Hide and Seek Using Function-based Q learning

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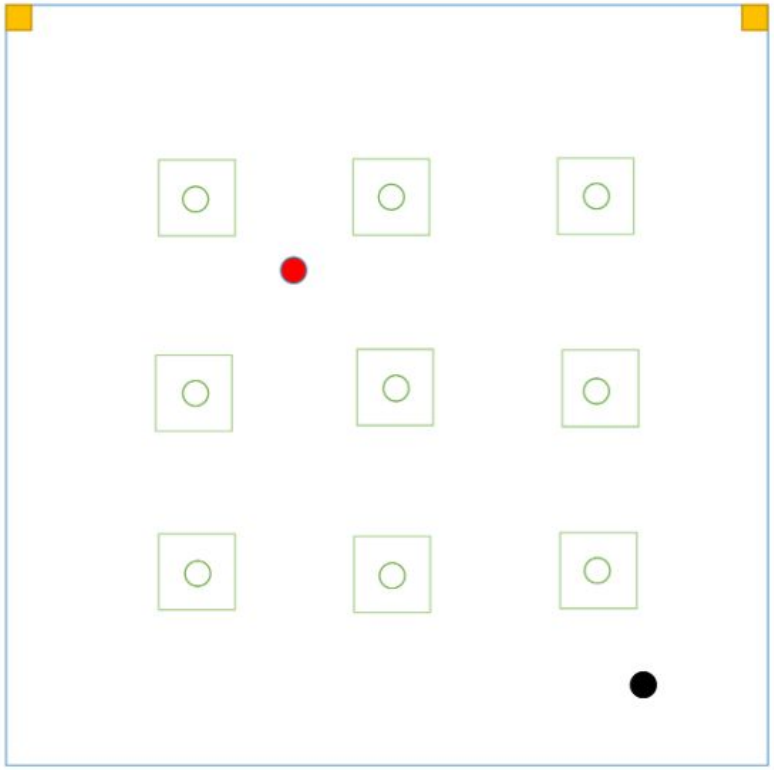
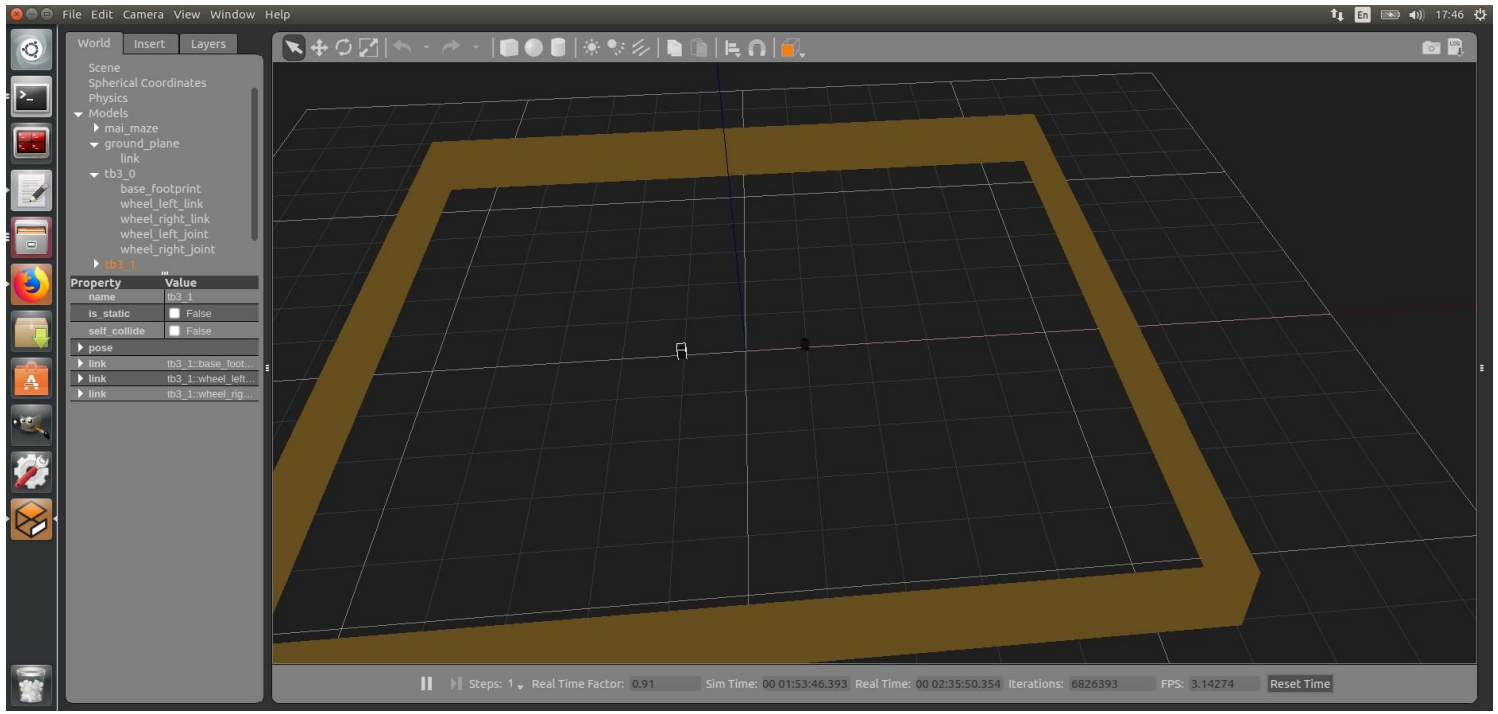
Outline

- Problem formulation
- Features
- Experiments
- Future work

Problem formulation



outlet
police
thief
pressure plate



Problem formulation

The Q function is approximated by some features.

$$Q(s,a) = \sum_i w_i f_i(s,a)$$

w:weighting vector
f:features

We use gradient descent to find w

$$w_i \leftarrow w_i + \alpha\left[R(s) + \gamma \max_{a'} Q(s',a') - Q(s,a)\right]\frac{\partial Q(s,a)}{\partial w_i}$$

Problem formulation

(Police)
Given
10*10 map outlet1(-5 , 5) outlet2(5 , 5)
Pressure plate: [3*s , 3*t] s , t ∈(-1 , 0 , 1)
robot size:0.3*0.3 (meter^2)
State: (i , j) -5 <= i <= 5,-5 <= j <= 6 i , j∈R
Action: (Up,Left,Down,Right,Stay)
Reward: 100 if police catch thief
-100 if thief escape
-0.1 go to the next state
Discount: 0.9

Problem formulation

(Thief)
Given
10*10 map outlet1(-5 , 5) outlet2(5 , 5)
Pressure plate: [3*s , 3*t] s , t ∈ (-1 , 0 , 1)
robot size:0.3*0.3 (meter^2)
State: (i , j) -5 <= i <= 5,-5 <= j <= 5 i , j∈R
Action: (Up,Left,Down,Right)
Reward: -100 if police catch thief
100 if thief escape
-0.1 go to the next state
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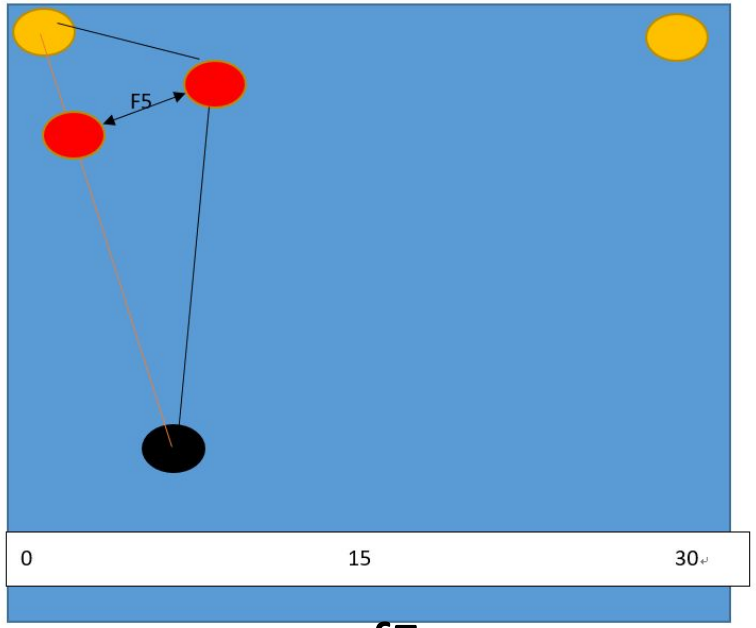
Features



f5

(Police)

feature1:constant

feature2:the minimum distance to the two outlets

feature3:x coordinate

feature4:y coordinate

feature5:the vertical distance from the police to the line between the thief and the exit

feature6:the distance of the police and the predict thief position

Features

(Thief)

feature1:constant

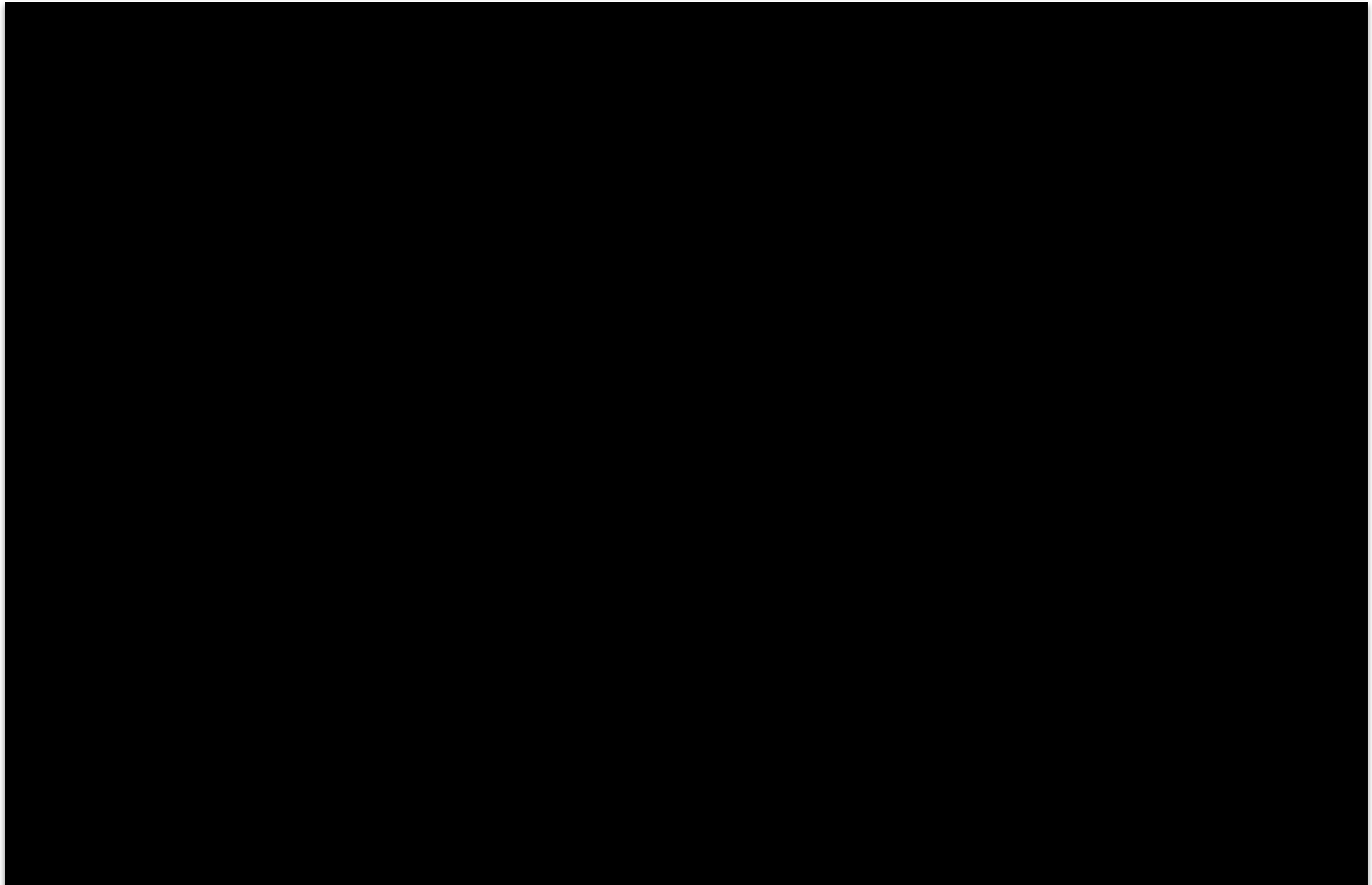
feature2:the minimum distance to the two outlets

feature3:x coordinate

feature4:y coordinate

feature5:the number of times that stay on the pressure plate

Experiments



Future

- Simulation
- Adjustment
  - feature
  - parameter
- Map reconstruct