Assignment 3: Data Structures

Assumptions:

1. The size of the river or ecosystem is fixed.
2. The input arguments to the function eco are river size and time steps.
3. Animals have been modelled as classes with kind, gender and strength as attributes.
4. The population of the ecosystem is assumed to be normally distributed with a mean of about half the size of the river and variance of one tenth the size of the river.
5. The number of bears and fishs is a random number between zero and the population of the ecosystem as determined in the above manner.
6. In every iteration each animal can move either left or right to the adjacent cell or can stay in its place.
7. If the animal at the extreme ends of the river moves to a cell outside of the river, then that animal is assumed to have migrated to another ecosystem and hence is eliminated from the list.
8. When there are three animals at a particular cell:
    - If there are three animals of the same species and gender, then the only the strongest animal survives.
    - If there are three animals of the same species but different genders, then the animals of the same gender fight to mate.
    - If there are two fishes and one bear, the bear eats the two fishes.
    - If there are two bears and one fish the fish is destroyed and then the normal two animal interaction rules are followed for the bears.
8. Whenever there is a baby produced it is randomly inserted into a vacant position in the river at the end of the loop.
9. The function returns the state of the ecosystem at every time point.

Examples:

1. **eco(15, 1): (random.seed(11))**
    - Total population: 6
    - No of fish: 6
    - No of bear: 0
    - The ecosystem is as given below

    [('fish', 'female', 0.09), ('fish', 'female', 0.59), None, ('fish', 'male', 0.14), None, None, None, ('fish', 'female', 0.18), ('fish', 'male', 0.45), ('fish', 'male', 0.62), None, None, None, None, None]
    - old positions: [0, 1, 3, 7, 8, 9]
    - new positions: [0, 1, 3, 8, 7, 10] (after random movement)
    - Final ecosystem after one time step:

    ['fish', 'fish', None, 'fish', None, None, None, 'fish', 'fish', None, 'fish', None, None, None, None]

2. **eco(15, 1): (random.seed(3))**
    - Total population: 7
    - No of fish: 5
    - No of bear: 2
    - The ecosystem is given by:

    [('fish', 'male', 0.39), None, ('fish', 'male', 0.54), ('fish', 'female', 0.19), None, None, None, None, None, ('bear', 'female', 0.60, ('bear', 'male', 0.62), ('fish', 'female', 0.23), None, None,

('fish', 'male', 0.25)]

- old positions: [0, 2, 3, 9, 10, 11, 14]
- new positions: [1, 2, 3, 10, 11, 11, 13] (after random movement)
- Final ecosystem after one time step:

[None, 'fish', 'fish', 'fish', None, None, None, None, None, None, 'bear', 'bear', None, 'fish', None]]

3. eco(15, 5): (random.seed(3))

- Total population: 7
- No of fish: 5
- No of bear: 2
- The ecosystem is given by:
- [('fish', 'male', 0.39), None, ('fish', 'male', 0.54), ('fish', 'female', 0.19), None, None, None, None, None, ('bear', 'female', 0.60), ('bear', 'male', 0.62), ('fish', 'female', 0.23), None, None, ('fish', 'male', 0.25]
- old positions: [0, 2, 3, 9, 10, 11, 14]
- new positions: [1, 2, 3, 10, 11, 11, 13]

[None, 'fish', 'fish', 'fish', None, None, None, None, None, None, 'bear', 'bear', None, 'fish', None]

- old positions: [1, 2, 3, 10, 11, 13]
- new positions: [1, 1, 2, 9, 11, 12]

[None, 'fish', 'fish', None, None, None, None, None, None, 'bear', None, 'bear', 'fish', None, None]

- old positions: [1, 2, 9, 11, 12]
- new positions: [1, 3, 9, 12, 12]

[None, 'fish', None, 'fish', None, None, None, None, None, 'bear', None, None, 'bear', None, None]

- old positions: [1, 3, 9, 12]
- new positions: [1, 4, 9, 13]

[None, 'fish', None, None, 'fish', None, None, None, None, 'bear', None, None, None, 'bear', None]

- old positions: [1, 4, 9, 13]
- new positions: [1, 5, 10, 13]

[None, 'fish', None, None, None, 'fish', None, None, None, None, 'bear', None, None, 'bear', None]