Tile Coding

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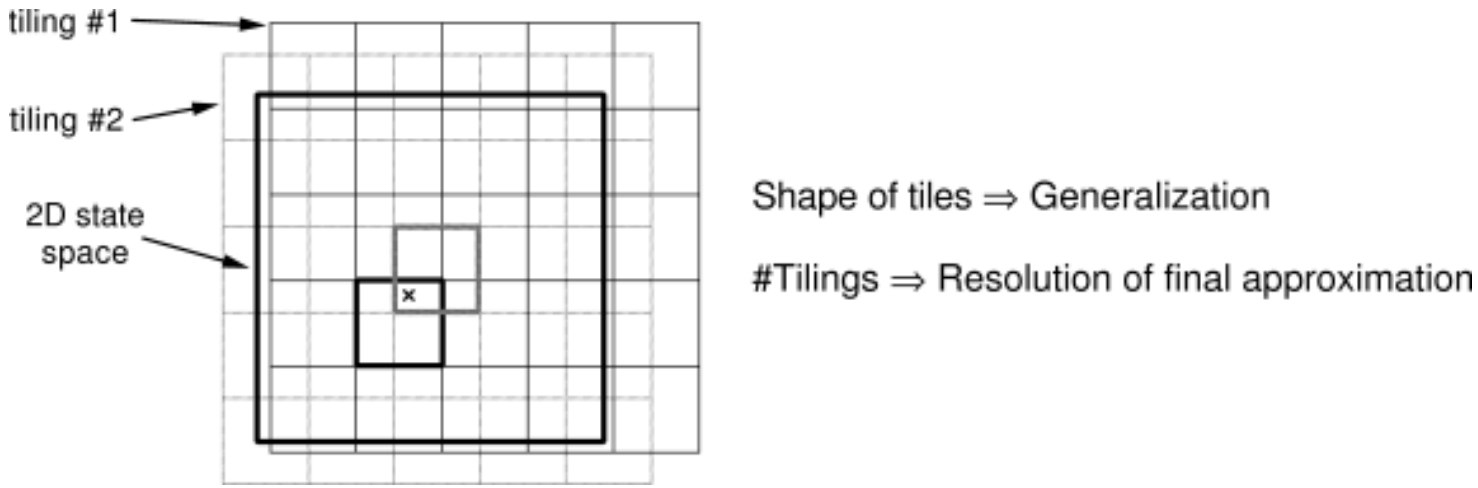
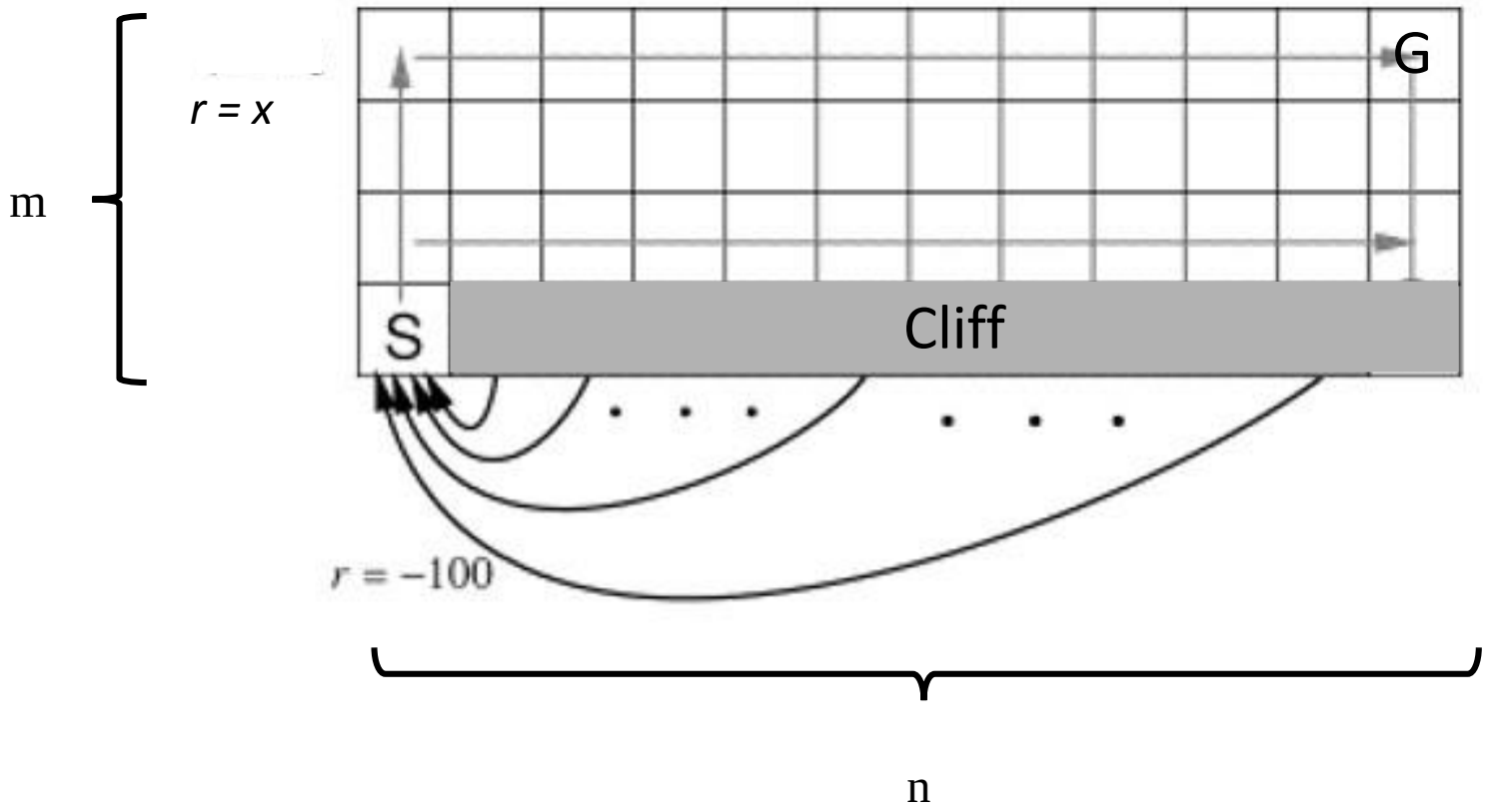
Introduction

- **Tile coding** is a form of coarse coding that groups continue states into exhaustive partitions.



- Different tilings: Grid tiling, Irregular tiling, Log stripes, Diagonal stripes

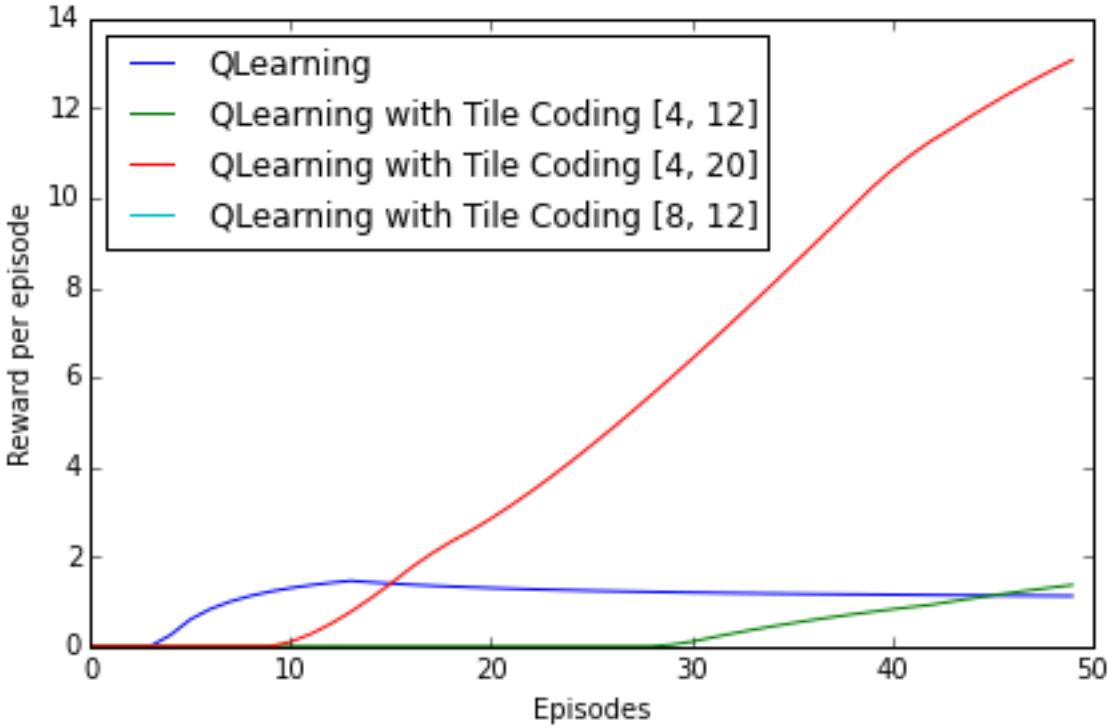
Large Scale CliffWalking



- m = n > 100

Results

- **Q-learning without Tile Coding**
  - **Average number of steps : 90468.3**
  - **Average time : 0.8179**
- **Q-learning with Tile Coding [4, 12]:**
  - **Average number of steps : 9507.48**
  - **Average time: 0.2363**
- **Q-learning with Tile Coding [4, 20]:**
  - **Average number of steps : 14232.18**
  - **Average time : 0.3549**
- **Q-learning with Tile Coding [8, 12]:**
  - **Average number of steps : 5541.16**
  - **Average time : 0.5709**



Parameter Estimation of a Plane

- After 60 iterations,
- Without Tile Coding

```
0 [[-0.00485091 0.6484623 ]] [ 0.28584111] 0.0402499
20 [[ 0.07618259 0.2899161 ]] [ 0.26610792] 0.000695447
40 [[ 0.09791516 0.22105317]] [ 0.29006329] 3.72425e-05
60 [[ 0.10039029 0.20508216]] [ 0.29708934] 2.25053e-06
```

- With Tile Coding (size of tiles is 20)

```
0 [[-0.37959146 -0.43442643 -0.84063673 -0.03851473 0.19489717 0.14552462 -0.43106794
0.06399334]] [ 0.54531169] 0.00582657
20 [[-0.37959146 -0.43502167 -0.84182721 -0.04030048 0.19251618 0.14254837 -0.43463942
0.05982658]] [ 0.51584381] 0.00485617
40 [[-0.37959146 -0.43502167 -0.84182721 -0.04030048 0.19251618 0.14254837 -0.43463942
0.05982658]] [ 0.51584381] 0.00485617
60 [[-0.37959146 -0.43502167 -0.84182721 -0.04030048 0.19251618 0.14254837 -0.43463942
0.05982658]] [ 0.51584381] 0.00485617
```

Parameter Estimation of a Plane

- With Tile Coding (size of tiles is 100)

```
0 [[ 0.81096244 -0.72231978 0.57849675 0.58854902 -0.49350154 -0.75187999 0.30046245
0.39356732]] [ 0.45528671] 0.00575172
20 [[ 0.81096244 -0.72281671 0.57750273 0.58705813 -0.49548948 -0.75436485 0.29748058
0.39008844]] [ 0.43068367] 0.00507527
40 [[ 0.81096244 -0.72281671 0.57750273 0.58705813 -0.49548948 -0.75436485 0.29748058
0.39008844]] [ 0.43068367] 0.00507527
60 [[ 0.81096244 -0.72281671 0.57750273 0.58705813 -0.49548948 -0.75436485 0.29748058
0.39008844]] [ 0.43068367] 0.00507527
```