

Rules for the Game of Freckers

COMP30024 Artificial Intelligence

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Freckers is a captivating two-player strategy game that brings a pond to your tabletop. Navigate your team of six frogs across an 8x8 grid, outsmarting your opponent with every hop and jump. With each turn, the pond transforms, presenting new challenges and opportunities. Will you be the first to reach the other side and claim victory? Freckers offers a perfect blend of simple rules and deep strategy, ensuring a fresh and exciting experience with every game!

Overview

Freckers is a two-player perfect information game played on a 8×8 board. The players (Red and Blue) take turns to move six frogs from one side of the board to the other.

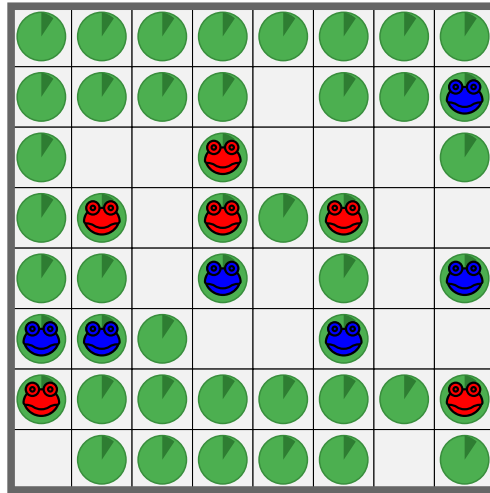


Figure 1: An example (in-progress) game of Freckers.

Game Board

We use a two-dimensional coordinate system to describe the positions of cells on the game board (Figure 2). Formally, a valid board *coordinate* is an integer pair (r, c) , $0 \leq r \leq 7$, $0 \leq c \leq 7$, where r is the *row* on the board and c is the *column*.

A given coordinate may be directly *adjacent* to up to **eight** other coordinates. For example, $(1, 2)$ is adjacent to eight coordinates:

- $(1, 3)$ – RIGHT
- $(1, 1)$ – LEFT
- $(0, 2)$ – UP
- $(2, 2)$ – DOWN
- $(0, 1)$ – UP-LEFT
- $(0, 3)$ – UP-RIGHT
- $(2, 1)$ – DOWN-LEFT
- $(2, 3)$ – DOWN-RIGHT

Those on the edges or corners of the board naturally have fewer adjacent coordinates. For example, the coordinate $(7, 7)$ only has three: $(6, 6)$ (UP-LEFT), $(6, 7)$ (UP), and $(7, 6)$ (LEFT).

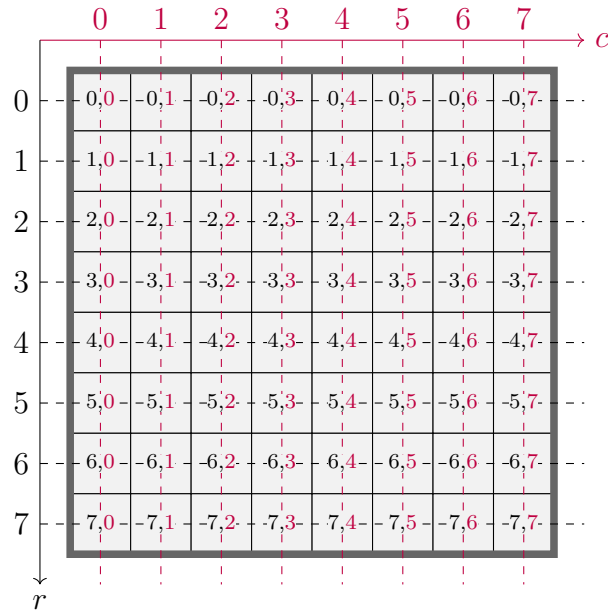


Figure 2: The coordinate system used on a Freckers game board.

Gameplay

Below we outline the high-level “sequence” for a typical game of **Freckers**. The subsequent sections then describe the individual components of this sequence in detail.

- The game begins with the configuration shown in Figure 3 and proceeds sequentially. Note that in our illustrations, the green circles represent “lily pads”. Initially there are 28 lily pads on the board with frogs occupying 12 of these lily pads.
- By convention, **Red** starts. Throughout the game **Red** and **Blue** take turns to play actions:
 - A **MOVE** action involves moving a frog to an *unoccupied* lily pad, either in a directly adjacent cell, or, via multiple jumps over occupied lily pads (similar to jump moves in classic Checkers).
 - A **GROW** action *generates* lily pads around all six frogs of the current player in the directly adjacent cells.
- The game ends when a player moves all their frogs such that they occupy the *opposite* row of the game board; *or*, a turn limit of 150 turns is reached.

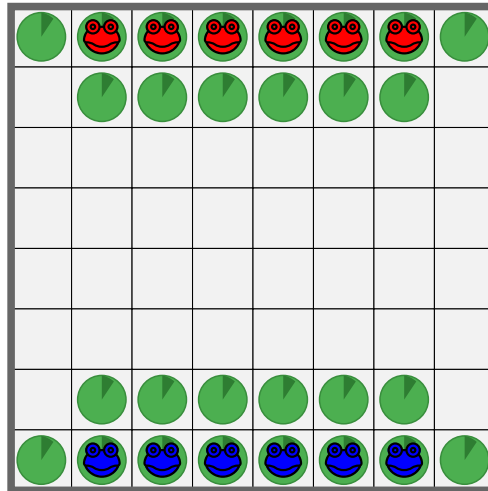


Figure 3: Initial game board configuration.

Actions

MOVE

On a given turn, the current player may choose to **MOVE** one frog “forwards” or sideways to an *unoccupied* destination lily pad. They may optionally jump over other frogs (of either colour) one or

more times along the way to the destination cell. Specifically, the definition of “forwards” depends on the current player’s colour:

- **Red** may only move RIGHT, LEFT, DOWN, DOWN-LEFT and DOWN-RIGHT
- **Blue** may only move RIGHT, LEFT, UP, UP-LEFT and UP-RIGHT

Figure 4 illustrates the valid moves for each respective player according to the rules above.

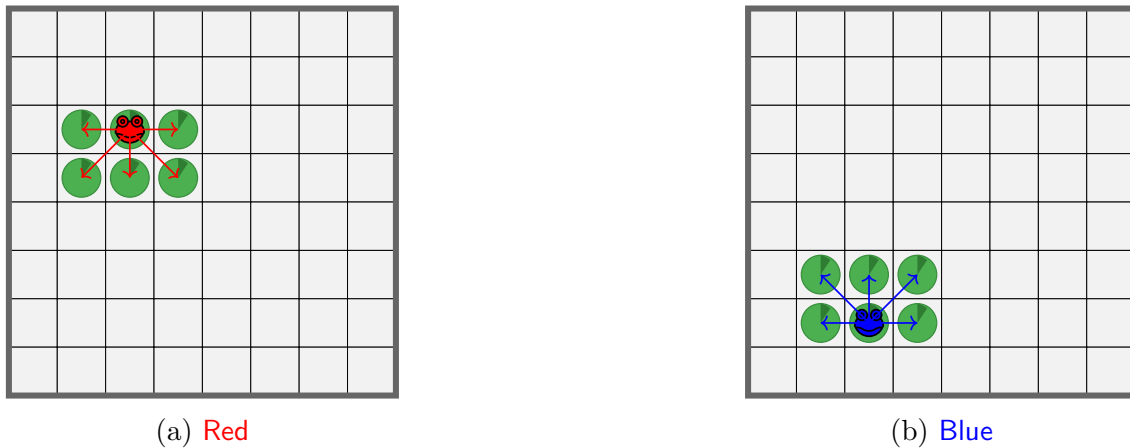


Figure 4: Valid **MOVE** directions for **Red** and **Blue** respectively (assuming there is just one frog on the game board). Notice that there is an unoccupied lily pad in the possible destination cells.

Regardless of whether the player moves to an adjacent cell or jumps over multiple frogs along the way, the *destination* cell must always contain an *unoccupied* lily pad. After performing a **MOVE** action, the lily pad in the *source* cell (from which the frog leaves) disappears and can only be regenerated via a subsequent **GROW** action (described next).

Figure 6 illustrates two example jump sequences. Notice how in (b) directions change during a multi-jump sequence. Importantly, all these jumps are in one of the five valid directions for the respective turn player (**Blue**).

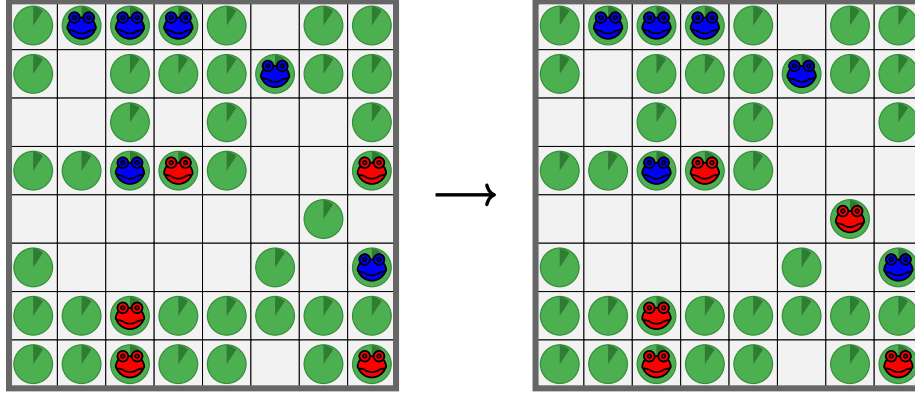
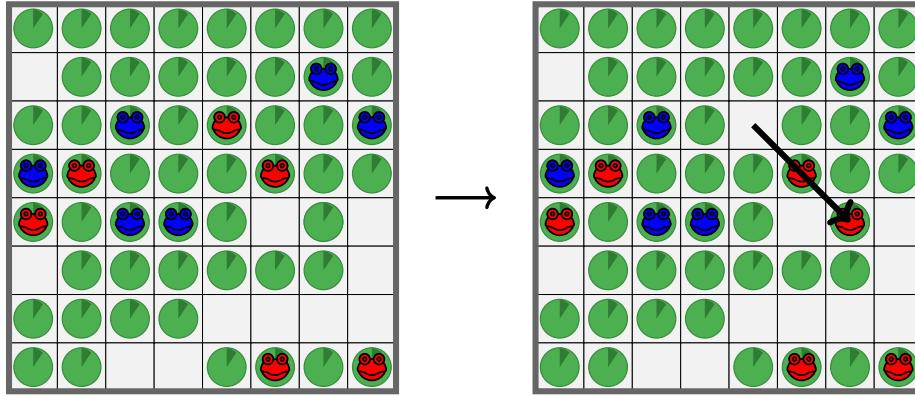
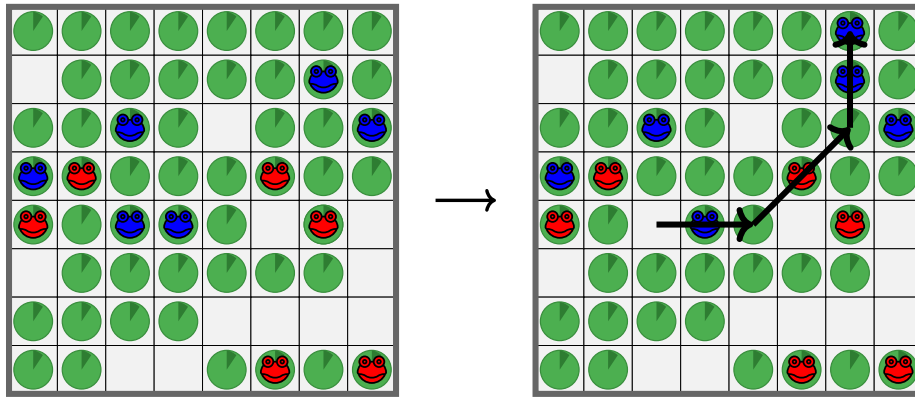


Figure 5: Red plays MOVE action (3,7) [DOWN-LEFT]. The board state before (left) and after (right) playing the action is shown.



(a) Red plays MOVE action (2,4) [DOWN-RIGHT].



(b) Blue then plays MOVE action (4,2) [RIGHT, UP-RIGHT, UP].

Figure 6: An example showing a sequence of two MOVE actions, the first involving a single jump, and the second involving three successive jumps.

GROW

On a given turn, a player may alternatively choose to play a GROW action. This results in lily pads being *generated* in the cells adjacent to all six of their frogs. In cells where there is already a lily

pad (occupied or not), no updates are made. Similarly, a lily pad may be generated in the same cell more than once, for example, if two of the player's frogs neighbor each other. The end result is ultimately no different – a single unoccupied lily pad is generated in the cell. Figure 7 shows an example GROW action played by Red.

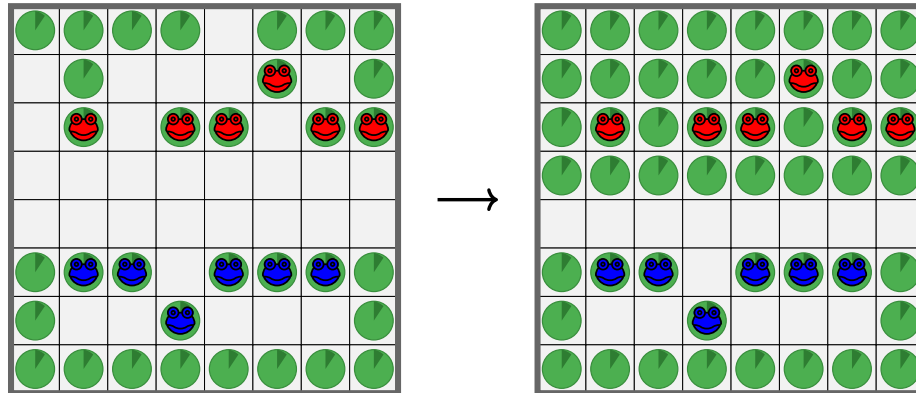


Figure 7: Red plays a GROW action. The board state before (left) and after (right) is shown.

Ending the Game

A game of **Freckers** ends if one of the following two conditions is met:

1. A player moves *all* of their frogs to the opposite row of the board ($r = 7$ for **Red** and $r = 0$ for **Blue**). This player is declared the **winner**.
2. There have been 150 actions played (across both players) with no winner declared. The player with more frogs in the opposite row is declared the **winner**, *or*, if this is a tie, the game ends in a **draw**.

Figure 8 shows an example board configuration where **Red** has won the game. Notice how $r = 7$ for all six frogs.

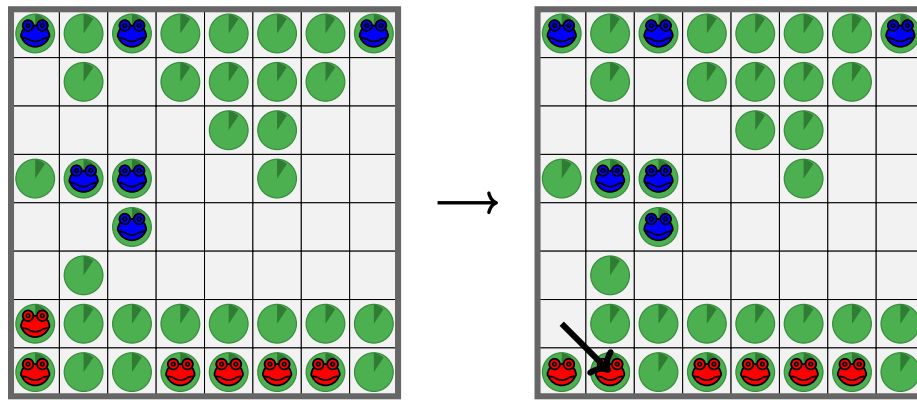


Figure 8: **Red** plays a final MOVE (6, 0) DOWN-RIGHT action to claim victory.

v1.1 Fixed Figure 5, which should have had a missing “from” lilypad in the resultant state.