Rules for the Game of

RoPaSci 360

COMP30024 Artificial Intelligence

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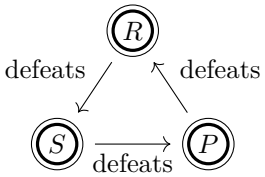
RoPaSci 360 is a simultaneous-play board game of chance and anticipation in the spirit of the storied hand-game known by many names throughout the world, including *Roshambo*, *Jan-Ken*, and, of course, *Rock-Paper-Scissors*. Throw down a team of tokens with which to crush, cover, and cut through your opponent. Attack them when and where they least expect it, but be quick to slip away or you won't escape their retaliation! Have you anticipated your opponent's next move, or are you thinking exactly what they want you to think? *Rock, paper, scissors, throw!*

Overview

RoPaSci 360 is played on a hexagonal **board** of 61 **hexes**, which may be **occupied** by **tokens**. Each token has one of 3 **symbols**: **Rock**, **Paper**, or **Scissors**. Two **players** (named **Upper** and **Lower**) play the game. The game begins with an empty board, but throughout the game, each player will **throw** up to 9 tokens onto the board (for example, see Figure 1b). The goal of each player is to catch and **defeat** their opponent's tokens, as per the mechanic of *Rock-Paper-Scissors* (Figure 1a).



(a) (above) Rock-Paper-Scissors mechanic: Rock defeats Scissors, Scissors defeats Paper, and Paper defeats Rock.

(b) (right) Four turns into this example game, Upper has thrown three tokens onto the board: One Rock (R), one Paper (P), and one Scissors (S). Upper has six throws remaining. Lower has five throws remaining, having thrown one Paper (p), one Scissors (s), and two Rocks (r_1, r_2). So far no tokens have been defeated, but S should watch out for r_2, it's only two hexes away!

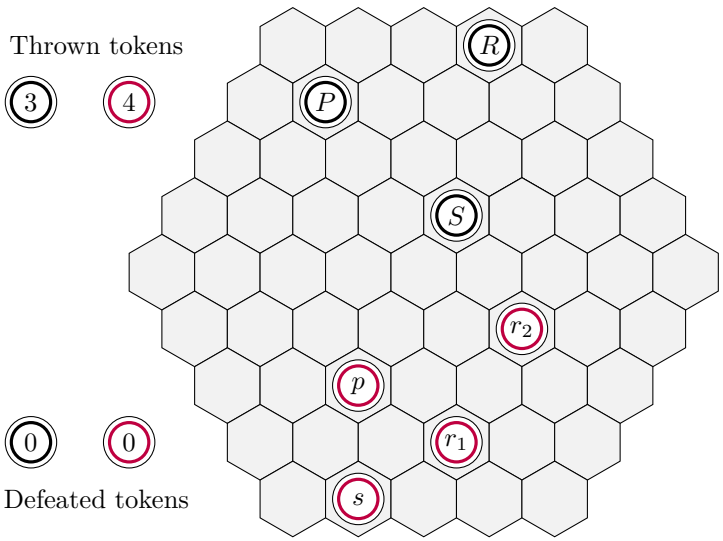


Figure 1: The core Rock-Paper-Scissors mechanic, and an example game configuration. More details below.

Gameplay

The game proceeds in turns. In each turn, both players take an **action**. Both actions are chosen and taken *at the same time*. Each action might be a **throw action**, a **slide action**, or a **swing action**. Afterwards, if there are any **overlapping tokens** (groups of multiple tokens occupying one hex), these tokens **battle**. These turns continue until the game ends. The rules for each type of action, along with the rules for battling overlapping tokens and ending the game, are described below.

Throw actions

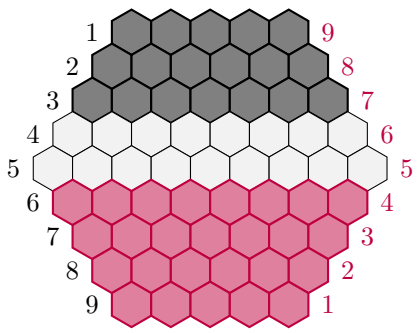
In a **throw action** (a 'throw'), a player adds a single new token, with a symbol of their choice (Rock, Paper, or Scissors), to the board. Each player can take the throw action *at most 9 times per game*. When throwing their n^{th} token since the start of the game, the player can choose any hex from the first n rows of hexes for this new token. Upper counts from the top row down, and Lower counts from the bottom row up (see Figure 2a). The chosen hex may be empty or may already be occupied by another token of either player.

Slide actions

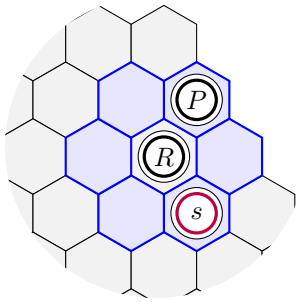
In a **slide action** (a 'slide'), a player moves an existing token from the hex it currently occupies to an **adjacent hex** (one of the at-most-six hexes in direct contact with the current hex—see Figure 2b). The adjacent hex may be empty or may already be occupied by another token of either player.

Swing actions

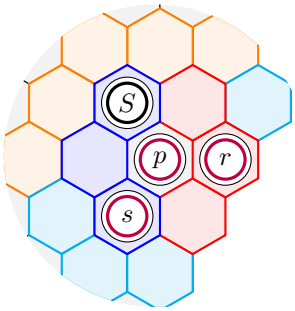
In a **swing action** (a 'swing'), a player moves an existing token from the hex it currently occupies *around* an adjacent **swinging hex** to an **opposite hex**. Opposite hexes are those adjacent to the swinging hex but not adjacent to the current hex, and not the current hex itself (see Figure 2c). The swinging hex *must be occupied by at least one of the player's tokens*—tokens cannot swing around empty hexes or hexes occupied only by opponent tokens. The opposite hex may be empty occupied by other tokens of either player.



(a) On Upper's third **throw**, Upper selects a hex from the top three hex rows (coloured black, all rows numbered on left). On Lower's fourth throw, Lower selects a hex from the bottom four hex rows (coloured purple, numbered right).



(b) The six hexes **adjacent** to R's hex are marked in blue. R can **slide** to any of these hexes, including those already occupied by P and s. P's hex is only adjacent to *four* hexes, since it's near an edge of the board.



(c) Lower's r can **swing** (around p's hex) to the hexes on the *opposite side* of p (blue), but *not* to the hexes on the *same side* (red). Lower's p can swing around r's or s's hexes (to cyan hexes), but *not* around hexes without Lower tokens (to orange hexes).

Figure 2: On each turn, both players simultaneously choose a throw action, a slide action, or a swing action.

Overlapping tokens

After every action, there may be hexes occupied by more than one token, of one or both players. These tokens **battle** according to the Rock-Paper-Scissors mechanic, with **defeated** tokens removed from the board:

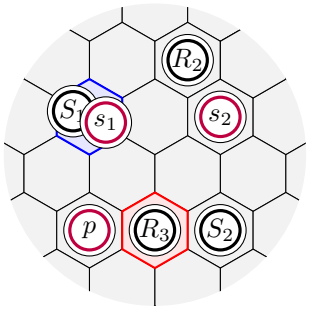
- If the hex is occupied by one or more tokens with each symbol, *all of the tokens are defeated.*
- If the hex is occupied by a Rock token, all Scissors tokens there are defeated.
- If the hex is occupied by a Scissors token, all Paper tokens there are defeated.
- If the hex is occupied by a Paper token, all Rock tokens there are defeated.

Even tokens controlled by a single player will battle if they share a hex. Moreover, a hex might remain occupied by multiple tokens if all of these tokens have the same symbol. See Figure 3a for further clarification.

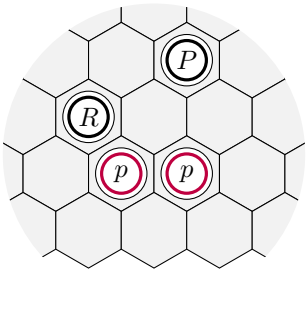
Ending the game

The game ends when one of the following conditions is met (if multiple are met, use the first in this list).

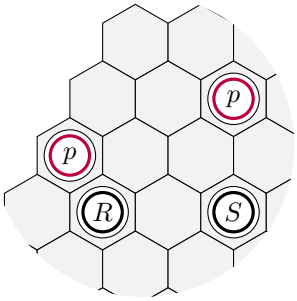
1. One player has no remaining throws and all of their tokens have been defeated: If the other player still has tokens or throws, declare that player the **winner**. Otherwise, declare a **draw**.
2. A token is **invincible** if it cannot be defeated by the opponent's remaining tokens, and the opponent has no remaining throws. Both players have an invincible token: Declare a **draw** (see Figure 3b).
3. One player has an invincible token (see condition 2) and the other has only one remaining token (not invincible): Declare the player with the invincible token the **winner** (see Figure 3c).
4. One game configuration (with the same number of tokens with each symbol and controlling player occupying each hex, and the same number of throws remaining for each player), occurs for a third time since the start of the game (not necessarily in succession): Declare a **draw**.
5. The players have had their 360^{th} turn without a winner being declared: Declare a **draw**.



(a) Two Scissors tokens remain undefeated on the blue hex. If p and S_2 slide onto the red hex, R_3, p, and S_2 will *all* be defeated. If p slides onto the red hex but R_2 slides onto s_2's hex, then R_3 and s_2 will be defeated.



(b) If neither player has throws or Scissors tokens remaining, and both players have Paper tokens remaining, these Paper tokens are invincible. The second end-of-game condition is met, so the game is declared a draw.



(c) If Lower has only Paper tokens, and no throws remaining, then Upper's Scissors token is invincible. If Upper can defeat either of Lower's remaining Paper tokens, we will declare Upper the winner by condition 3.

Figure 3: In these examples, assume all tokens are visible, and neither player has remaining throws.