

Neural Network
for
Hill-Climbable Subgoals

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Motivation

- ④ scrubbing
- ④ pre-computation space
- ④ query time

went a little bit too fast through this

Problem Formulation

- directed graph
 - states and edges
 - each edge has a positive cost of 1 (four-connected)
- an agent has a single current state
 - change by taking an action
- total cost of a path from start to goal is the solution cost
- an algorithm has to be complete] which means what ?

Problem Formulation

- real-time-ness
- bounded computation
- move time
- sub-optimality
- heuristic (euclidean distance)

What's the bound?
Is the bound
dependant on the
graph size?

Why Euclidean distance on 4-connected
graphs?

For each you need to tell us how these are solving / not solving your problem.

In other words, why is your work still needed?

Related Work

- A* [Hart, et al. 1968]
- D LRTA* [Bulitko, et al. 2008]
- KNN LRTA* [Bulitko, Björnsson, 2009]
- HCDPS [Lawrence, Ramon, Bulitko, 2010]



one person

How is this related?
It's not real-time.

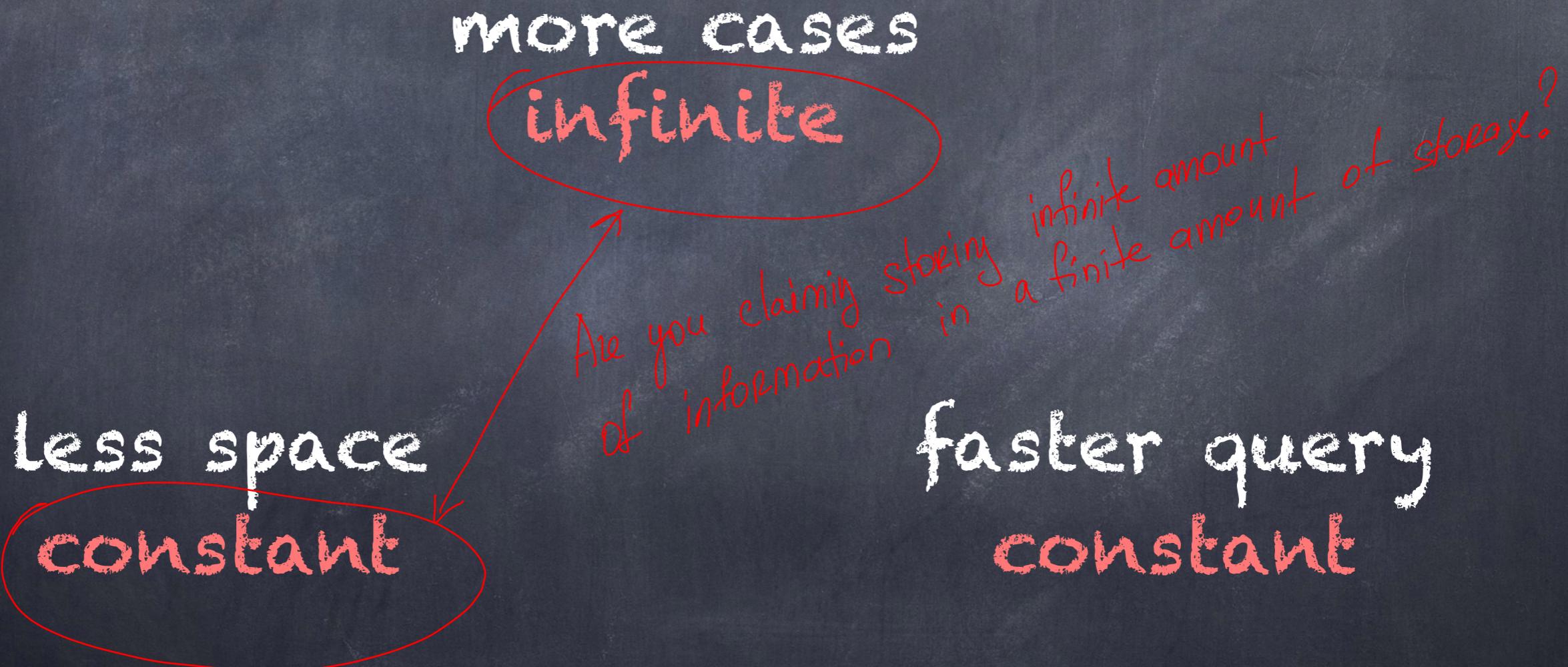
Related Work

- static map path finding
??
- build a "case base" for querying

Related Work

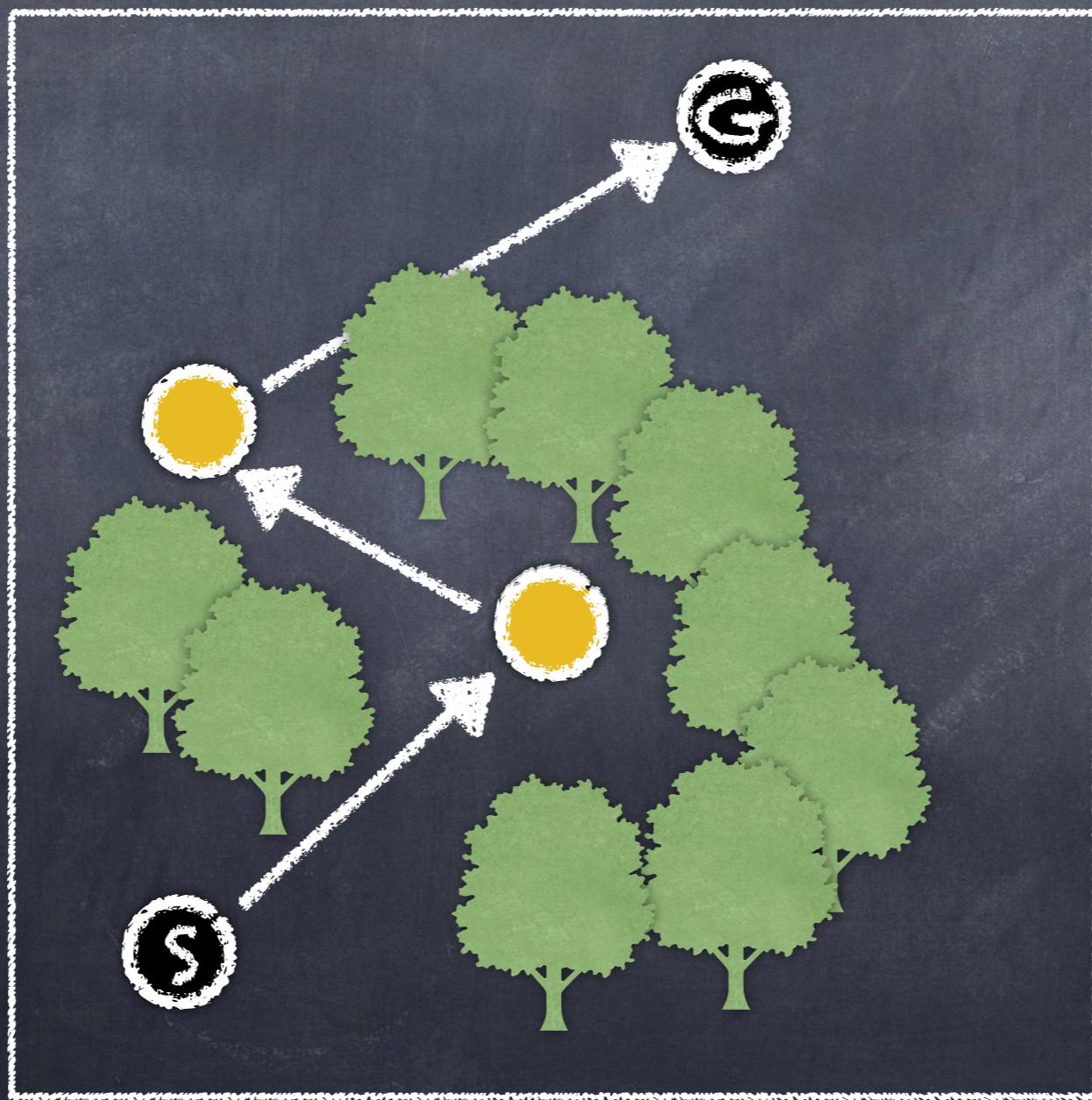


Related Work

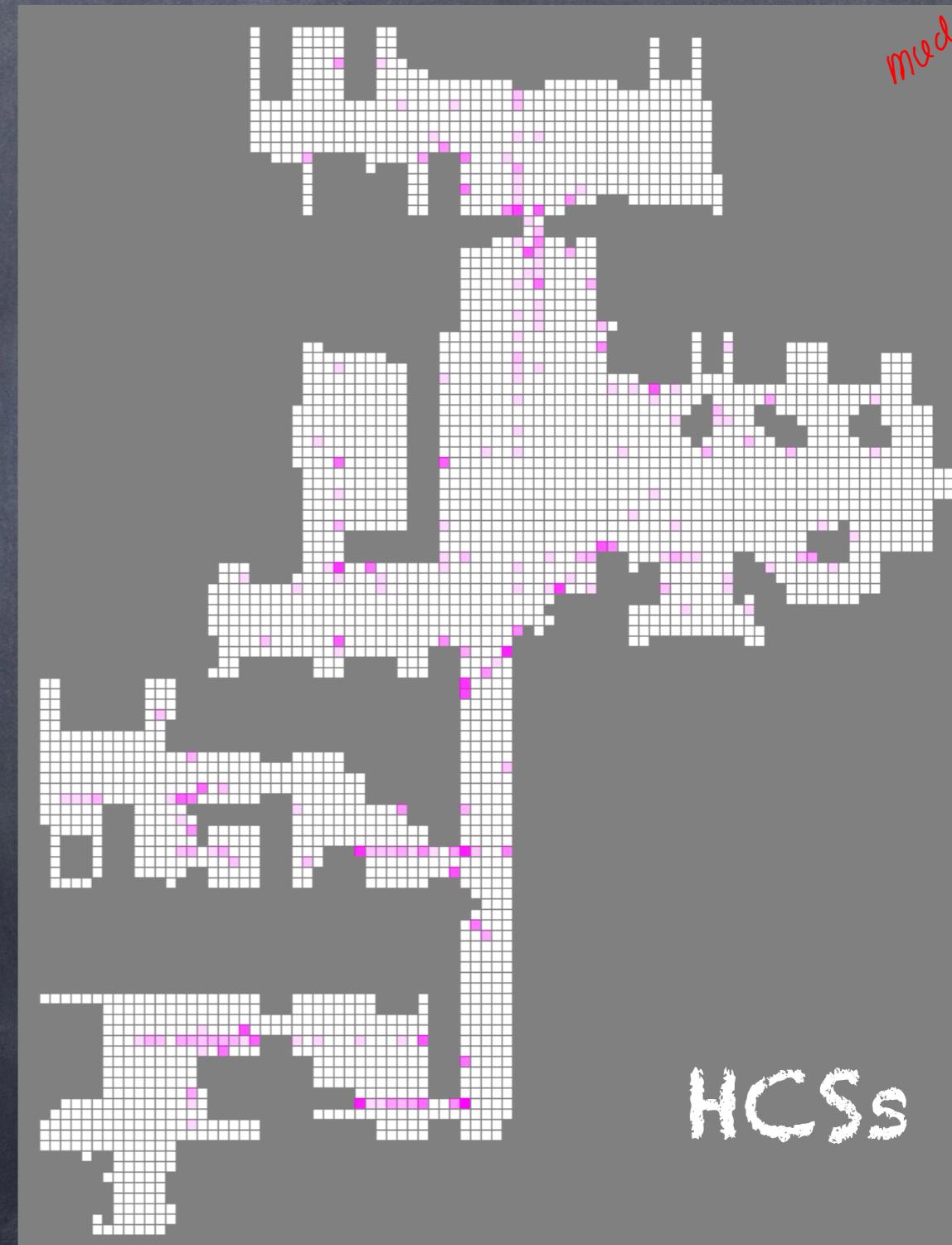


Neural Network for Hill-Climbable Subgoals (NNHCS)

Hill-Climbable Subgoal (HCS)



Intuition

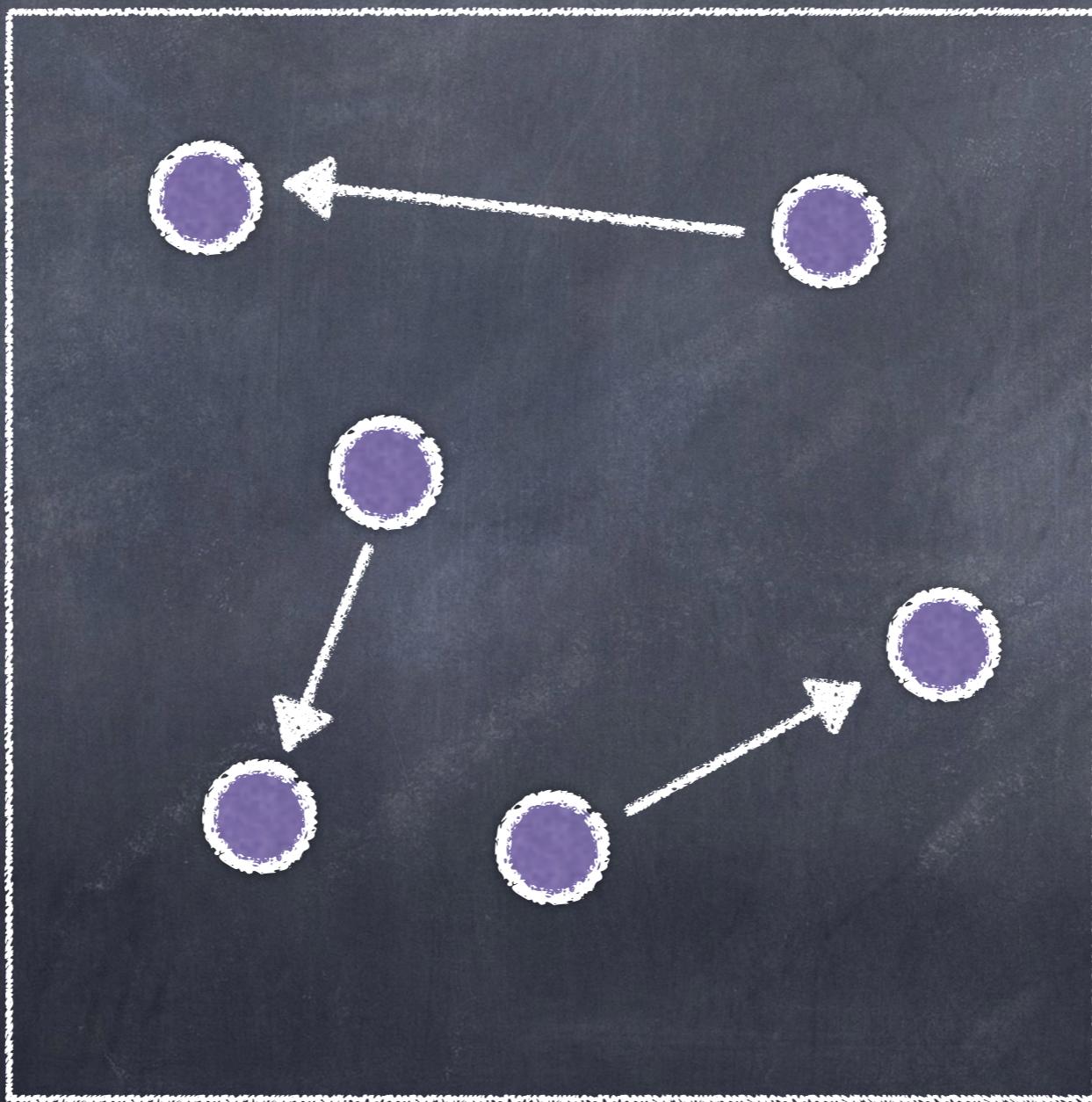


good pic
but a bit
too hard
wavy

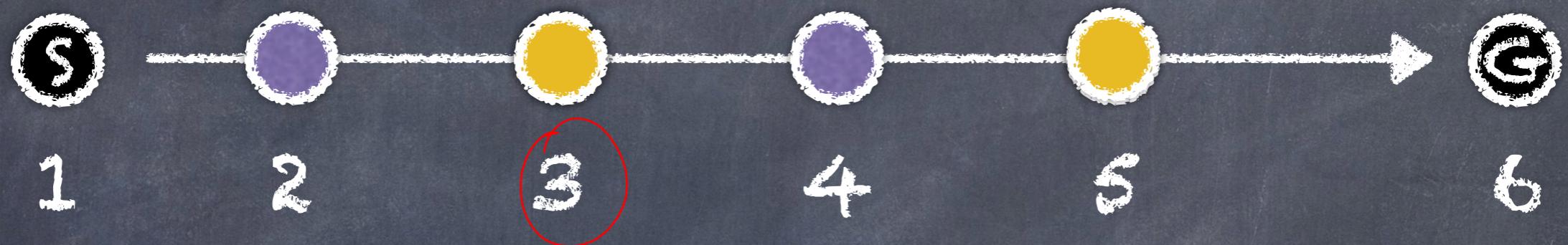
Intuition



offline



offline



How are these assigned?
How do you convert (x, y) to scalar index?

start	1	2	3	4	5
goal	6	6	6	6	6
HCS	3	3	5	5	6

Is this your own algorithm?
Are you using any published
makes
here?
To so
then
give references

offline

start	1	2	3	4	5	...
goal	6	6	6	6	6	...



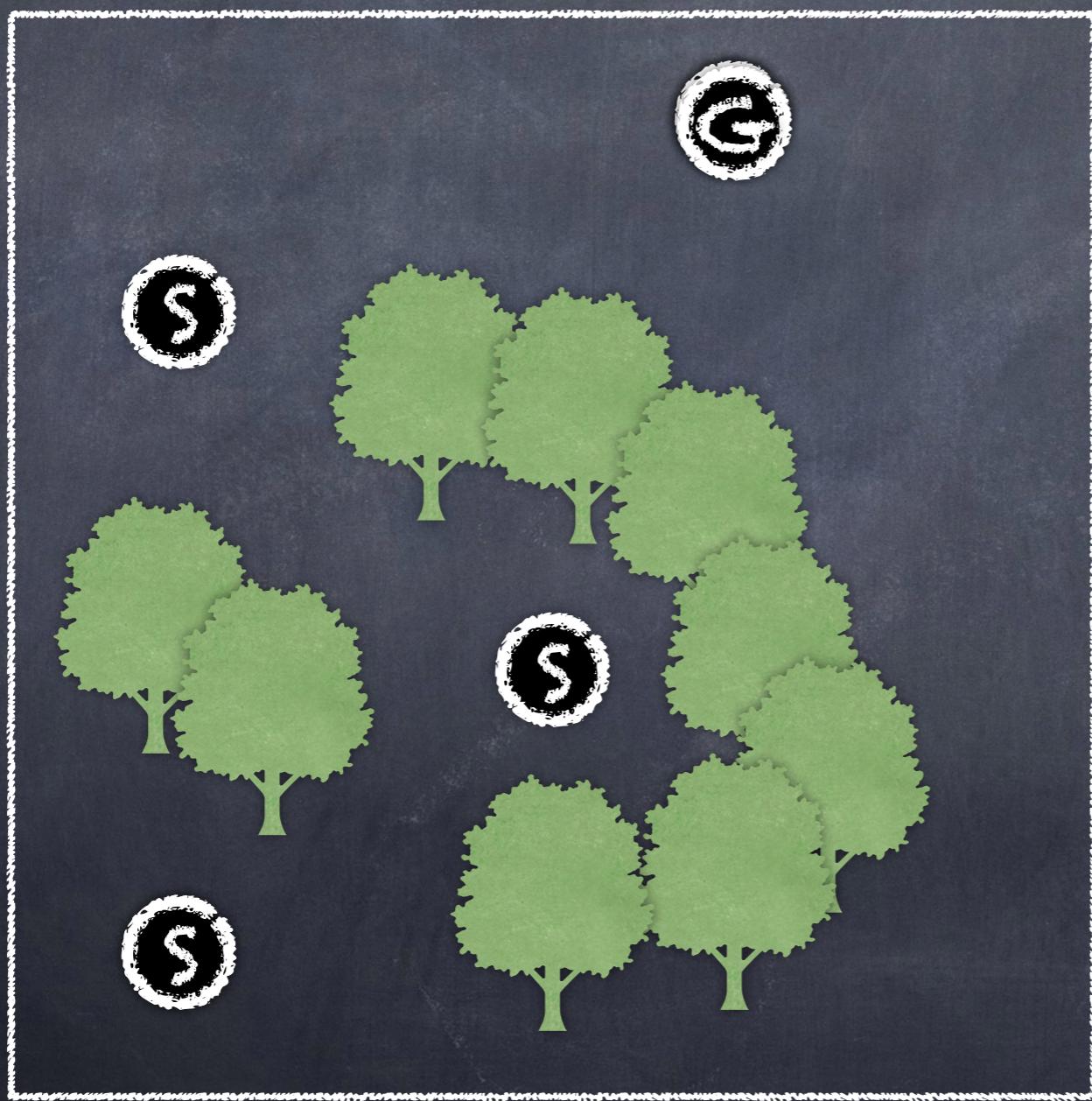
HCS	3	3	5	5	6	...
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offline

Layer (type)	Output Shape	Param #
Embedding-1	[-1, 2, 64]	198,528
Linear-2	[-1, 1024]	132,096
Dropout-3	[-1, 1024]	0
Linear-4	[-1, 3102]	3,179,550
LargeEmbedModel-5	[-1, 3102]	0
Total params:	3,510,174	
Trainable params:	3,510,174	
Non-trainable params:	0	
Input size (MB):	0.00	
Forward/backward pass size (MB):	0.06	
Params size (MB):	13.39	
Estimated Total Size (MB):	13.45	

Why estimated?

Online



Online

- can't hill-climb? get a new subgoal

- subgoal too far? cutoff steps

Why is this a problem? As long as it's

hillclimable...

Hill-climbing is

certainly real-time,
regardless how
far the goal is.

- completeness?

- fallback (oracle) - LRTA* (8)

↳ How did you come up
w/ this weight?

- active when visit count > 1

just 1?
Why?

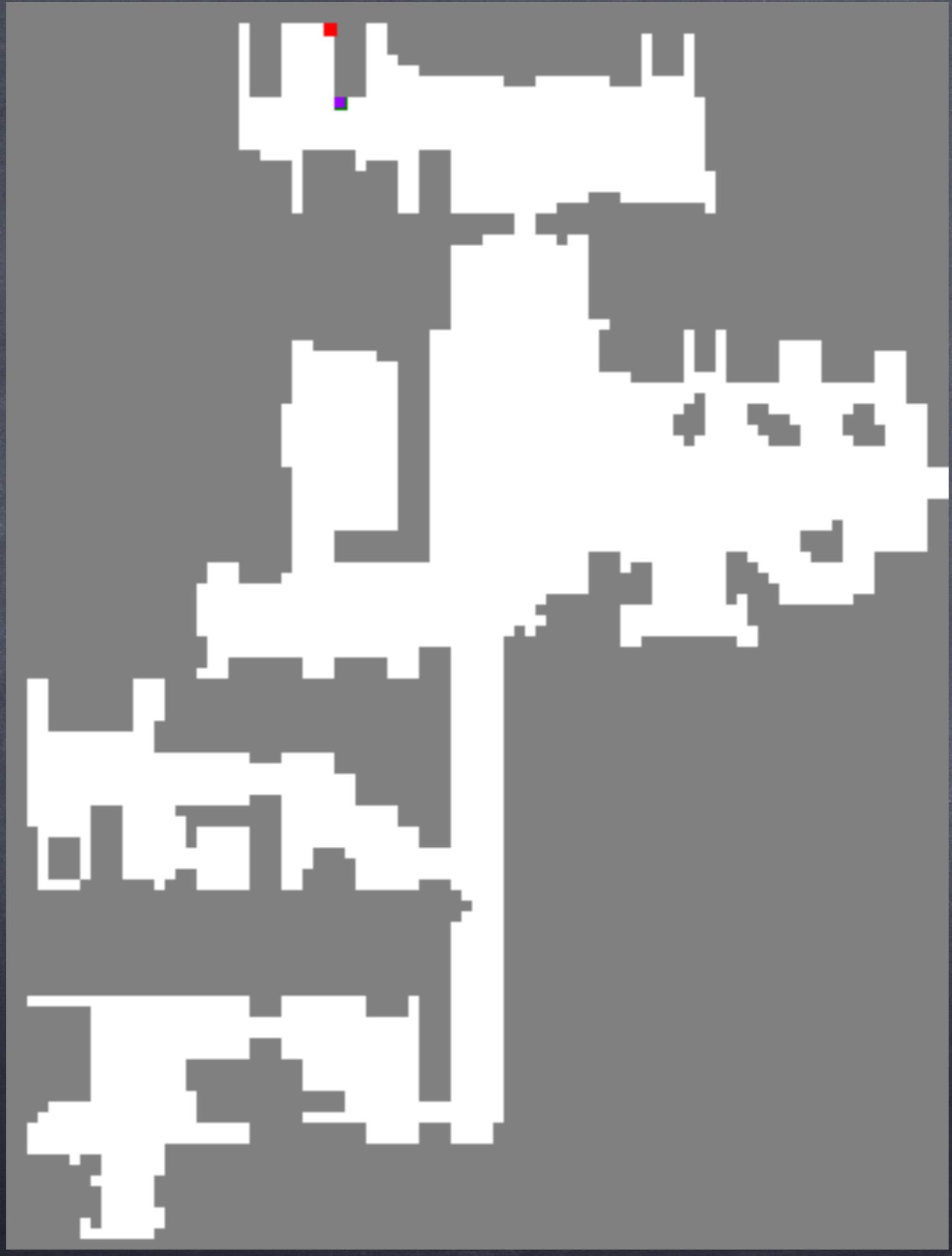
NNHCS in Action



subopt (%)
0



subopt (%)
0



(worst case)
subopt (%)
375

Evaluation

Why not compare to your closest competitors: LRTA*, ENN (RTA*), HCDPS?

ANN Training time? Paths build the ANN size

	DB time (s)	DB size (MB)	move time (μs)	overall time (ms)	subopt (%)
NNHCS How many trials?	1300	13	1127 \pm ?	15.8 \pm ?	3-8 \pm ?
LRTA* (8)	0	0	830 \pm ?	34.3 \pm ?	242.3 \pm ?

- find optimal path 83-85%
- DB time pays off after 71k runs
- How often does the NN select the actual/nearest HC subgoal
- furthest

Weakness (Future Work)

- ④ utilize HCS patterns in map more
 - NNRT? — ④ is necessary?
 - ④ portable?] How can this be portable given just coordinates/indexes are map-specific?
- ④ select better HCS/paths
- ④ 9M vs 14M

But looking
at the
whole map
is cool.

Conclusion

- a few HCSs makes a good path
- NN can remember HCSs

Does the NN
actually
remember
HCS?

How often
does NN
produce
the
actual
HCS?