

term-cost + reward + noise

from, to

2, 3, 4  
 $\Delta = 1$

$a \cdot r$

$\begin{bmatrix} 0 \\ 1 \end{bmatrix}$   
 indicator  
 $\text{node} \in G$

$b \cdot \text{noise}$

$U[-1, 1]$

$$\frac{1}{2 \cdot |G|}$$

$$\frac{1}{200}$$

$$|\text{path}| \leq \max X \cdot \max Y = |\text{Map}|$$

$$[-0.005; 0.005]$$

$$\text{Noise} = \sum_{i=1}^{|\text{path}|} b \cdot \text{noise}[i]$$

$$= b \cdot \sum \text{noise} \leq b \cdot |\text{path}| \cdot 1 =$$

$$\frac{1}{200} \cdot 100 \cdot 1 =$$

$$\frac{1}{2}$$

$$\frac{20 \times 5}{10 \times 10}$$

$$|G|$$

$$|G| + 1 < 1 = \Delta$$

term-cost + reward + noise

from, to

2, 3, 4

$\Delta = 1$

$a \cdot r$

$\begin{bmatrix} 0 \\ 1 \end{bmatrix}$   
indicator  
node  $\in G$

$b \cdot \text{noise}$

$U[-1, 1]$

$$\frac{1}{2 \cdot |G|}$$

$$\frac{1}{200}$$

$$[-0.005; 0.005]$$

$$|\text{path}| \leq \max X \cdot \max Y =$$

$$= |M_{ap}|$$

$$\text{Noise} = \sum_{i=1}^{|\text{path}|} b \cdot \text{noise}[i] =$$

$$= b \cdot \sum \text{noise} \leq b \cdot |\text{path}| \cdot 1 =$$

- 1)  $\text{ter\_cost} + \text{noise}$
- 2)  $\text{ter\_cost} + \text{reward}$
- 3)  $\text{ter\_cost} + \text{reward} + \text{noise}$

$$\downarrow$$

$$\Delta_{tc}$$

$$\downarrow$$

$$\Delta_r$$

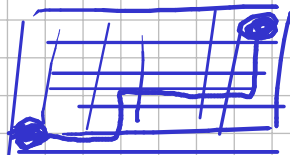
$$\text{Noise} = \sum_{i=1}^{|path|} b - r \leq b - |Map| < \Delta_r = \frac{1}{2|G|}$$

$$b = \frac{1}{4 \cdot |G| \cdot |Map|}$$

$$b < \frac{1}{2 \cdot |G| \cdot |Map|} ; |G| \approx |Map|$$

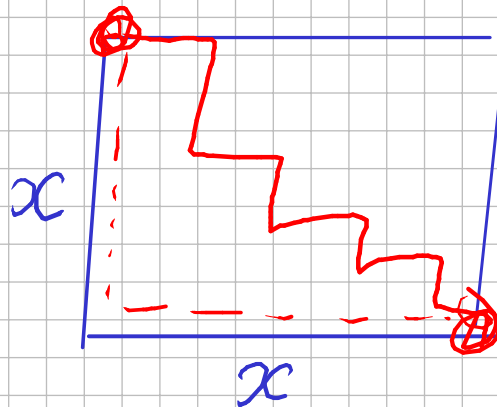
$$b \approx \frac{1}{2 \cdot |Map|^2}$$

$$|path| \leq |Map|$$

 $10 \times 10$ 

$$|\text{path}| \sim 2 \sqrt{|\text{Map}|}$$

$$\Sigma = |\text{Map}|$$



$$S = \text{см}^2 \text{ (площадь квадрата)}$$

$$b \cdot |path| < \Delta z = \frac{1}{2|G|}$$

$$b < \frac{1}{2|G| \cdot |path|}, \quad |path| \in \left[ \frac{|Map|}{2\sqrt{|Map|}} \right]$$

$$b = \frac{1}{4 \dots}$$

double newCost =

$$= \underbrace{\text{curr.cost}} + \text{terrainCost} + a \cdot \gamma + b \cdot \text{noise}$$

$$\text{newCost} \sim \sum_{i=1}^{|\text{path}|} \text{terrainCost}[i, i+1] \sim$$

$$\sim \langle \text{terrainCost} \rangle \cdot |\text{path}| \sim$$

$$\sim \frac{2+3+4}{3} \cdot |\text{path}| \sim 3 \cdot |\text{path}| \sim \text{big}$$

$$b \sim \frac{1}{4 \cdot |G| \cdot |\text{path}|} \sim \text{small}$$

$$\text{newCost} = \text{big} + \text{small}$$

$$\delta = \frac{\text{newCost}}{b} = 3 \cdot |\text{path}| \cdot 4 \cdot |G| \cdot |\text{path}| =$$

$$= 12 \cdot |G| \cdot |\text{path}|^2$$

1)  $|\text{path}| \sim |\text{Map}|$  ,  $|G| \sim |\text{Map}| \cdot \frac{1}{2}$

$$\delta \sim 12 \cdot \frac{1}{2} \cdot |\text{Map}| \cdot |\text{Map}|^2 = 6 |\text{Map}|^3 =$$

$$= 6 \cdot (100)^3 \sim 6 \cdot 10^6 \quad \text{pessimistic estimate}$$

2)  $|\text{path}| \sim 2\sqrt{|\text{Map}|}$  ,  $|G| \sim |\text{Map}| \cdot \frac{1}{2}$

$$\delta \sim 12 \cdot \frac{1}{2} \cdot |\text{Map}| \cdot (2\sqrt{|\text{Map}|})^2 = 24 \cdot |\text{Map}|^2 =$$

$$= 24 \cdot (100)^2 = 2,4 \cdot 10^5 \quad \text{optimistic estimate}$$





## *calculateNextMove*

*trajectory = findBestTrajectory*

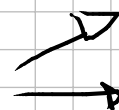
*if trajectory is better than current memorized, then update*

*EMove = ...*

*return Emove;*

## *findBestTrajectory*

*generate many trajectories*



*25 random noise restarts*

*for each 'g' from 'Goals'*

*assess cost for each trajectory*

*continuousPath(pPos, g)*

*while 'Goals' not empty*

*next = bfsNearest*

*return best trajectory*

*trajectory complete;*

## *calculateExplorationProgress*