CSC 480: Artificial Intelligence
Wumpus World Lab

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Hexagonal Wumpus World

- ◆ similar to the grid wumpus world, but the underlying geometry is hexagonal

- ◆ mark the status of tiles
  - ◆ visited (V)
  - ◆ safe (OK)
  - ◆ possible pit (P?)
  - ◆ confirmed pit (P!)
  - ◆ possible wumpus (W?)
  - ◆ confirmed wumpus (W!)
  - ◆ percepts (SBGPC)
  - ◆ orientation of the agent
  - ◆ action (arrow or line)

Task Definition

- ◆ add information about the stench and breeze percepts in this map by coloring or shading the respective tiles
  - ◆ percepts are only available for the current location
  - ◆ the agent knows about the existence of adjacent tiles, but can't perceive anything about adjacent tiles
- ◆ use a clockwise search strategy
  - ◆ the agent starts from its current orientation and examines adjacent tiles in a clockwise direction
  - ◆ if it finds a safe, unvisited place, it proceeds there, and puts the unexamined adjacent tiles on the fringe
  - ◆ if there aren't any safe unvisited ones, it continues with unexplored tiles from its fringe
    - ❖ the fringe may be re-arranged so that adjacent tiles are explored first to minimize movement in this online search
  - ◆ if only risky locations are left, it takes the first one clockwise
- ◆ keep track of the activities of your agent through the template below
  - ◆ create copies of it as needed (e.g. for each step)


Knowledge and Reasoning

- ◆ accumulate knowledge your agent has about the Wumpus world
  - ◆ current location and percept
  - ◆ new knowledge from observation (percepts)
  - ◆ new knowledge from reasoning
    - ❖ definitive locations of pits, wumpus
  - ◆ speculation
    - ❖ possible locations for pit, wumpus
    - ❖ probabilities (optional)
 - ◆ determine the next action

Alternative Mode: WW Game

- if you want to make this more realistic, you can do it as a game:
  - one person (A) sets up the environment with locations for the wumpus and pits
  - the other person (B), who should not know or see that setup, traverses the Wumpus World by asking A about properties of the current tile
  - A responds with the percept for that location
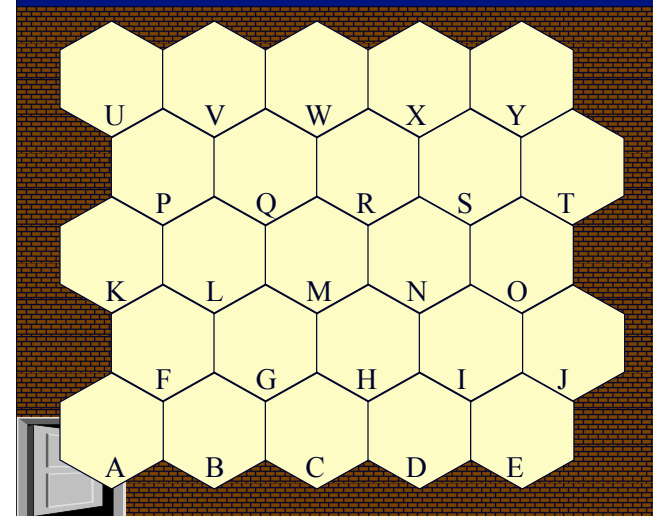 - B updates its world model on the template, and decides what the next action will be

Hex WW Configuration F10
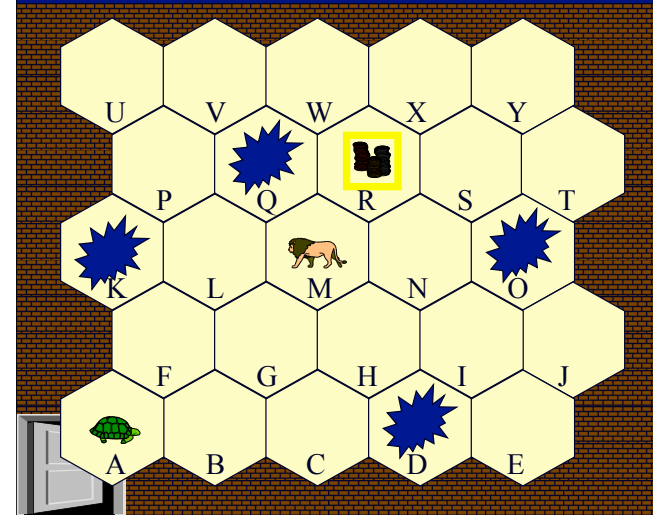
- add information about the stench and breeze percepts in this map by coloring or shading the respective tiles

Hex WW Breeze + Smell
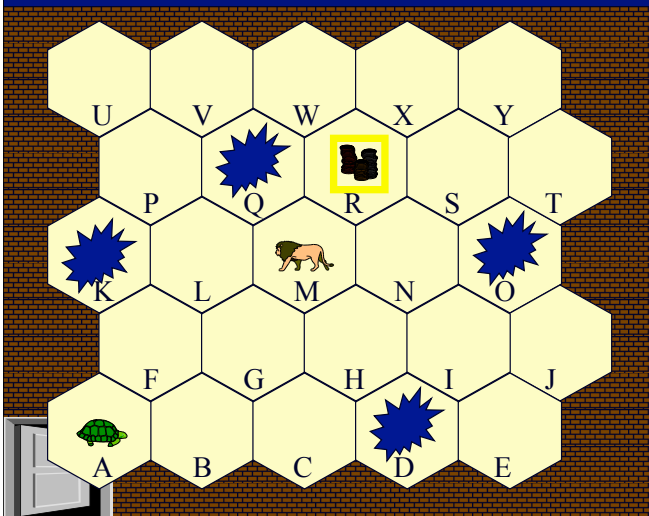
- add information about the stench and breeze percepts in this map by coloring or shading the respective tiles

Hex WW: Legend

safe location: **OK**

visited location: **V**

possible pit **P?**

confirmed pit **P!**

possible wumpus **W?**

confirmed wump. **W!**

shoot arrow

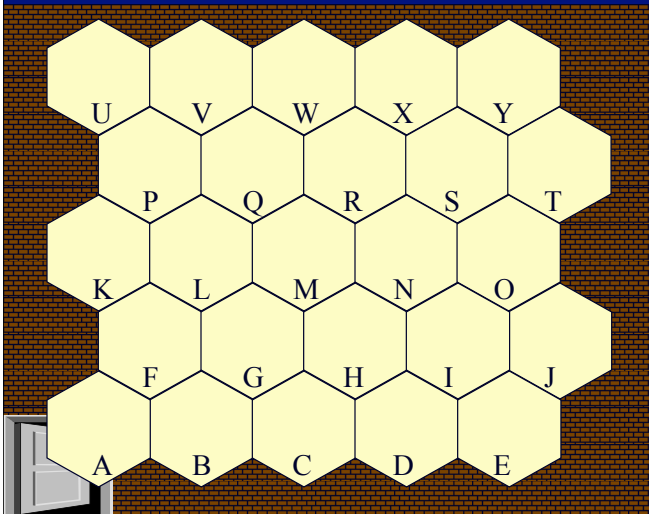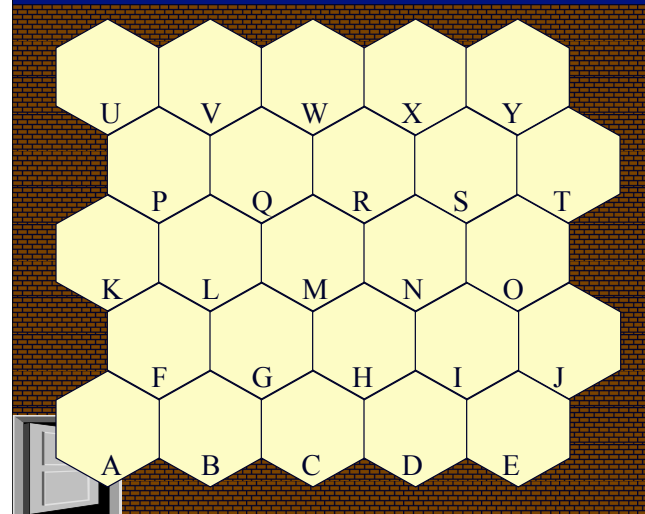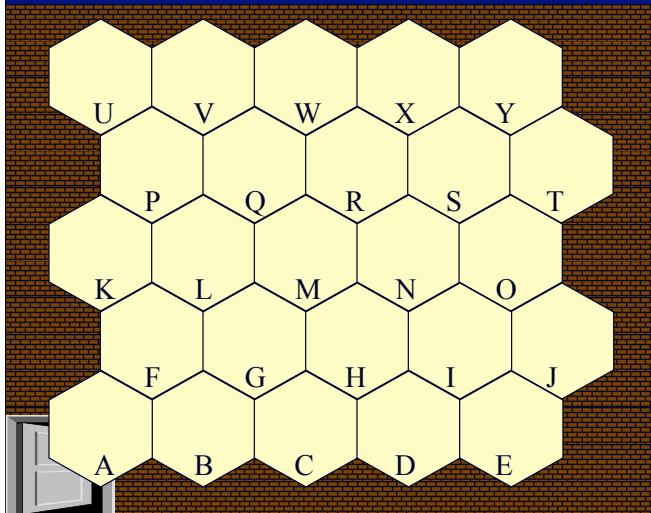return path

Hex WW: Template
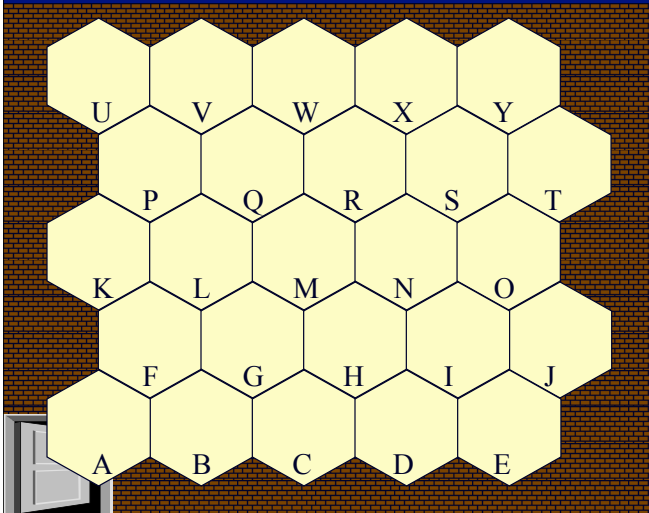
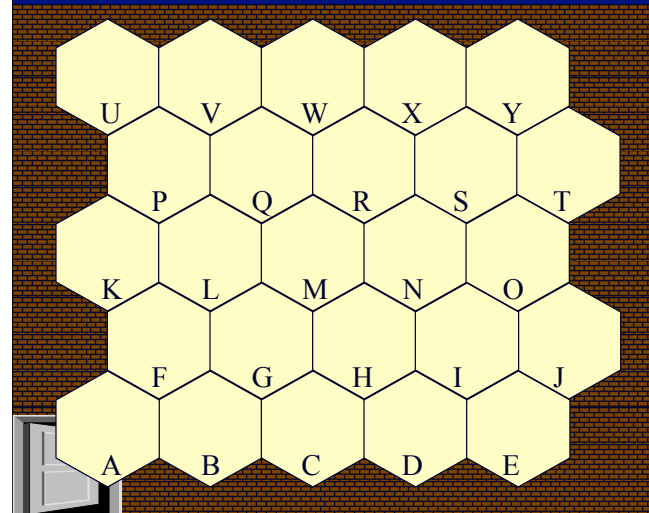- Agent Position
  e.g. **A**
- Percept
  [S B G P C]
- New Knowledge
  - observation
    percepts for current square
  - reasoning
    adjacent squares ok?
  - speculative
    possible locations for pits, wumpus
- Next Action
  - *move*
  - *turn left (60 degrees)*
  - *turn right (60 degrees)*
  - *shoot*
  - *grab*
  - *exit*

U V W X Y
P Q R S T
K L M N O
F G H I J
A B C D E

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Hex WW: Template

U V W X Y
P Q R S T
K L M N O
F G H I J
A B C D E
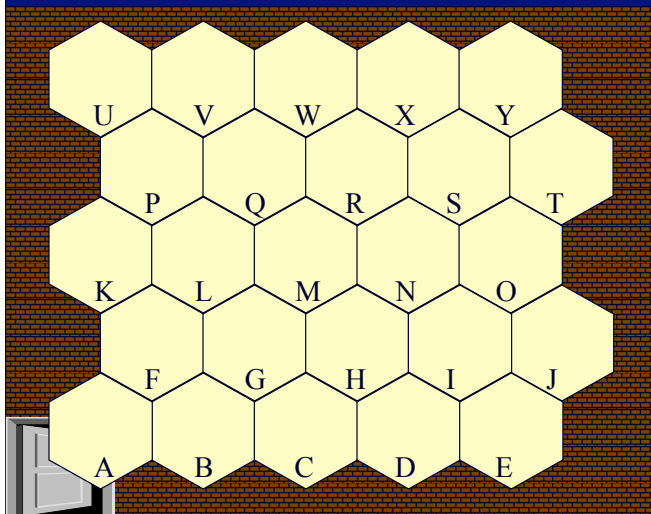
- Agent Position
  e.g. **A**
- Percept
  [S B G P C]
- New Knowledge
  - observation
    percepts for current square
  - reasoning
    adjacent squares ok?
  - speculative
    possible locations for pits, wumpus
- Next Action
  - *move*
  - *turn left (60 degrees)*
  - *turn right (60 degrees)*
  - *shoot*
  - *grab*
  - *exit*

Exploration Example

- The following slides illustrate the first few exploration steps of the agent.

Hex WW B: Exploration A

- ◆ Agent Position
  A
- ◆ Percept
  [_ _ _ _ _]
- ◆ New Knowledge
  - ◆ observation
    A safe
  - ◆ reasoning
    B, F safe
  - ◆ speculative
- ◆ Next Action
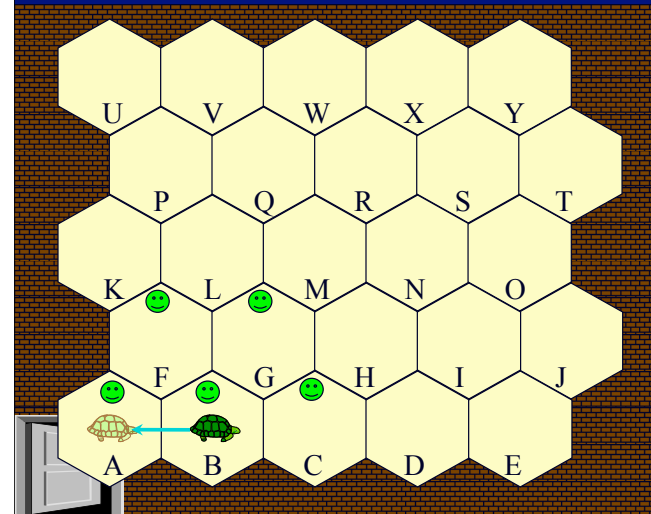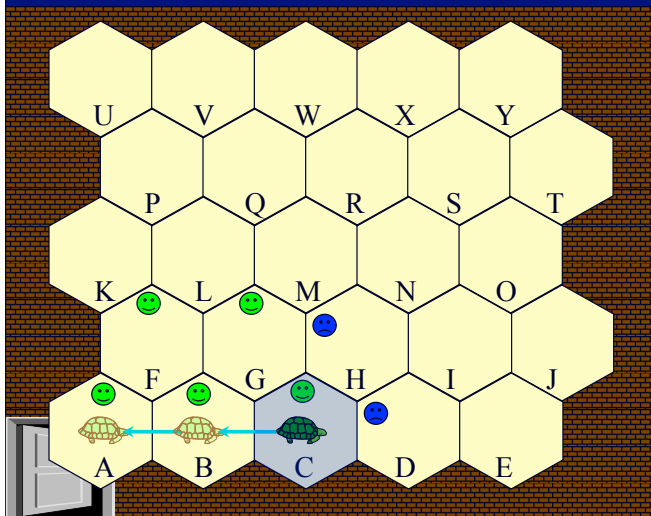 *move*

Hex WW B: Exploration B

- ◆ Agent Position
  B
- ◆ Percept
  [_ _ _ _ _]
- ◆ New Knowledge
  - ◆ observation
    B safe
  - ◆ reasoning
    C, G safe
  - ◆ speculative
- ◆ Next Action
  move

Hex WW B: Exploration C

- ◆ Agent Position
  C
- ◆ Percept
  [_ B _ _ _]
- ◆ New Knowledge
  - ◆ observation
    C safe
  - ◆ reasoning
  - ◆ speculative
    D, H pit?
- ◆ Next Action
  turn, (move), turn, (move), turn, turn, move

  (Note: Bumps skipped)