Computer Science 5400
Artificial Intelligence

Spring 2023

Puzzle : Happy Cows Farm

version 23.02.10

Introduccion

The puzzle for this semester is "*Happy Cows Farm*", a piece placement game. The objective of the game is to place several cows in a field in a way that maximizes a score.

The Farm

The farm is a square grid board where every cell location is either **grass** 🟩, a **haystack** 🟡, or a water **pond** 🟦. Help Clayton the happy farmer place his cows 🐮 in the field while observing the following rules and preferences:

- There are as many cows as haystacks.
- Cows can only be placed in grass cells.
- Cows **prefer** to be adjacent to a haystack either horizontally or vertically.

- Cows are **most happy** if they are adjacent (horizontally or vertically) to both a haystack and a water pond.
- Cows **dislike** being next to another cow, horizontally, vertically and even diagonally.

The Scoring

Every cow placement has a corresponding score, which is the sum of the scores assigned to each cow. A cow's score is the **sum** of the following applicable rules :

- **+1** : If a cow is horizontally or vertically adjacent to a haystack.
- **+2** : If a cow is horizontally or vertically adjacent to **both** a haystack and a water pond.
- **-3** : If a cow is next to another cow (horizontally, vertically or diagonally)

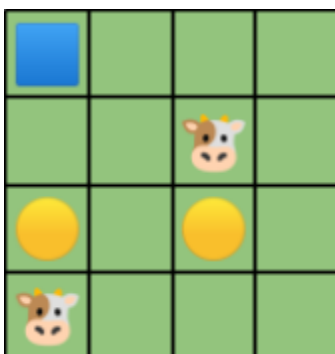Notice then that a cow surrounded by grass cells has a score of **0**.

Example Placements:

Placement 1: total score = **1**.

The top cow has a score of **0**. The bottom cow has a score of **1**.

Placement 2: total score = **-5**.

The top cow has a score of **-2** (1-3). The bottom cow has a score of **-3**.

Placement 3: total score = **2**.

The top cow has a score of **1**. The bottom cow has a score of **1**.

Placement 4: total score = **4**.

The top cow has a score of **3** (1+2). The bottom cow has a score of **1**.

General Notes:

- There may be more than one optimal placement of the cows.
- There will always be at least one grass cell per cow.