

# Computer Science 5400

## Artificial Intelligence

Spring 2022

Puzzle Assignment Set : Pengu

version 22.02.10



### Introduccion







The puzzle for this semester is "Pengu", a sliding piece game. The objective of the game is for [Pengu the Penguin](#) to navigate a frozen playing field picking up fish while avoiding bears and other hazards located inside the field. Pengu **dies** if it moves into the same location as any of the hazards.

### The Frozen Playing Field

The frozen playing field is a grid board where every cell location is either **ice**, **snow**, a **wall**, or a **hazard**. Ice and snow cells are called *open cells*. Ice cells may contain **fish**. Pengu occupies a single open cell and can move in any of the 8 basic cardinal directions. ( **north**, **northeast**, **east**, **southeast**, **south**, **southwest**, **west**,

**northwest** ). When Pengu moves in any direction, he will *slide* across any ice cells in the moving direction and stop when he slides into a snow cell or a hazard cell, or hits a wall cell. If Pengu slides into a hazard cell, he dies. Pengu will pick any fish in the cells he slides across.



**Field 1** : A sample frozen playing field showing Pengu , ice cells ( *blank* ), snow cells ( ) walls() , hazards (  ) and fish ( ) .

## The Game Turn

The game progresses by turns. Each turn involves a single movement from Pengu. The hazards **do not** move. Each turn progresses as follows:

1. Pengu makes a move.
2. Pengu slides in the chosen direction of the move.
  - a. If Pengu slides into an ice cell, Pengu picks up any fish in that cell and continues sliding in the same direction.
  - b. If Pengu slides into a snow cell, Pengu stops moving at that cell.
  - c. If Pengu slides into a hazard cell, the game ends.
  - d. If the next cell in Pengu's direction is a wall cell, pengu ends in the current cell.

Pengu's **score** is the number of fish he picks. The game continues taking turns until either Pengu **dies**, or pengu collects **all the fish**.

## Example Moves:

For the following examples, consider **Field 1** above as the initial playing field.

### Example 1:

Pengu moves North:



Pengu dies by sliding into the bear, with a final score of **1**.

### Example 2:

Pengu moves Northeast:



Pengu stops by hitting a wall, score stays at **0**.

**Example 3:**

Pengu moves East:

#	#	#	#	#	#
#	🐻	❄️		🐋	#
#	🐟		❄️	#	#
#				🐧	#
#	❄️		#	❄️	#
#	🐟	#	🐻	🐟	#
#	#	#	#	#	#

Pengu slides across the board and picks up one fish for a score of **1**.

**Example 4:**

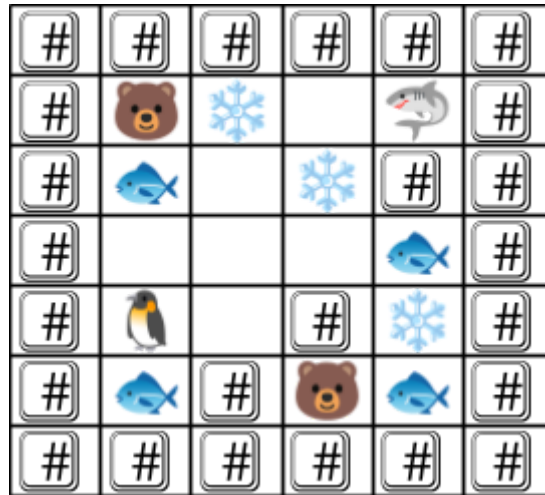
Pengu moves Southeast:

#	#	#	#	#	#
#	🐻	❄️		🐋	#
#	🐟		❄️	#	#
#				🐟	#
#	❄️		#	❄️	#
#	🐟	#	💀	🐟	#
#	#	#	#	#	#

Pengu dies by sliding into the bear, with a final score of **0**. Notice that Pengu slides between the two diagonal wall cells.

### Example 5:

Pengu moves South:



Pengu stops at the snow cell, score stays at **0**.

### General Notes:

- Every frozen playing field is completely surrounded by walls.
- Fish appear only over ice cells.
- Snow cells stay snow cells, even after Pengu steps on them.
- Moving directly into an adjacent wall is **not** considered a valid move (as it does not change Pengu's position.)
- If there are no fish on the grid, **and** pengu is alive, the game ends with [victory!](#).