ASSIGNMENT 1 – WUMPUS WORLD

The Assignment

- The Wumpus World is a simple maze-like game where the player agent has to take decisions based on conflicting information.

- Your task is to implement a player agent.

- The agent should be able to solve the game on a number of different maps.

The Wumpus World

- A cave consisting of rooms connected vertically and horizontally.
- Somewhere in the cave lurks the Wumpus.
- The Wumpus can be killed by the player, but the player only has one arrow.
- Some rooms have bottomless pits.
- Goal is to find the gold treasure!
- Wumpus world is a well-known testbed for logic, first is from 1972.

The Wumpus World

- ## Score:
  - +1000 for picking up the gold.
  - -1000 for falling into a pit or getting eaten by the Wumpus.
  - -1 for each action taken.
  - -10 for shooting the arrow.

- ## Environment:
  - 4x4 grid in our example.
  - Player starts at (1,1), facing right.
  - Randomly placed pits, Wumpus and gold.

- ## Actions:
  - Turn 90^0 left or right
  - Move forward
  - Shoot
  - Grab

The Wumpus World

- ## Sensors:
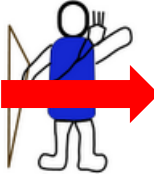 - Simplified version compared to the lecture, bump and scream senses not used.
  - In squares next to the Wumpus the player perceives a stench (not diagonally).
  - In the squares next to a pit the player perceives a breeze (not diagonally).
  - In the square with the gold treasure, the player perceives a glitter.
  - Percepts: [Stench, Breeze, Glitter]
  - Example: [Stench, Breeze, None]

Example Wumpus World

Percept$_{(1,1)}$ = [None, None, None]
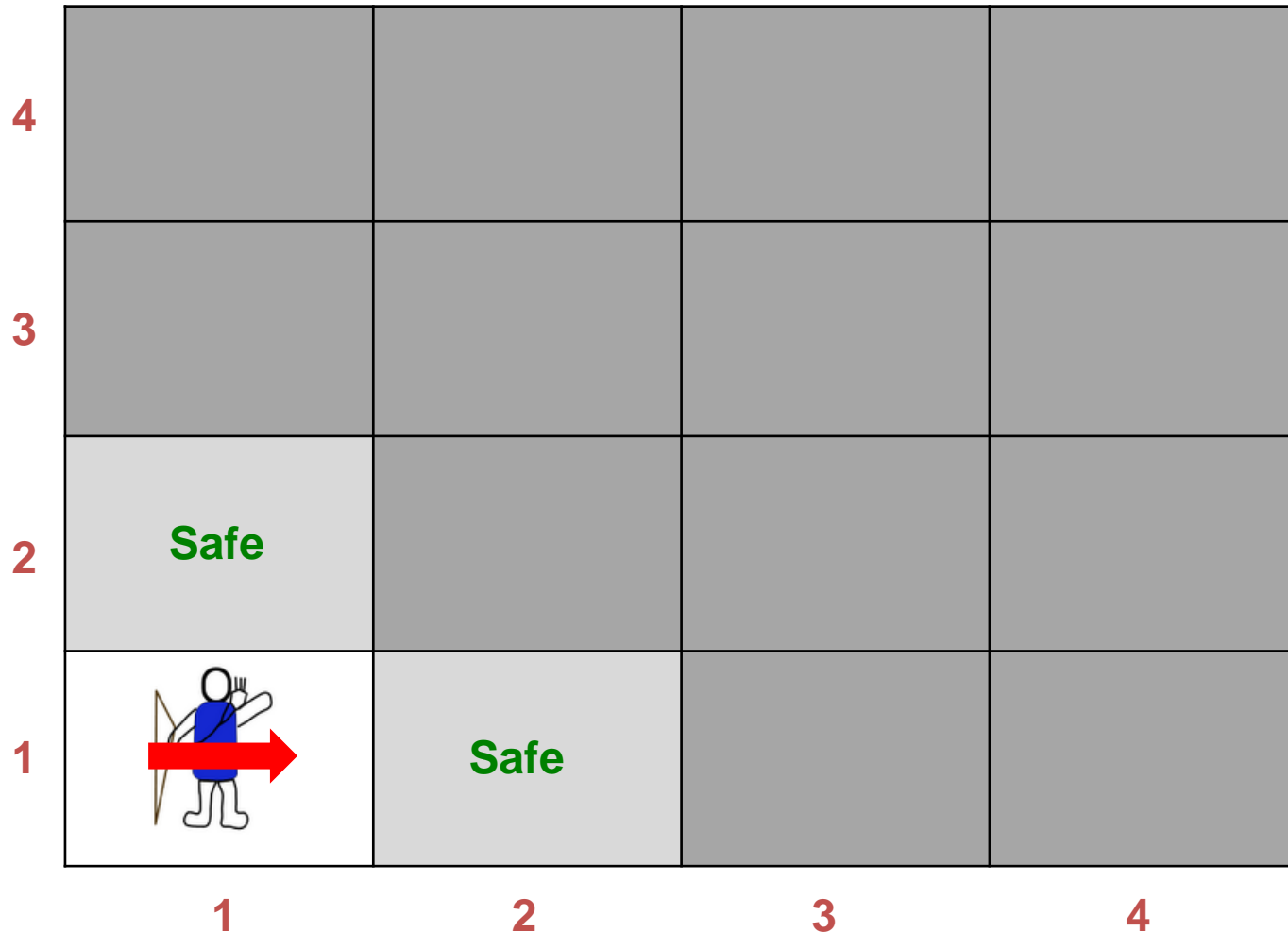
Action: Move Forward

Percept$_{(2,1)}$ = [None, Breeze, None]
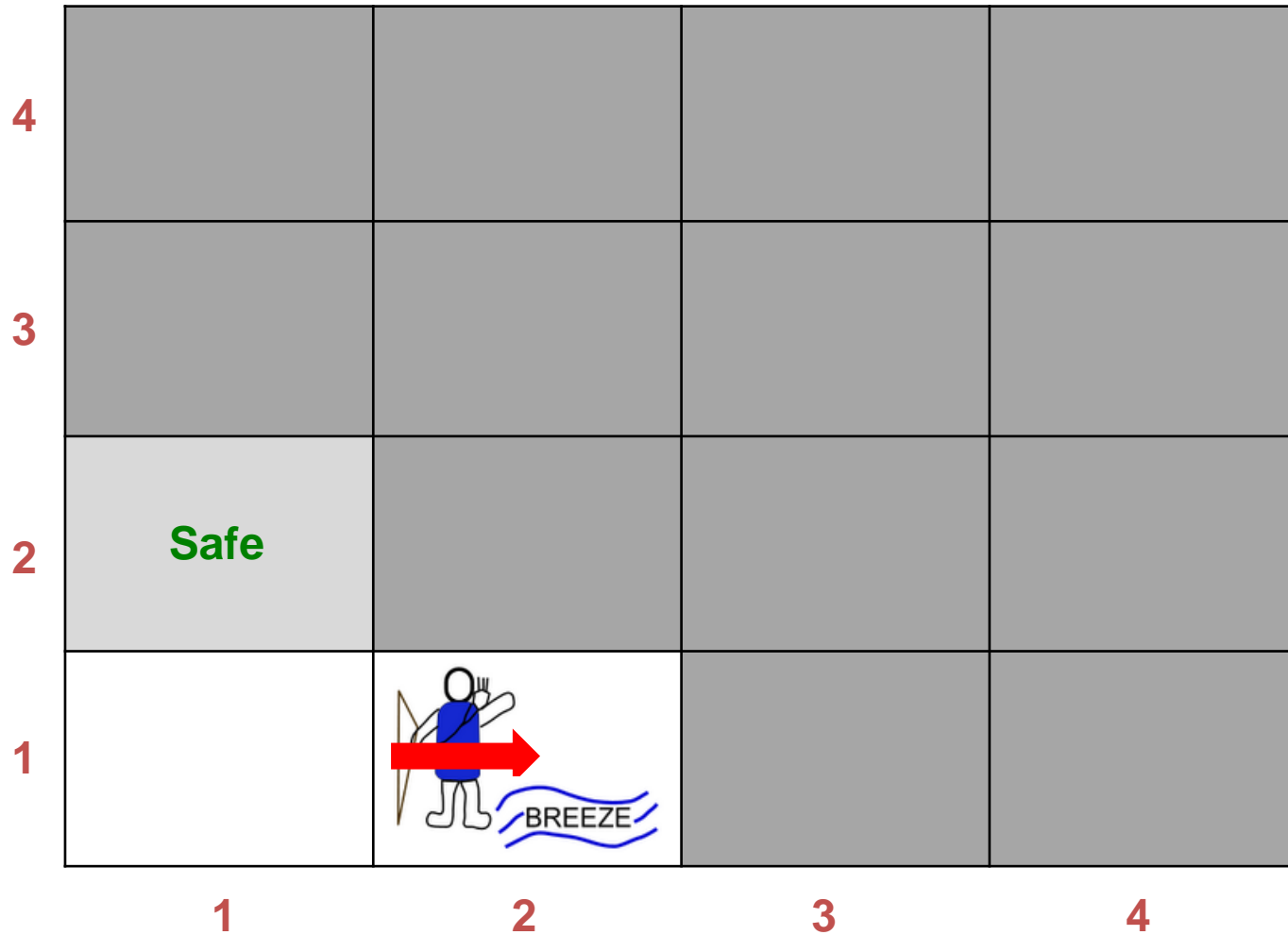
What conclusions can we make?

Percept$_{(2,1)}$ = [None, Breeze, None]
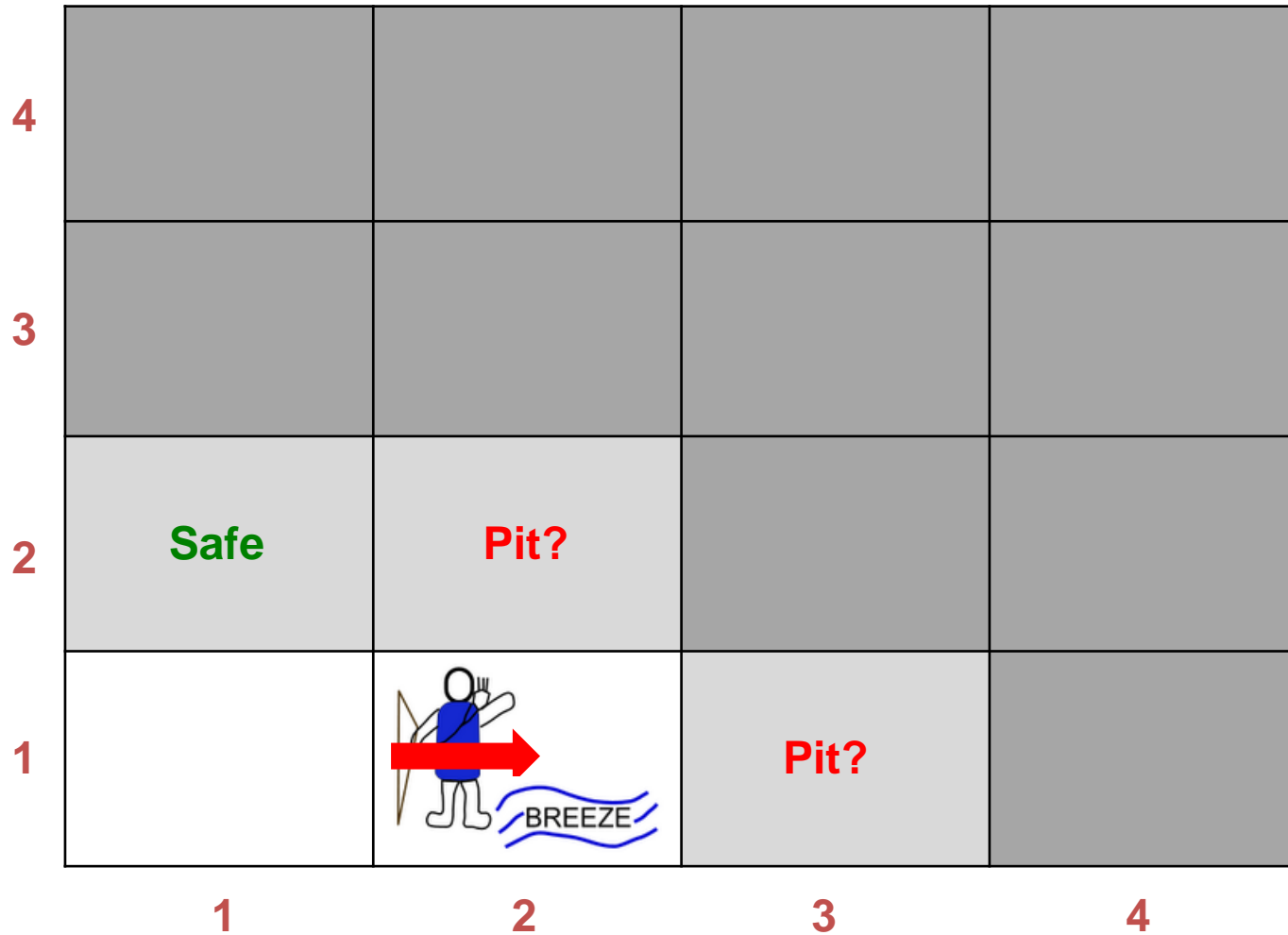
We need more information…

Percept$_{(1,2)}$ = [Stench, None, None]
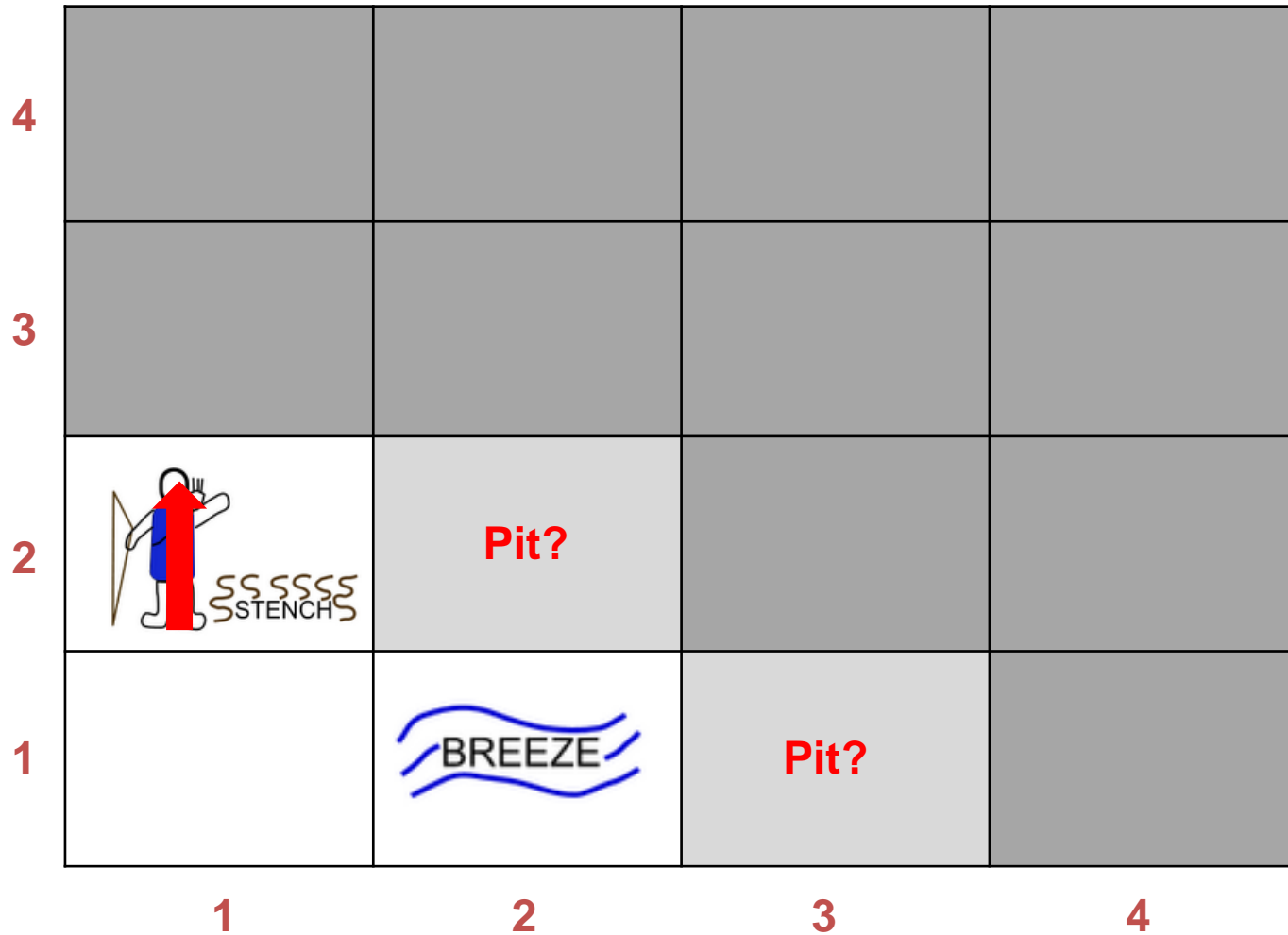
What conclusions can we make?

Percept$_{(1,2)}$ = [Stench, None, None]

The Wumpus is nearby, but where?

Percept$_{(1,2)}$ = [Stench, None, None]
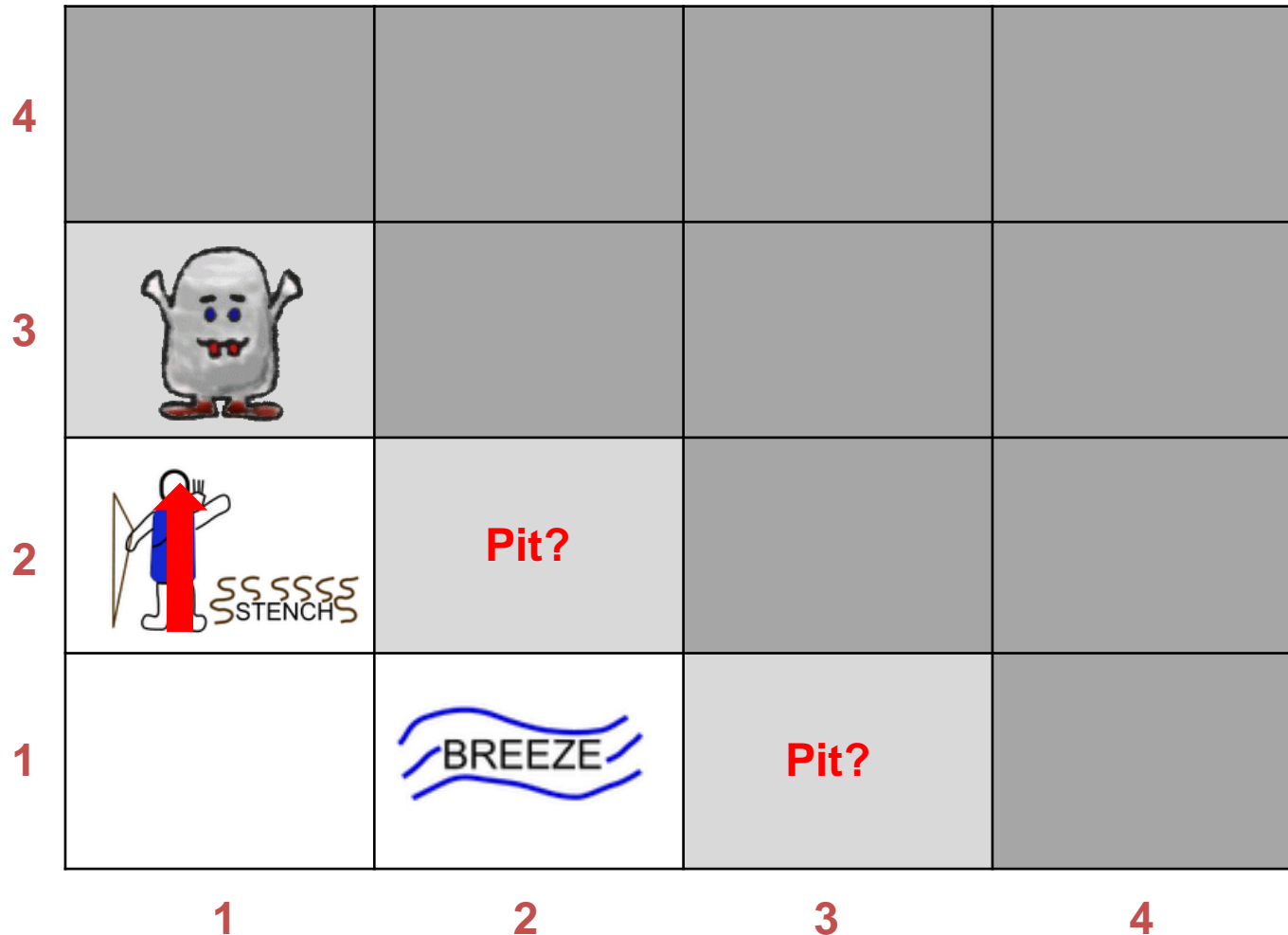
Wumpus must be in (1,3), since no stench was perceived in (2,1)

Percept$_{(1,2)}$ = [Stench, None, None]
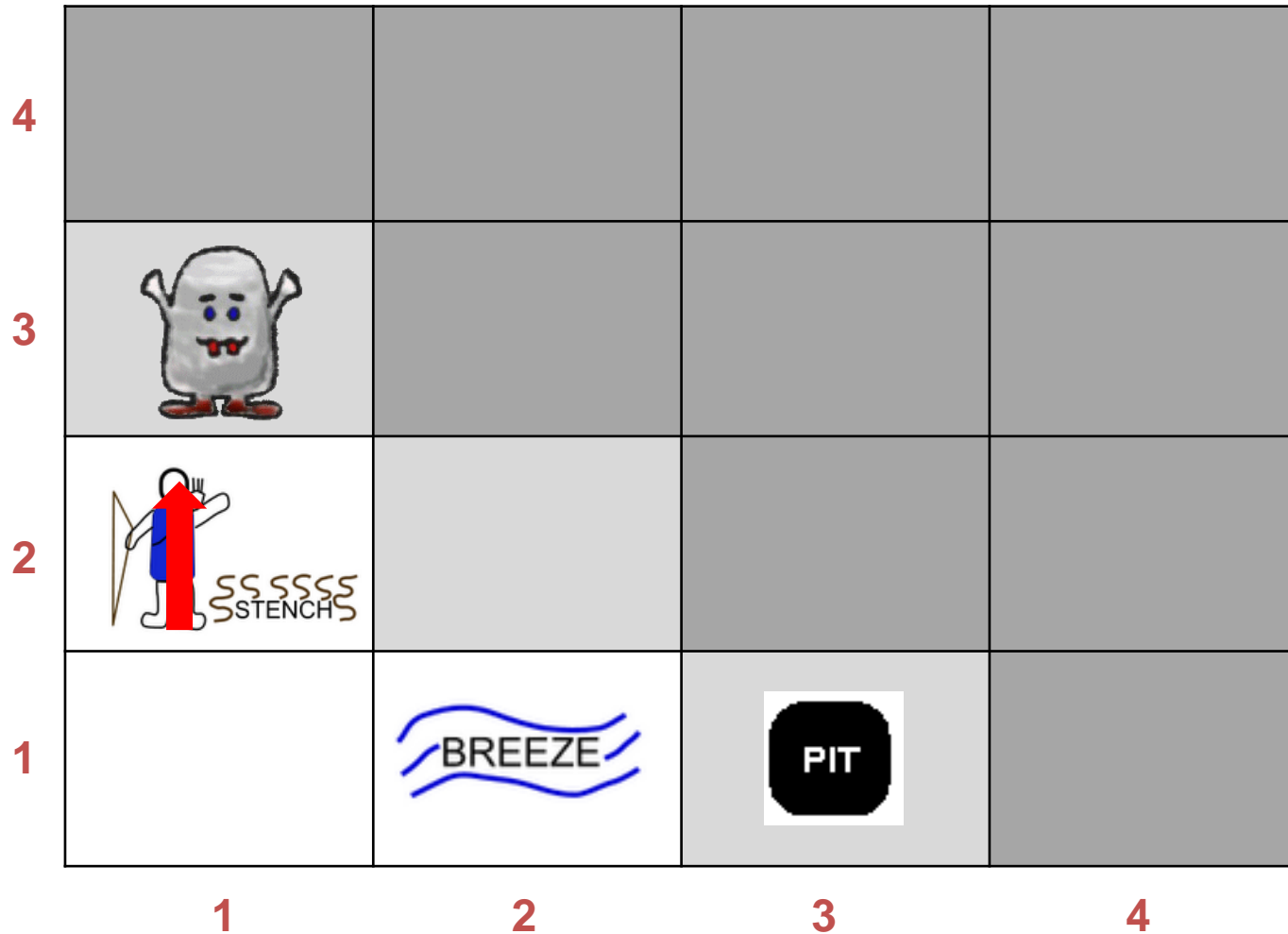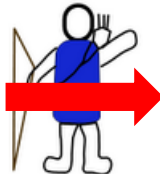
We can also conclude that the Pit must be in (3,1), since no Breeze is perceived in (1,2).

Percept$_{(1,2)}$ = [Stench, None, None]
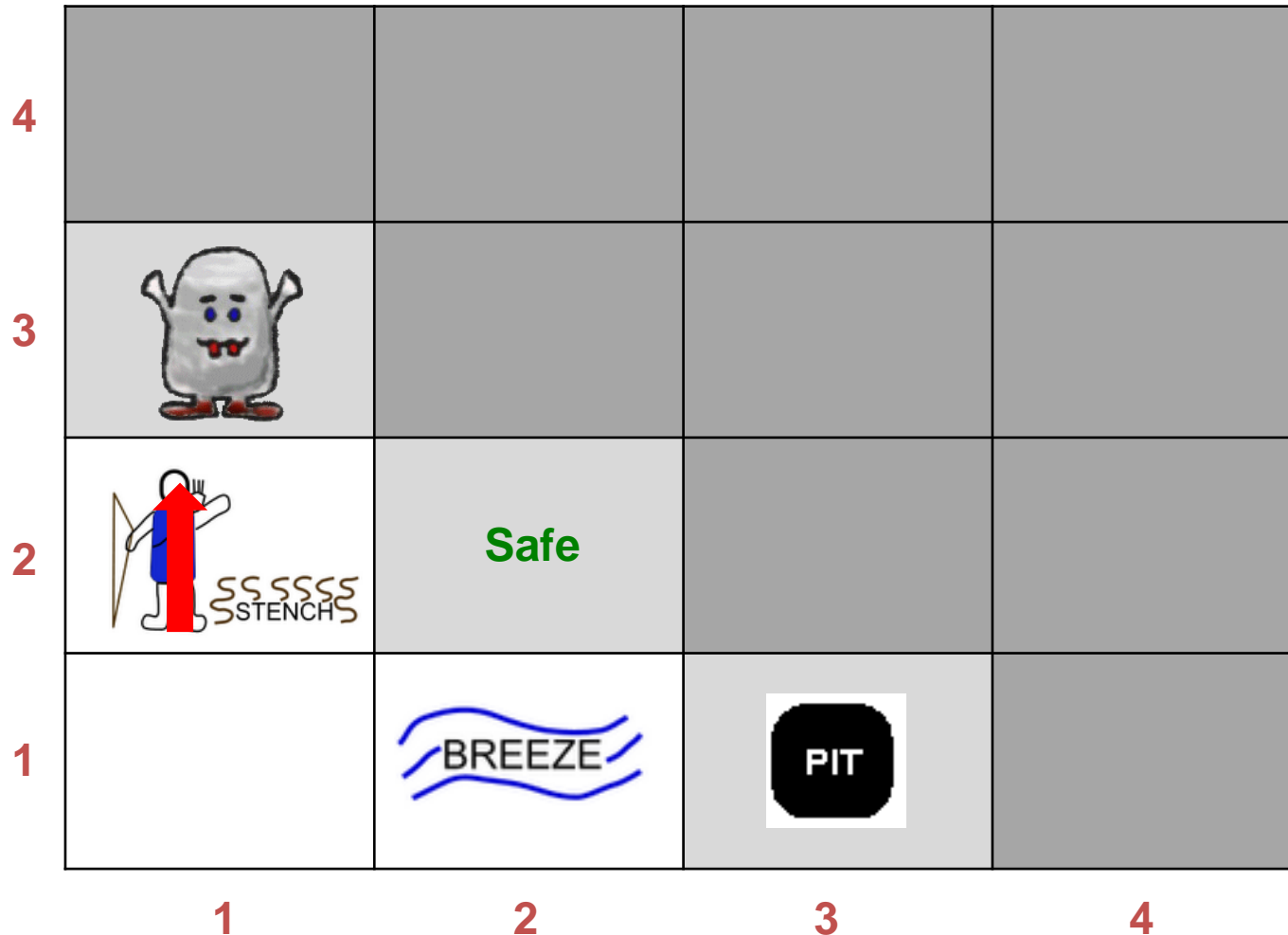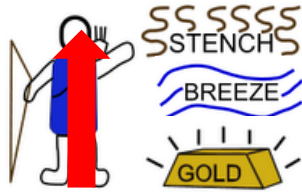
And that (2,2) is safe, since no Breeze is perceived and we know where Wumpus is.

Percept$_{(2,2)}$ = [None, None, None]

No Stench or Breeze, so (2,3) and (3,2) must be safe! We choose (2,3).

Percept$_{(2,3)}$ = [Stench, Breeze, Glitter]

We sense Glitter, so lets dig up the treasure!

The Application
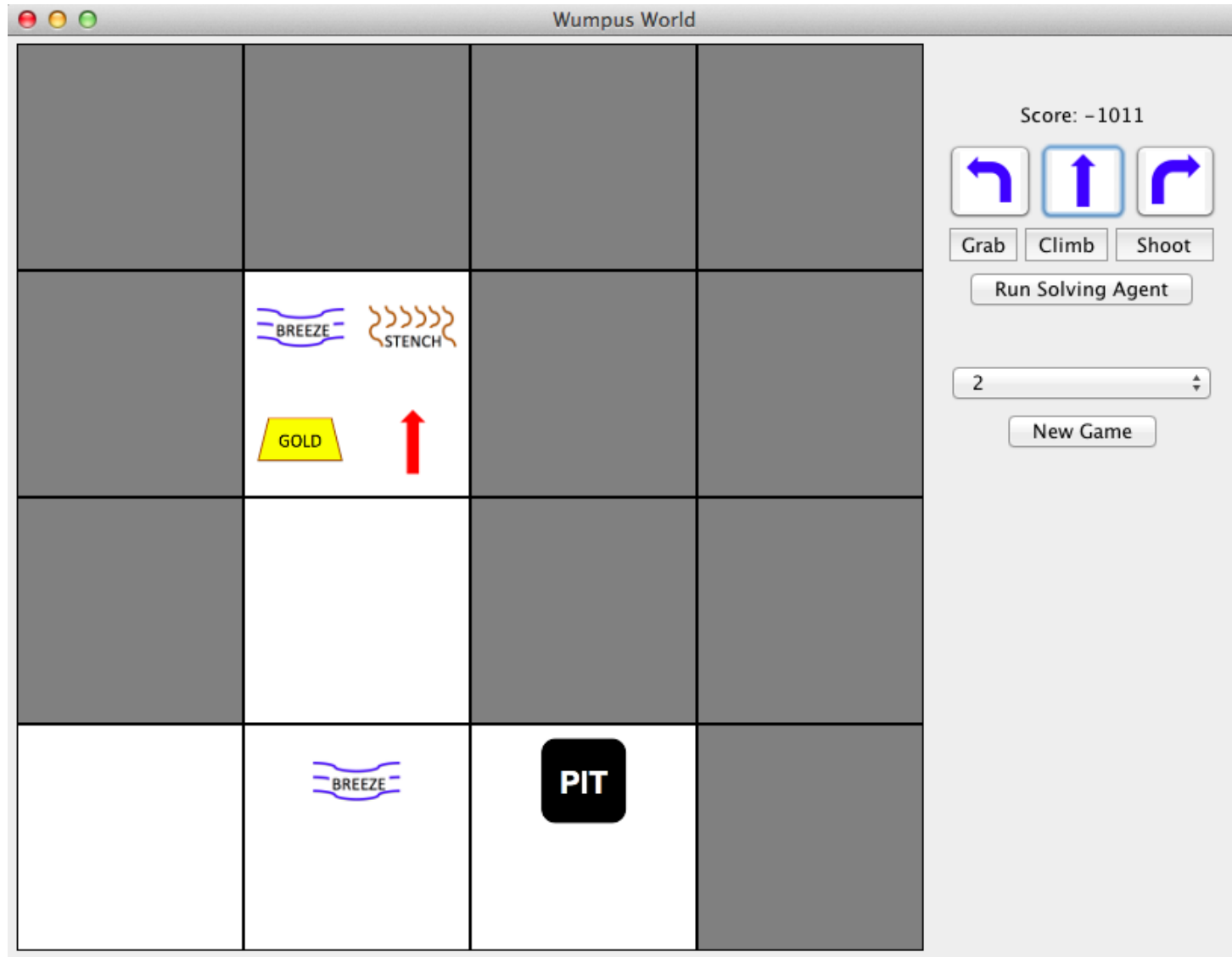
The Application

- The application is written in Java.

- Your task is to add code to the MyAgent.java class to create an "intelligent" player for game.

- The class contains some examples of basic methods you need to use.

- Your code is called by clicking the *Run Solving Agent* button in the GUI.

The Application

- A version of the application modified for the web can be found here: http://aiguy.org/WumpusWorld.html

Basic methods

```java
//Location of the player
int cX = w.getPlayerX();
int cY = w.getPlayerY();
```

```java
//Basic action:
//Grab Gold if we can.
if (w.hasGlitter(cX, cY))
{
    w.doAction(World.A_GRAB);
    return;
}
```

```java
//Test the environment
if (w.hasBreeze(cX, cY))
{
    System.out.println("I am in a Breeze");
}
if (w.hasStench(cX, cY))
{
    System.out.println("I am in a Stench");
}
if (w.getDirection() == World.DIR_LEFT)
{
    System.out.println("I am facing Left");
}
```

```java
//Move actions:
w.doAction(World.A_TURN_LEFT);
w.doAction(World.A_TURN_RIGHT);
w.doAction(World.A_MOVE);
```

Requirements

- Grade E:
  - Rule-based if-then system.
- Grade D:
  - Rule-based system where the rules are described in a separate file, for example using logic notation.
- Grade C:
  - Solution based on a Naïve Bayes approach.
- Grade B:
  - Learning-based system using for example Reinforcement Learning.
- Grade A:
  - Solution using neural networks. Own implementation of network required, no usage of external libraries.
- A solution that does not behave well (by for example missing obvious percepts) will receive an Fx grade.

Requirements

- All solutions have to be compatible with the given code.

  - No change in programming language or IDE is permitted.

- Comment your code to make the grading task easier.

What to submit

- The complete source code for the Wumpus World program containing your AI agent including the project file.

- A report explaining your approach to solve the problem.

- Submit to It's Learning no later than: **30th October 2017 23:59**