Falling Asteroids

Python Foundation

Time: 60 mins

Introduction

In this class, students will be introduced to using multiple turtles, while loop and if condition using which they will add an asteroid and make it fall continuously. By the end of the class, they will add the effect of multiple asteroids falling.

Python Commands Introduced

- variable_name = turtle.Turtle() Creates a turtle named variable_name.
- screen.register_shape(image) Registers image as a shape of the screen.
- turtle.shape(image) Assign an image to the turtle.
- turtle.hideturtle() Makes the turtle invisible.
- turtle.showturtle() Makes the turtle visible.

Vocabulary

- **Multiple turtles:** To create 'n' number of objects, 'n' number of turtles need to be created.
- The **while loop** repeats the code block until the condition is true. Using this, we make the asteroid fall until it reaches the bottom edge of the screen.

  Syntax:

  ```
  while(condition):
      #code
  ```

- **If statement** checks for a condition and only if it satisfies the condition, the code block is executed. Using this in our game, if the asteroid has crossed the bottom edge, the asteroid's position will reset to the top of the screen.

  Syntax:

  ```
  if(condition):
      #code
  ```

Learning Objectives

Student(s) should be able to:

- ***Explain*** how to create multiple turtles.
- ***Describe*** the use of a while loop.
- ***Implement*** the if statement and while loop to make the asteroid reappear and give continuous movement to it.

Activities

1. **Class Narrative:** *(2 mins)*
    - Ask students about objects encountered in space travel.
    - Build excitement about adding space objects like asteroids, comets in our space game.

2. **Concept Introduction Activity:** *(2 mins)*
    - Lead them to think of falling asteroids as the obstacles and how they can be added and moved around in the game.

3. **Activity 1: Create an Asteroid** *(12 mins)*

    Teacher Activity:
    - Introduce how to assign an image to the turtle and explain to them **the need of a separate turtle for each object** in game.
    - Explain how to create a spaceship turtle and assign an image to it.

    Student Activity:
    - Guide the student to create an asteroid turtle and assign an image to it.

4. **Activity 2: Move the Asteroid** *(10 mins)*

    Teacher Activity:
    - Introduce them how to use a while loop to run a code repeatedly until the condition is satisfied.
    - Explain the **while** loop and its condition to make the asteroid fall.

    Student Activity:
    - Guide the students to move the asteroid continuously until it crosses the bottom edge.
      Note: Students might miss "**:**" or code indentation for while loop. Guide the student to correct it.

5. **Activity 3: Reset the Asteroid** *(12 mins)*

    Teacher Activity:
    - Introduce the problem of an asteroid disappearing and lead them to find a solution.
    - Explain the use of **if** conditional statements to check if the asteroid has crossed the bottom edge and if yes, only then make it reappear.

    Student Activity:
    - Guide the student to reset the asteroid from the top every time it crosses the bottom edge.
    - Help the students to hide the asteroid while it bounces back from the bottom and make it reappear when it reaches the top.

6. **Introduce the Post class project:** *(2 min)*
    - Continuing the previous post class project, add a football and direct it towards the goalpost.

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 towards the end of the class.

8. **Additional activities:**
    - Encourage them to spin the asteroid as it falls.

- Encourage them to limit the movement of the spaceship to the screen.

9. **State the Next Class Objective:** *(1 min)*
    - You will learn to detect the collision of the asteroid with the spaceship.

U.S. Standards:

CSTA: 2-AP-10, 2-AP-12, 2-AP-13

Links Table		
Activity	**Activity Name**	**Link**
Class Presentation	Falling Asteroids	https://s3-whjr-curriculum-uploads.whjr.online/483f99c6-60af-45c1-b5ce-0bb2d1c0a45a.html
Teacher Activity 1.1	Create an Asteroid	https://tynker.com/code/project/62bb02d1bbb835098e111052
Teacher Activity 1.1 Solution	Solution of TA1.1	https://tynker.com/code/project/62bb034bbbb835098e111057
Teacher Activity 1.2	Create an Asteroid	https://tynker.com/code/project/62bb01ee5ced733e3b0af622
Teacher Activity 1.2 Solution	Solution of TA1.2	https://tynker.com/code/project/62bb01820101177cad1d8262
Student Activity 1	Create an Asteroid	https://tynker.com/code/project/628ccb3ed4d5f836507c0a12
Teacher Reference: Student Activity 1 Solution	Solution of SA1	https://tynker.com//code/project/628ccdef8a6e60502027d092
Student Activity 2.1	Move the Asteroid	https://tynker.com/code/project/62b546a3e035786bf668bba8
Teacher Reference: Student Activity 2.1 Solution	Solution of SA2.1	https://tynker.com/code/project/628cd2761a4f7b091015d2a4
Student Activity 2.2	Move the Asteroid	https://tynker.com/code/project/62bc31736e81f354f72c22c2
Teacher Reference: Student Activity 2.2 Solution	Solution of SA2.2	https://tynker.com/code/project/62bc31d0a064a16f270cbcd7
Student Activity 3.1	Reset the Asteroid at starting position	https://tynker.com/code/project/628cdb307ccd5f5ff349bb82
Teacher Reference: Student Activity 3.1 Solution	Solution of SA3.1	https://tynker.com/code/project/628cd6d362855a468729ca52
Student Activity 3.2	Reset the Asteroid at starting position	https://tynker.com/code/project/628cdc94c52c1826fa173f43
Teacher Reference: Student Activity 3.2 Solution	Solution of SA3.2	https://tynker.com/code/project/628cdc379bad2719fb354f82
Student Additional Activity 1	Spin the Asteroid	https://tynker.com/code/project/628cde222d53854902600bc2
Teacher Reference: Student Additional Activity 1 Solution	Solution of SAA1	https://tynker.com/code/project/628cde70077aa8605c026e92

Student Additional Activity 2	Limit the Spaceship movement	https://tynker.com/code/project/62a04b672e4e20227b60fcb2
Teacher Reference: Student Additional Activity 2 Solution	Solution of SAA2	https://tynker.com/code/project/62a04c736ddc9d5ab44f3c32
Post Class Project	Barge the Goalpost	https://tynker.com/code/project/62b40089cfd26f413c477094
Teacher Reference: Post Class Project Solution	Solution of Post Class Project	https://tynker.com/code/project/62b3fe6ed2c974015a74f362