Modeling the Zombie Apocalypse

PEARC17 Modeling Day Group 6
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Safe Zone

Humans have established safe zone

Top right corner

Humans stop in this, zombies turn around

```python
if objects[i][4] == 0:
    if np.random.rand() > 0.7:
        # infrequently drop a zombie in the area below the safe zone
        if np.random.rand() > 0.5:
            objects[i][0] = np.random.uniform(0.7, 1)
            objects[i][1] = np.random.uniform(0, 0.7)
            # infrequently drop a zombie in the area to the left of the safe zone
        else:
            objects[i][0] = np.random.uniform(0, 0.7)
            objects[i][1] = np.random.uniform(0.7, 1)
    else:
        objects[i][0] = np.random.uniform(0, 0.7)
        objects[i][1] = np.random.uniform(0, 0.7)
else:
    objects[i][0] = np.random.rand()
    objects[i][1] = np.random.rand()
```
Random Movement

Zombies and humans have chance of changing direction

Zombies more likely to alter course

Humans have higher top speed (abs(.5) vs abs(.25))

```python
#humans have 1 in 5 chance of changing velocity
if objects[j][4] == 1 and np.random.rand() < .2:
    objects[j][2] = 0.5 - np.random.uniform(0,1)
    objects[j][3] = 0.5 - np.random.uniform(0,1)

#zombies have 1 in 2 chance of changing velocity
elif objects[j][4] == 0 and np.random.rand() < .5:
    objects[j][2] = 0.25 - np.random.uniform(0, 0.5)
    objects[j][2] = 0.25 - np.random.uniform(0, 0.5)
```
Zombies Cluster Together

If the zombies get close enough together they will cluster together

The velocity vector of one zombie is changed to be equal to the other

```python
# group_zombies
for j in range(N):
    if objects[j][4] == 0:
        for k in range(N):
            if objects[k][4] == 0:
                if distance(objects, j, k) < 0.05:
                    objects[k][2] = objects[j][2]
                    objects[k][3] = objects[j][3]
```
Running the Simulation

80 humans vs. 20 zombies
Zombies and humans move randomly
Zombies move slower
Top right corner is the safe zone
Zombies cluster together