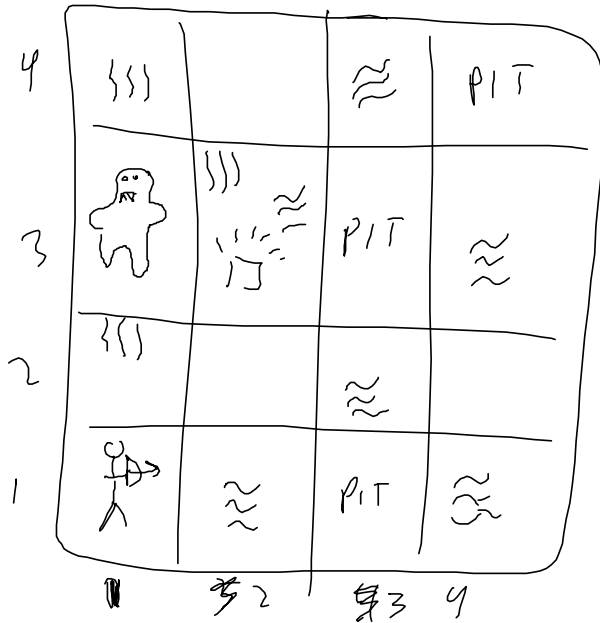


Intro

Friday, October 7, 2016 9:41 AM

Partial Observable

Wumpus
WorldSensors

smell

feel breezes

see

bump

Actions

up

down

left

right

shoot up

" down

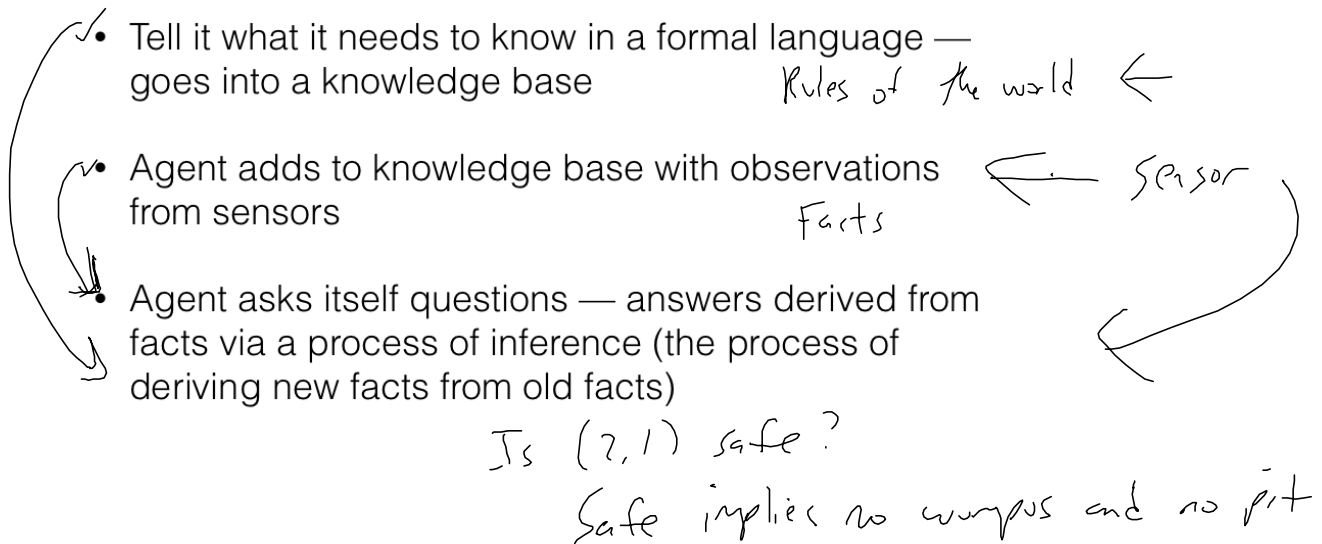
" left

" right

Logical agents

Wednesday, October 5, 2016 9:31 AM

- Logical agents can adapt to partially-observable domains because they can infer things about aspects of the world that are unobserved
- How a logical agent works:



• Knowledge base:

- Comprised of facts about the world, how the world works, and how to change the world
- Sentences that are logically evaluated to true or false
- Sentences must be represented in some knowledge representation language

• Things we need:

1. How to represent facts/sentences
2. What facts to give agent? (Knowledge engineering)
3. How to reason about facts? (How to do inference such that conclusions agent draws are guaranteed to be correct)

Propositional logic

Wednesday, October 5, 2016 9:34 AM

Propositional Logic

- Knowledge representation language in which a possible world is represented by a number of propositions that are true or false

- Primitives:

- atoms

symbols

P : "It is sunny"
 Q : "It is raining"

→ • $\wedge, \vee, \rightarrow, \neg, \leftrightarrow,$

→ • TRUE, FALSE

→ • $()$

- Formulae

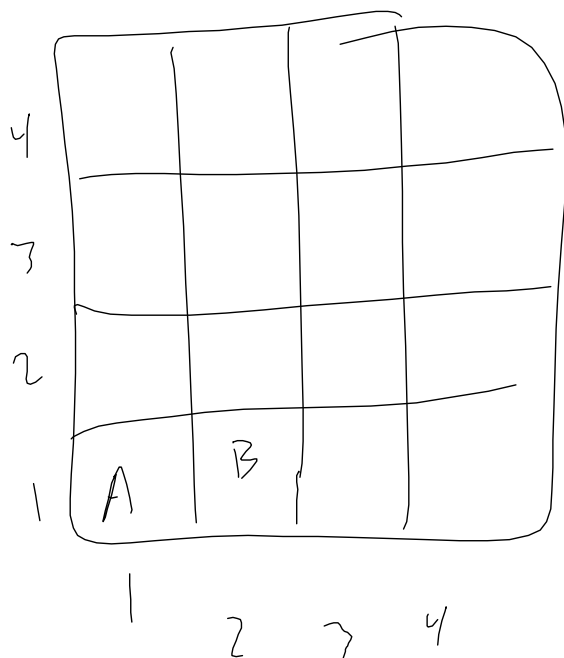
$Q \rightarrow \neg P$ It is never the case that it is sunny when raining

- Agent sense atoms and infers the truth of other atoms that are not directly observable

- Query: Am I in a world in which P is true, given that I have observed Q?

Proof

Resolution Algorithm



P_{11} : Pit in (1,1)

P_{12} :

P_{21} :

P_{13} :

B_{11} : breeze at (1,1)

B_{21} :

⋮

W_{11} : wumpus at (1,1)

W_{12} :

Observation:

$\neg B_{11}$

$\neg W_{11}$

$\neg P_{11}$

B_{21}

In the KB

sensed

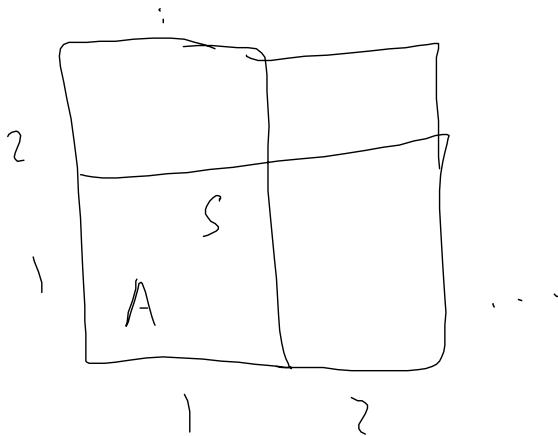
"A square is breezy iff there is a pit in an adjacent cell"

" B_{21} is breezy iff a pit is (3,1) or (2,2) or (1,1)"

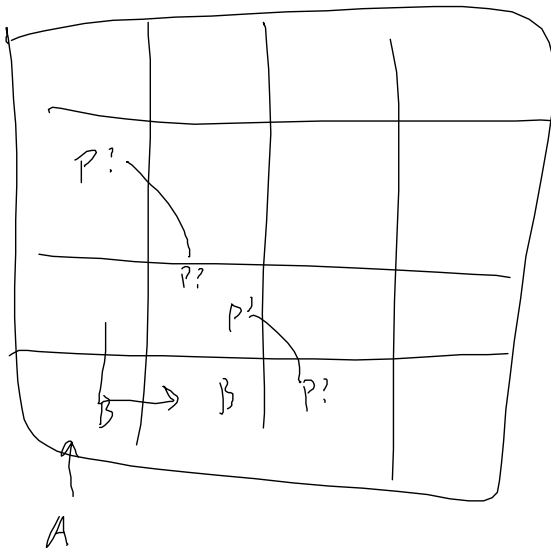
$$B_{21} \leftrightarrow P_{31} \vee P_{11} \vee P_{22}$$

"B₁ is heavy ..."

Query "Is (3,1) safe" $S_{3,1} \rightarrow \neg P_{3,1} \wedge \neg W_{3,1}$



Shoot Right
"Coercing the environment"



Can handle this
situation w/
probabilistic reasoning.

Can we add probability to logic?

Shoot Arrow $\xrightarrow{0.3} \neg W$

Sprinkler $\xrightarrow{0.99} \text{wet Grass}$

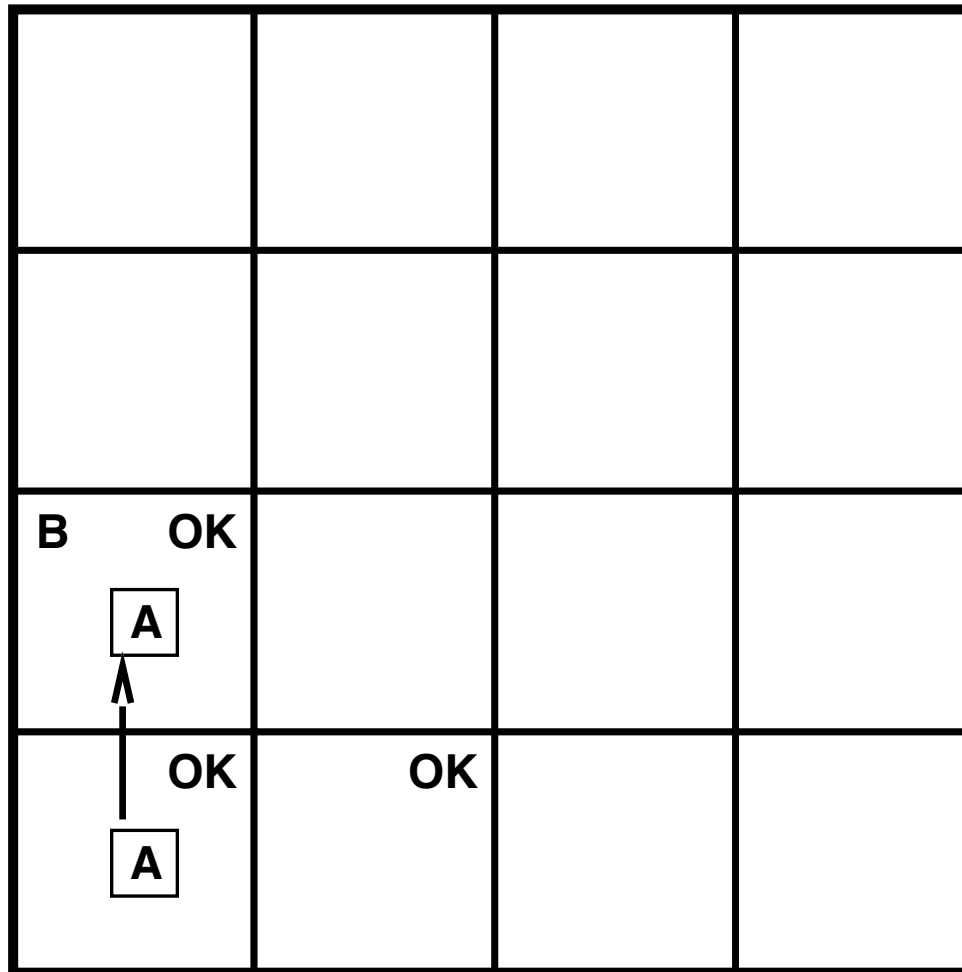
Wetgrass $\xrightarrow{0.7} \text{Rain}$

Sprinkler $\xrightarrow{0.693} \text{Rain}$

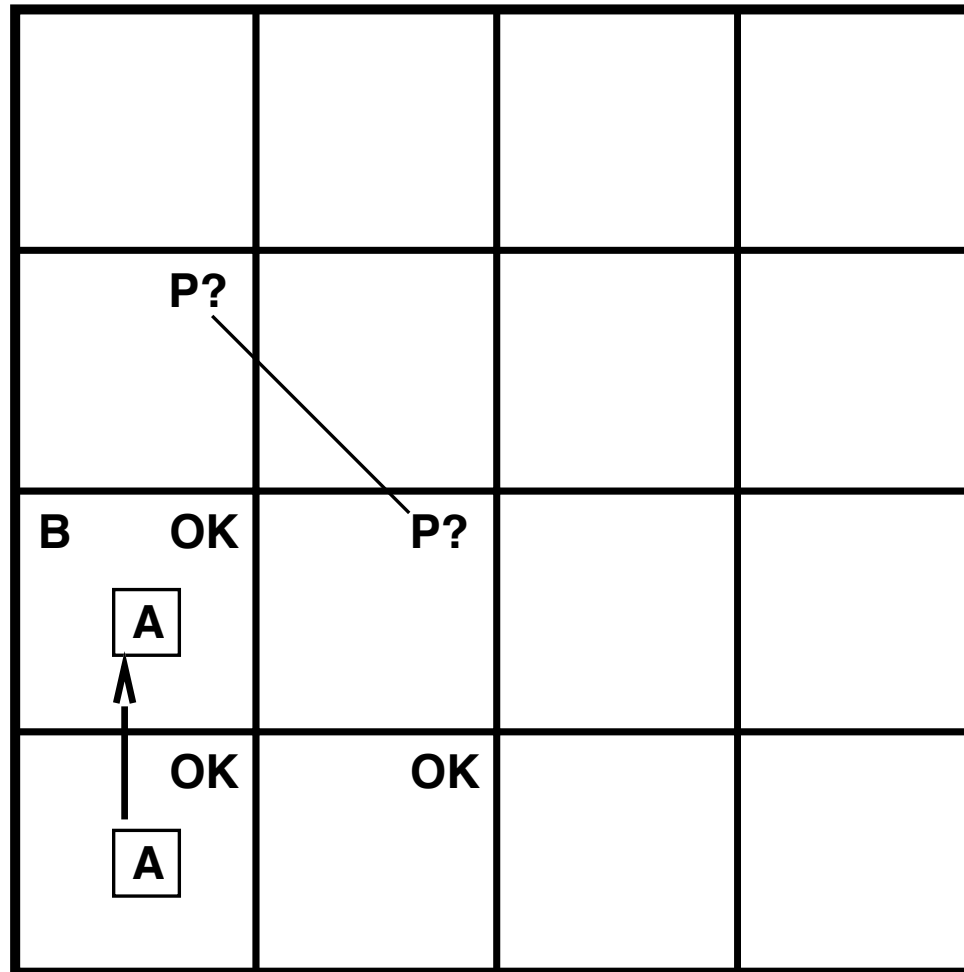
Exploring a wumpus world

OK			
OK <div>A</div>	OK		

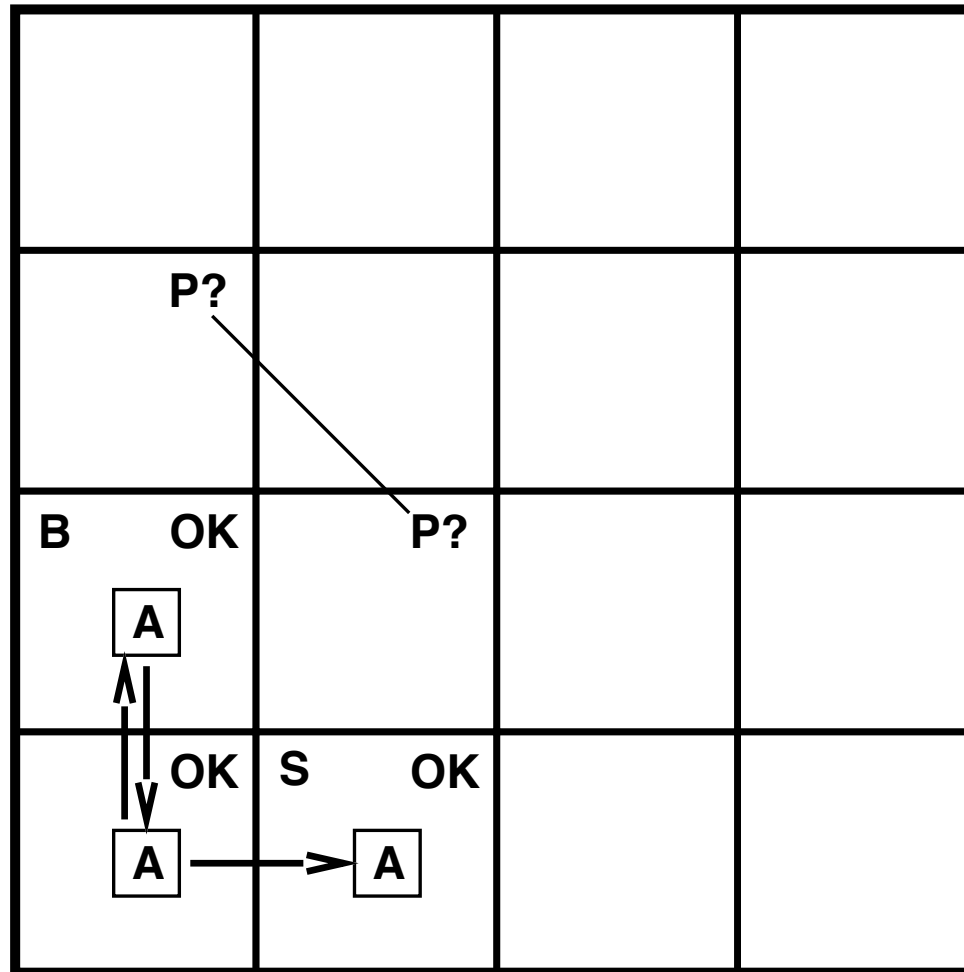
Exploring a wumpus world



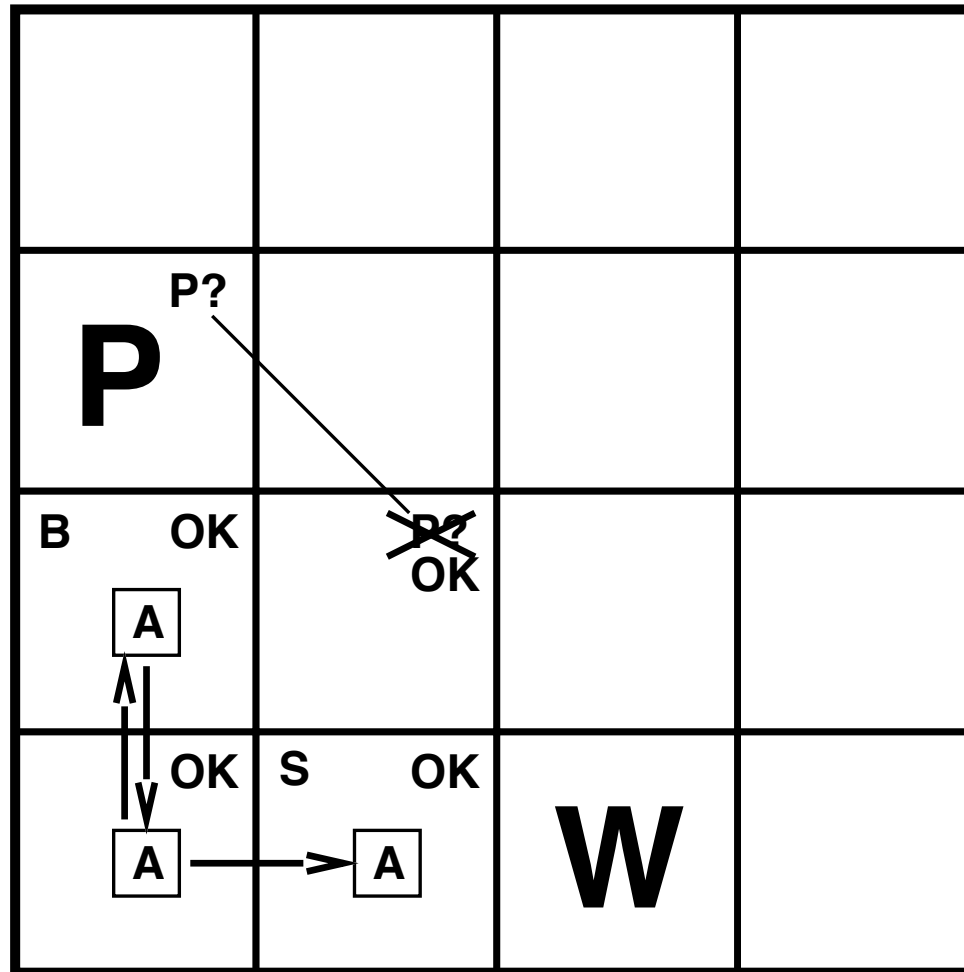
Exploring a wumpus world



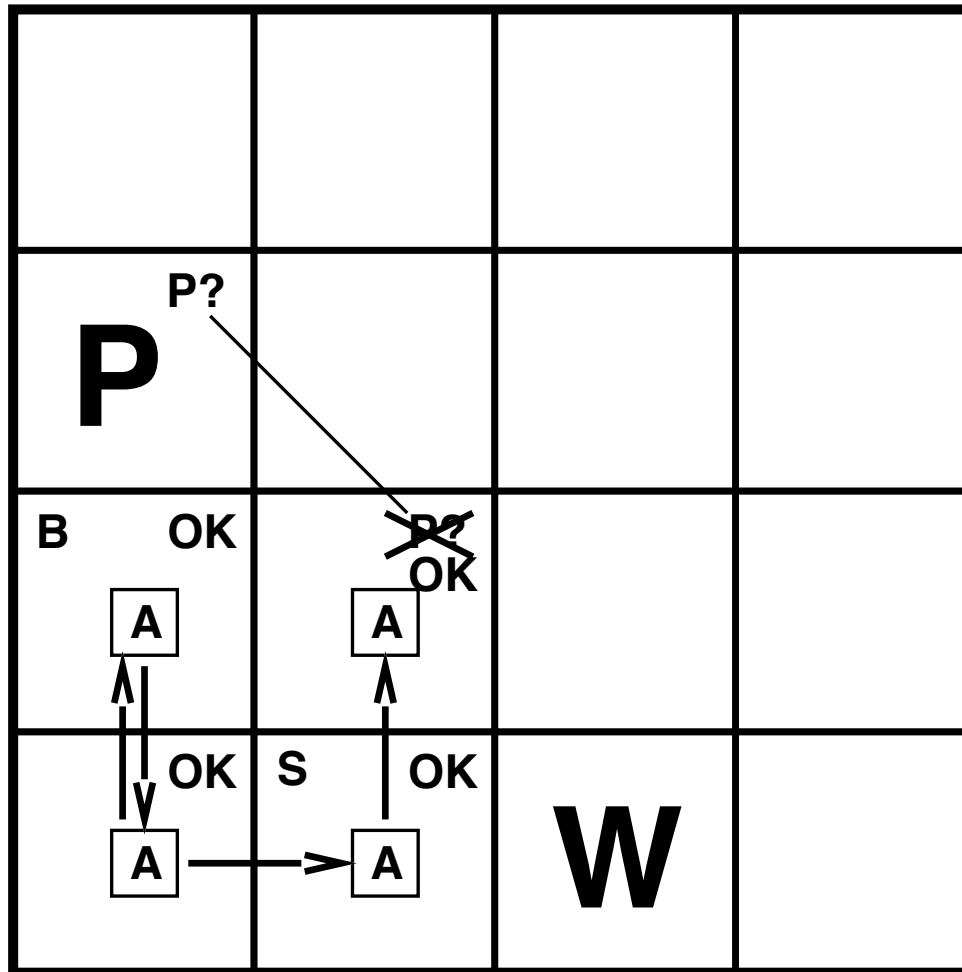
Exploring a wumpus world



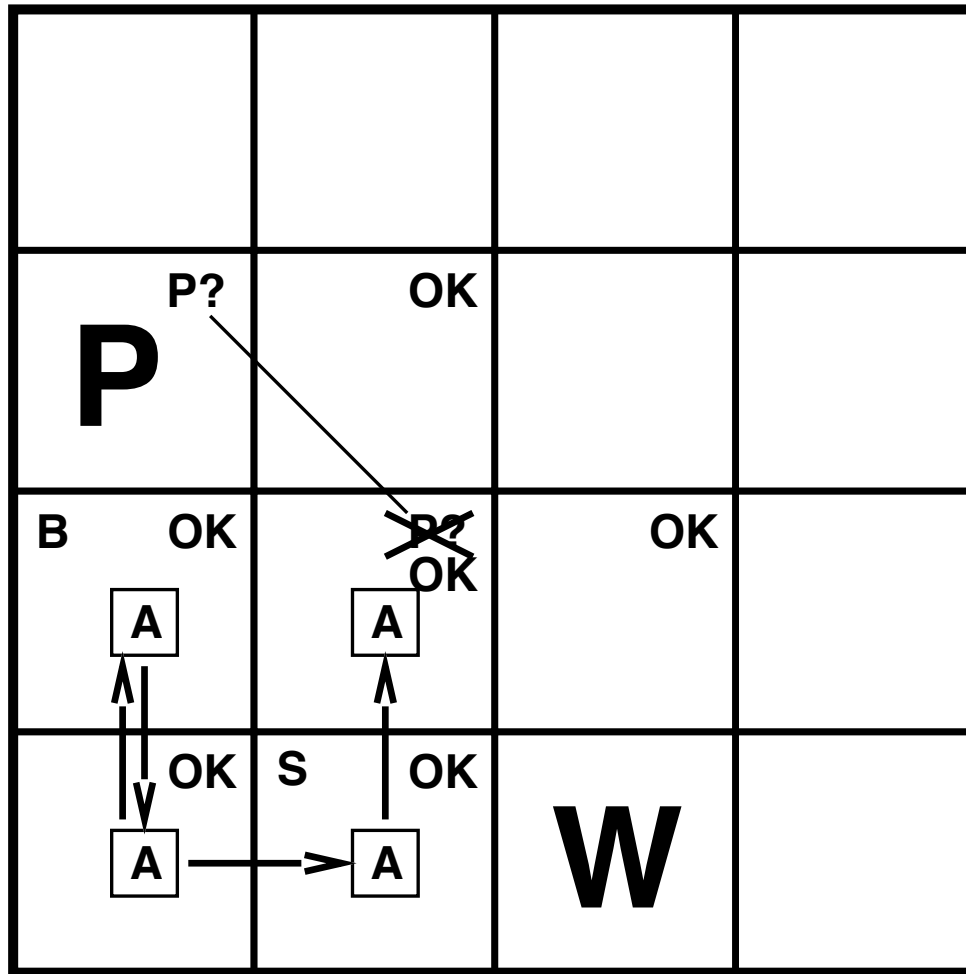
Exploring a wumpus world



Exploring a wumpus world



Exploring a wumpus world



Exploring a wumpus world

