Design a Satellite

Python Foundation

Time: 60 mins

Introduction

In this class, students will be introduced to the Turtle tool using which they will learn to draw basic shapes and fill them with colors to create the structure of a satellite.

Python Commands Introduced

- turtle.forward(steps)   Moves the turtle forward by the number of steps specified.
- turtle.left(angle)   Turn the turtle in the anticlockwise direction by the angle specified.
- turtle.right(angle) Turn the turtle in the clockwise direction by the angle specified.
- turtle.goto(x,y)   Moves the turtle to (x,y) coordinate on the screen.
- turtle.penup()   Lifts the turtle up and stops drawing.
- turtle.pendown() Place the turtle on the screen and get ready to draw.
- turtle.fillcolor('color')   Specifies the color to be used for filling a shape.
- turtle.begin_fill() Get ready to fill the color set in turtle.fillcolor('color').
- turtle.end_fill()   Stops filling the color in the shapes created here after.

Vocabulary

- **Turtle:** Turtle is a tool in Python that provides users with a virtual canvas to create shapes and patterns.
- **Coordinates:** The position of the turtle on the canvas is given by two points x and y, written as (x,y). The different positions represented by (x,y) are also known as the coordinates of the turtle on the canvas.

Learning Objectives

Student(s) should be able to:
- *Describe* how to give instructions or commands.
- *Explain* how to write commands using the Python programming language.
- *Demonstrate* to use the turtle tool to draw shapes using commands in Python.
- *Create* squares and triangles to create the structure of a satellite.

Activities

1. **Ice Breaker:** *(2 mins)*
    - Before you present your screen, introduce yourself and interact with the students
    - Ask students their names and their favorite game.
      <u>Note:</u> Use Ice Breaker activity if the student has not attended the trial class.

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

- Ask students about the image of Earth rising over the moon's surface and relate it to 3300 satellites which click pictures of Earth and outer space.

3. **Concept Introduction Activity:** *(2 mins)*
    - Introduce the title screen and discuss the objects to be added in the space themed title screen(e.g. stars, planet and satellite).
    - Show them a labeled image of the satellite and ask them which basic shapes can be used to create each part of the satellite.

4. **Activity 1: Draw Satellite Body and Reflector:** *(10 mins)*

    Teacher Activity:
    - Explain to the students the Tynker coding platform, code area, how to import turtle tool, how to run the code, and where to see the output.
    - Introduce the Turtle tool and use the **turtle.forward(steps)** and **turtle.left(angle)** to draw a square shaped satellite body.
    - Summarize the use of the **dot(.)** operator.

    Student Activity:
    - Explain about the reflector that it is used in satellites to send back the signals received from the earth.
    - Guide the students to use the **turtle.forward(steps)** and **turtle.right(angle)** to draw a triangular reflector.

5. **Activity 2: Draw Solar Panels:** *(15 mins)*

    Teacher Activity:
    - Introduce the **turtle.goto(x,y)** which moves the turtle to a new location (x,y).
    - Use the **turtle.penup()** and **turtle.pendown()** to avoid trailing lines while drawing the left solar panel.
    - Probing Question: "How did we select the point to draw the left solar panel?"
      Expected Answer: "We stopped drawing using turtle.penup() and moved to the desired coordinate using turtle.goto() and then, we can start drawing using turtle.pendown()."

    Student Activity:
    - Guide the students to use **turtle.goto(x,y)**, **turtle.penup()** and **turtle.pendown()** to move the turtle and draw the right solar panel.
    - Guide the student to play the output without grid by commenting "**import grid**" using "**#**" before it.

6. **Activity 3: Color the Satellite:** *(10 mins)*

    Teacher Activity:
    - Introduce the turtle commands **turtle.fillcolor(color)**, **turtle.begin_fill()** and **turtle.end_fill()** to fill the color in the square shaped satellite body.

    Student Activity:
    - Guide the students to follow a sequence of commands to fill color in the triangular reflector.
    - Encourage the students to explore setting color for the solar panels.

7. **Introduce the Post class project:** *(2 min)*

- Draw the missing parts of the satellite.(Middle window, last window and the right thruster)
- Explain how the student can access and complete the Post class project.

8. **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.

9. **Additional activities:**
   - Encourage them to draw and color the square-shaped chamber.
   - Allow them to draw the partition line passing through the solar panels.

10. **State the Next Class Objective:** *(1 min)*
   - We will learn to create a moon, its craters and a few stars for the game title screen using the Turtle tool.

U.S. Standards:

CSTA: 2-AP-13, 2-AP-14

Links Table		
Activity	**Activity Name**	**Link**
Class Presentation	Design a Satellite	https://s3-whjr-curriculum-uploads.whjr.online/395dba67-20b0-4e38-990e-75ee8367c9a9.html
Teacher Activity 1	Draw the Body of the Satellite	https://tynker.com/code/project/62a155555ff81e23ec291eb2
Teacher Activity 1 Solution	Solution of TA1	https://tynker.com/code/project/62a1556a5ff81e23ec291eb4
Student Activity 1	Draw the Reflector of the satellite	https://tynker.com/code/project/62a1556d55c8422ef3431102
Teacher Reference: Student Activity 1 Solution	Solution of SA1	https://tynker.com/code/project/62a072a4ef724b33ee6f29b2
Teacher Activity 2	Draw Left Solar Panel	https://tynker.com/code/project/62a1bdf63bb7ae77461820c2
Teacher Reference: Teacher Activity 2 Solution	Solution of TA2	https://tynker.com/code/project/62a1bdf913dc2b7e5f01a872
Student Activity 2	Draw Right Solar Panel	https://tynker.com/code/project/62a158c9a537ec3e3738ece2
Teacher Reference: Student Activity 2 Solution	Solution of SA2	https://tynker.com/code/project/62a092930c5e052cc14849b2

Teacher Activity 3	Color the Satellite	https://tynker.com/code/project/62aaf720f8be3e46e64d04d2
Teacher Reference: Teacher Activity 3 Solution	Solution of TA3	https://tynker.com/code/project/62a15a420731272e01308b62
Student Activity 3	Color the Satellite	https://tynker.com/code/project/62a15a4486fe2d1e1e43e8e2
Teacher Reference: Student Activity 3 Solution	Solution of SA3	https://tynker.com/code/project/62a07f4cfb78dd1e957bdec2
Student Additional Activity 1	Create a Square Chamber	https://tynker.com/code/project/629860d219c6c639ed1d4f82
Teacher Reference: Student Additional Activity 1 Solution	Solution of SAA1	https://tynker.com/code/project/62985d088a69186287602b32#/
Student Additional Activity 2	Partition Lines for Solar Panels	https://tynker.com/code/project/62a03732f909c76f8927bdc2
Teacher Reference: Student Additional Activity 2 Solution	Solution of SAA2	https://tynker.com/code/project/62a03511ce3d04293c7e90e2
Post Class Project	Rocket	https://tynker.com/code/project/62ab0f2341c77207d16a69b3
Teacher Reference: Post Class Project Solution	Solution of Post Class Project	https://tynker.com/code/project/629f308642c3a666de3b69e2