

CSC411H1S Project 4

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1. The board is represented by a flat 9-element NumPy tuple. Turn denotes whose turn it is (1 for X, 2 for O). Done denotes whether the game is done (True if game is over, False otherwise.)

Below is an example of a sample game played against myself.

```
Python 2.7.14 |Anaconda custom (64-bit)| (default, Oct 5 2017, 02:28:52)
[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)] on darwin
env.render()
=====
env.step(0)
Out[3]: (array([1, 0, 0, 0, 0, 0, 0, 0, 0]), 'valid', False)
env.render()
x..
=====
env.step(4)
Out[5]: (array([1, 0, 0, 0, 2, 0, 0, 0, 0]), 'valid', False)
env.render()
x..
.o.
=====
env.step(8)
Out[7]: (array([1, 0, 0, 0, 2, 0, 0, 0, 1]), 'valid', False)
env.render()
x..
.o.
..X
=====
env.step(2)
Out[9]: (array([1, 0, 2, 0, 2, 0, 0, 0, 1]), 'valid', False)
env.render()
x.o
.o.
..X
=====
env.step(6)
Out[11]: (array([1, 0, 2, 0, 2, 0, 1, 0, 1]), 'valid', False)
env.render()
x.o
.o.
x.x
=====
env.step(3)
Out[13]: (array([1, 0, 2, 2, 2, 0, 1, 0, 1]), 'valid', False)
env.render()
x.o
oo.
x.x
=====
env.step(7)
Out[15]: (array([1, 0, 2, 2, 2, 0, 1, 1, 1]), 'win', True)
env.render()
x.o
oo.
xxx
=====
```

```
env.done
Out[17]: True
env.step(1)
Out[18]: (array([1, 0, 2, 2, 2, 0, 1, 1, 1]), 'done', True)
```

2. (a)

(b)

(c)

3. (a)

(b)

4. (a)

(b)

5. (a)

(b)

(c)

(d)

6.

7.

8.