Hw3 (Q Learning)

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Setup steps :

1> Setup Python Virtual environment and install base packages like numpy, and cv2
Can use base:conda environment which has cv2 preinstalled

2> **Run the 018225597.py file** and the output video file will be generated.

Working :

The script has many comments explaining the code structure and the constraints and variables are initialised on top to make it easy to experiment.

```
# Constants
GRID_SIZE = 20
OBSTACLE_RATIO = 0.2
START = (0, 0)
GOAL = (19, 19)
ACTIONS = [(0, -1), (0, 1), (-1, 0), (1, 0)]
ACTION_NAMES = ['Up', 'Down', 'Left', 'Right']

# Q-Learning parameters
ALPHA = 0.1
GAMMA = 0.95
EPSILON_DECAY = 0.995
EPSILON_MIN = 0.01
EPISODES = 1000

# Visualization
CELL_SIZE = 30
VIDEO_FILENAME = 018225597.mp4'
FPS = 30
```

Assumptions :

While randomly generating the grid, although a low probability the path can be blocked where the destination is covered / starting point is covered, I have assumed this rarely happens and have not handled this case, if this happens can just rerun the script to get a new video file.

[Wanted to mention it here as i spotted the same]

Maybe a fix for this would have been to calculate a path initially to see if the problem is solvable or not