Cse 431

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Project 1

**File Structure:**

The folder contains multiple files related to the project. Here's what you likely have:

**sgraph.py**: This file contains the implementation of the SGraph class. The class is designed to model the directed graph with switches and provide methods to manipulate and interact with the graph, including moving the robot, counting commands, solving puzzles, and finding challenging instances.

**enumerator.py**: This file contains the implementation of the DigraphEnumerator class, which is responsible for generating different instances of 2-regular directed graphs. This class plays a crucial role in tasks related to enumerating graphs with different labels and characteristics.

**testcase.py**: This file contains unit test cases using the unittest framework. The test cases are designed to validate the correctness of the implemented SGraph and DigraphEnumerator classes. The tests cover various functionalities and scenarios to ensure the code works as expected.

**main.py**: This file contains the main() function, which provides a user interface for interacting with the SGraph class. It presents a menu to the user to perform different operations.

**Project Functionality:**

SGraph Class (sgraph.py): The core class that models the directed graph and offers methods to perform various operations.

**Initialization**: The SGraph class is initialized with a dictionary of edges representing the graph structure and initial switch states for each vertex.

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**Move Function**: The move method simulates the robot's movement based on an input sequence of edge labels ('a' or 'b'). It updates the robot's position and switch states along the way.

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**Count Function**: The number of different instruction sequences that move the robot from an initial position to a destination within a given instruction length.

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**scount function**: The number of instruction sequences of a specific length for the robot to move from an initial position to a destination, while ensuring that the final switching state conforms to a given set of states.

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**Solve Function**: The solution method finds a shortest sequence of instructions from a given initial position.

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**Find Hardest Function**: The find\_hardest method aims to find the hardest problem instance for a given graph size, where the robot must move to maximize the length of the command sequence.

**DigraphEnumerator Class (enumerator.py):** The class responsible for efficiently generating instances of the 2-regular digraph.

**Initialization**: The DigraphEnumerator class is initialized with a graph size (m).

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Enumeration: It enumerates different instances of the 2-regular digraph based on specific conditions.

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**main() Function (main.py):** This function provides a user-friendly menu for interacting with the SGraph class.

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