
     - Updating the vertical velocity of Dr. Cleo to 0 when the copy of Dr. Cleo's object collides with the platform.

   Probing question: How will you detect Dr. Cleo's collision with the platforms while moving horizontally?
   Expected answer: Create a copy and move forward/ backward and detect the collision of copy with the platform to set Dr. Cleo's velX to 0.

   Student Activity: *(7 mins)*
   - Guide the student/s to stop Dr. Cleo when she collides with the platform horizontally by updating the value of velX in the function standOnPlatform() in the Player class.

5. **Activity 3: Make Movements Smoother:** *(10 mins)*

   Student Activity: *(10 mins)*
   - Highlight to the student/s that Dr. Cleo can jump in the mid-air.

- Explain to the student/s using slides how to stop Dr. Cleo from jumping when she is not standing on the platform by using an indicator isStanding.
- Guide the student/s to make changes in the methods applyGravity(), standOnPlatform(), and jump() by adding the indicator isStanding and setting its value to true or false as required.
- Guide the student/s to decrease the width of the bubblegun from the width of Dr.Cleo and reset the x-position of Dr. Cleo to make the horizontal collision smoother.

6. **Introduce the Post class project:** *(2 min)*
    - In the basketball game, detect the collision between the basket and the basketball to score a goal.

7. **Test and Summarize the class learnings:** *(5 mins)*
    - Check for understanding through quizzes and summarize learning after respective missions.
    - Summarize the overall class learning toward the end of the class.

8. **Additional activities:**
    - Encourage the student/s to detect the collision between the player and a spring and make the player jump higher on falling on a spring.
    - Encourage the student/s to reset the player to its initial position on colliding horizontally with a spring.

9. **State the Next Class Objective:** *(1 min)*
    - We will learn to create a safe alternate path for Dr. Cleo to travel around the city.

U.S. Standards:

CSTA: 2-AP-11, 2-AP-12, 2-AP-14

Links Table		
Activity	**Activity Name**	**Link**
Class Presentation	Jump To Safety	https://s3-whjr-curriculum-uploads.whjr.online/c8f47830-6057-4631-b9a0-1960d9967cbc.html
Explore Activity	Jump To Safety: Explore Activity	https://tynker.com/code/view/633e87bf4b7d4516af309922/
Teacher Activity 1	Make Dr. Cleo Jump on Keypress	https://tynker.com/code/project/63318704b72dd31d58684172
Teacher Activity 1 Solution	Make Dr. Cleo Jump on Keypress - Solution	https://tynker.com/code/project/633186be0e92c85906438ee5
Student Activity 1	Add Gravity to Dr. Cleo	https://tynker.com/code/project/633185bb2ed4447ae239c4c2
Teacher Reference: Student Activity 1 Solution	Add Gravity to Dr. Cleo - Solution	https://tynker.com/code/project/63318581b381ff4ec31d0b62

Teacher Activity 2	Add Vertical Collision Detection	https://tynker.com/code/project/633185158ca6c22db260a6a2
Teacher Activity 2 Solution	Add Vertical Collision Detection - Solution	https://tynker.com/code/project/633184f5fa90d94fa87a4ae2
Student Activity 2	Add Horizontal Collision Detection	https://tynker.com/code/project/6331847aea3fe82f9d18fab6
Teacher Reference: Student Activity 2 Solution	Add Horizontal Collision Detection - Solution	https://tynker.com/code/project/633184071858e80922229932
Student Activity 3.1	Avoid the Midair Jump	https://tynker.com/code/project/633183203 97b3131af081e22
Teacher Reference: Student Activity 3.1 Solution	Avoid the Midair Jump - Solution	https://tynker.com/code/project/6331824eaf1d49571a1d3742
Student Activity 3.2	Debug the Horizontal Collision	https://tynker.com/code/project/633e878bdc91357cc5770d77
Teacher Reference: Student Activity 3.2 Solution	Debug the Horizontal Collision - Solution	https://tynker.com/code/project/633e87bf4b7d4516af309922
Student's Additional Activity 1	Make Dr. Cleo Jump On Springs	https://tynker.com/code/project/633349d26f44ee10a0d1db272
Teacher Reference: Student's Additional Activity 1 Solution	Make Dr. Cleo Jump On Springs - Solution	https://tynker.com/code/project/633349d0537683a4d2e1c4422
Student's Additional Activity 2	Reset the Player	https://tynker.com/code/project/633349b737f1710430135e8e2
Teacher Reference: Student's Additional Activity 2 Solution	Reset the Player - Solution	https://tynker.com/code/project/633348f33cf6f5353356fdd02
Post Class Project	Basketball	https://tynker.com/code/project/633b34406d9fad5f9c57a7e2
Teacher Reference: Post Class Project Solution	Basketball - Solution	https://tynker.com/code/project/6337fb0d9928ed6fb3759c82