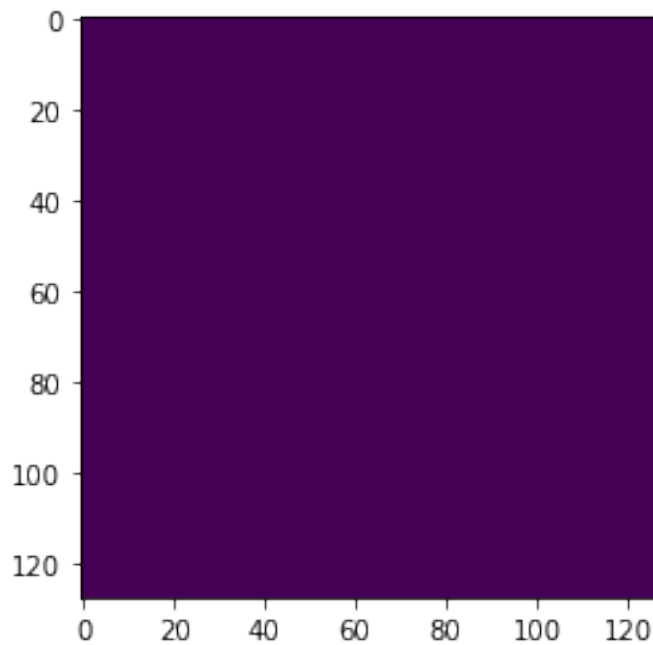# langton

June 28, 2021

```python
[1]: import numpy as np
     import matplotlib.pyplot as plt
     import cv2
     %matplotlib inline
```

0.1 Initializing the State

```python
[2]: n = 128
     state = np.zeros((n,n))
```

```python
[3]: plt.imshow(state)
```

```
[3]: <matplotlib.image.AxesImage at 0x7f1235365340>
```

```
[4]:  # Randomly identifying a start location
      start = ( int(n/3+np.random.rand()*n/3), int(n/3+np.random.rand()*n/3) )
```

0.2   Evolving the State

Using **orient** to keep track of the direction of traversal.

```
[5]:  N = 2*10**4 # Number of timesteps

      pos = start
      orient = 0
      for time in range(N):
          # Updating the current state
          if state[pos]==0.0:
              state[pos] = 255.0
              orient = (orient+1)%4 # Turning clockwise
          elif state[pos]==255.0:
              state[pos] = 0.0
              orient = (orient+3)%4 # Turning anti-clockwise

          # Finding the next state
          if orient == 0:
              if pos[1]-1>0:
                  pos = (pos[0], pos[1]-1)
          elif orient == 1:
              if pos[0]+1<n:
                  pos = (pos[0]+1, pos[1])
          elif orient == 2:
              if pos[1]+1<n:
                  pos = (pos[0], pos[1]+1)
          elif orient == 3:
              if pos[0]-1>0:
                  pos = (pos[0]-1, pos[1])

          if time<1500:
              if time%100==0:
                  fname = "Iteration-"+str(time)+".png"
                  cv2.imwrite(fname, state)
          else:
              if time%1000==0:
                  fname = "Iteration-"+str(time)+".png"
                  cv2.imwrite(fname, state)
```

```
[ ]:
```