# Game Description

The game is a two-player, zero-sum, win-loss game with a value of 1 to player 1 if he wins and 0 if he loses.

## Game Structure

Players alternate moves: player 1 moves at odd $t$ and player 2 at even $t$. The position quality at time $t$ is $q_t \in \{s, c\}$ represents the quality or complexity of the position ($s$ if simple, $c$ if complex).

At each turn, the moving player chooses a move $m_t \in \{S, C\}$, where $S$ represents a simple move and $C$ a complex move. This choice determines the quality of the next position: $q_{t+1} = m_t$.

## Blunders and Game Progress

After the move, Nature intervenes to determine if a blunder has occurred. The probability of a blunder depends on both the position quality $q_t$ and the chosen move $m_t$, with blunders more likely in complex positions and with complex moves. Specifically:

- Let $b_{qm} = \Pr(\text{blunder} | q_t = q, m_t = m)$
- We assume $b_{sC} > b_{sS}$ and $b_{cC} > b_{cS}$ (blunders are more likely making complex moves)
- If a blunder occurs, the moving player loses immediately and the game ends

If no blunder occurs:

- The game terminates with probability $\tau$, in which case player 1 wins
- With probability $1 - \tau$, the game continues to the next state $q_t$, determined by the move made in that round

We are interested in Markov-perfect equilibria.

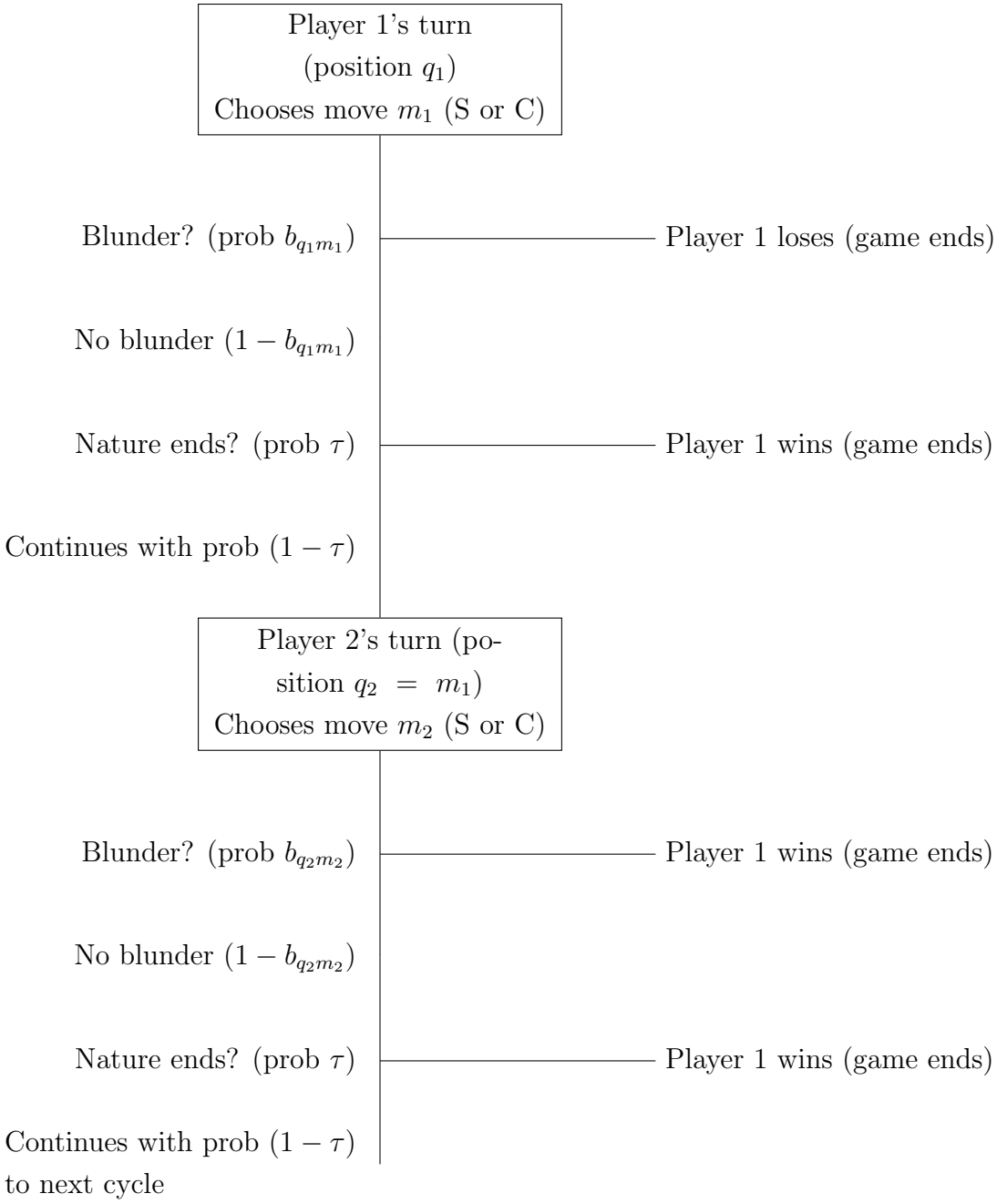


Figure 1: One Cycle in the Game (starting with Player 1)

# Strategy Profiles and Paths

## Strategy Profiles

A strategy profile is defined as:

$$([1's \text{ response to } s][1's \text{ response to } c], [2's \text{ response to } s][2's \text{ response to } c])$$

For example: $(CS, CC)$

Here, $[1's \text{ response to } s][1's \text{ response to } c]$ is Player 1's strategy: a record of how Player 1 will respond to every possible position, e.g., $CS$.

## Paths and Markov Strategies

A sequence of non-nature moves is called a *path*. We use subscripts to make clear who is making a move.

Under Markov strategies, players' moves depend only on the current position quality ($s$ or $c$), not on the history of play. This means:

- If a position quality repeats (e.g., players reach a simple position again), the same player must make the same move choice as before