The University of Melbourne
School of Computing and Information Systems
COMP30024 Artificial Intelligence

Rules for the Game of

Chexers

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Chexers is a three-player hexagonal turn-based race game. Test the loyalty of your band of two-faced checkerpieces as you charge them through a twisting and treacherous battleground. Will all your pieces stay true to your cause? Can you earn yourself some new followers in the chaos? To win this tumultuous chase, you must double-cross and triple-cross your way across the finish line before your opponents—three, two, one... go!

Setup

Chexers plays on a hexagonal **board** of 37 **hexes**, as illustrated in Figure 1. Three players (**Red**, **Green**, and **Blue**) play the game. Each player initially controls 4 **pieces** of their **colour**. The pieces begin in the configuration shown below in Figure 1, occupying hexes along three edges of the board.

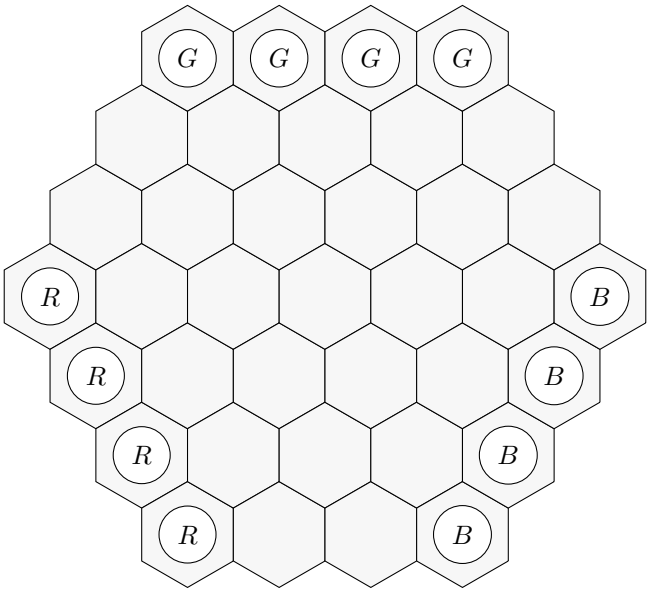


Figure 1: Board with 37 hexes and starting configuration of 12 pieces: 4 Red (R), 4 Green (G), 4 Blue (B).

Gameplay

Players take turns, starting with Red, followed by Green, followed by Blue. This cycle repeats until the game ends. On each turn, the current player must take a single **action** involving a piece in their colour, if possible. This action may be a **move action**, a **jump action**, or an **exit action**. If no such actions are possible the player must **pass** instead, taking no action. Note that a player can *only* pass if they have no available actions (for example if the player has no remaining pieces or their remaining pieces are 'blocked' by other pieces). Each type of action is described in the following sections.

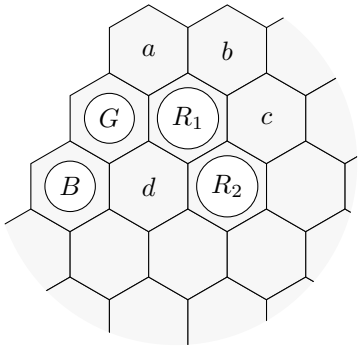
Move actions

A **move action** (a 'move') involves moving a piece from the hex it currently occupies to an adjacent hex (one of the at-most-six hexes in direct contact with the current hex on the board). For the move action to take place, the adjacent hex must not be occupied by another piece. A configuration illustrating available move actions is shown in Figure 2a.

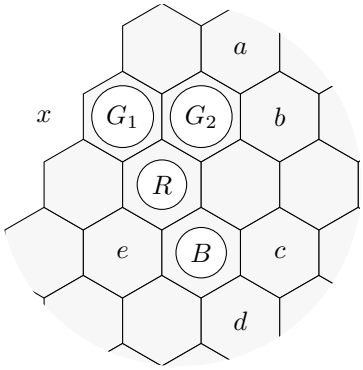
Jump actions

A **jump action** (a 'jump') involves moving a piece from its current hex to an unoccupied hex **opposite** some occupied adjacent hex. That is, a piece 'jumps over' an adjacent piece onto the hex directly on the other side from where it started. Figure 2b explores an example configuration to illustrate these concepts.

The adjacent piece (the one to be 'jumped over') may have any colour. If this piece is a different colour from the jumping piece, then it will be **converted**—its colour will change to the colour of the jumping piece as a result of the jump action. In this way, jump actions enable a player to 'gain control' of additional pieces.



(a) **Move actions:** In this configuration, the piece R_1 has an available move action to each of the hexes marked a, b, c and d. Though the hexes occupied by G and R_2 are also adjacent, moves to these hexes are not available since they are occupied. G is on a hex near an edge of the board and has only 4 adjacent hexes to begin with; since 2 of them are occupied (by B and R_1), G can only move to hex a or hex d.

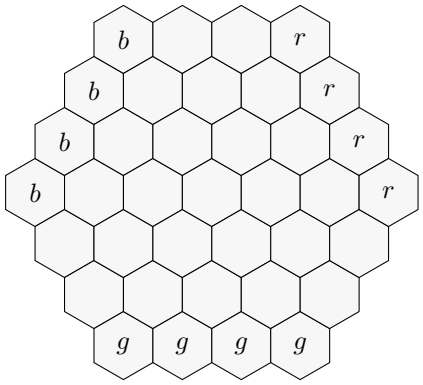


(b) **Jump actions:** In this configuration, G_1 has a jump action available over G_2 to the horizontally opposite hex marked b. G_1 cannot jump over R because the hex opposite R is occupied (by B). Note that G_1 cannot jump all the way to the hex marked d either: a jumping piece may only go over a single hex. G_2 can jump over R because the opposite hex from G_2's perspective, e, is unoccupied (this jump action will result in the **conversion** of R to a Green piece). G_2 cannot jump over G_1 because there is no hex opposite G_1 from G_2's perspective (such a hex would have to be at the position marked x). Note further that 'jump sequences' are *not* allowed: G_2 *cannot* jump over R to e and then over B to c in one action, for example.

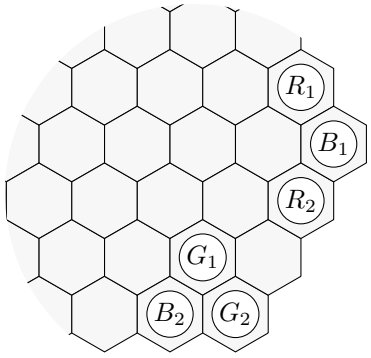
Figure 2: These partial board configurations exemplify the rules for move actions and jump actions.

Exit actions

An **exit action** (an 'exit') involves a piece 'leaving the board'. These actions are only possible when a piece occupies some hex on the edge of the board directly opposite the edge where the controlling player's pieces started the game (as per Figure 1). The exiting piece is removed from the board (leaving its hex unoccupied). Figure 3 outlines the hexes that allow exit actions for each player, and shows some examples of available exit actions.



(a) This figure marks the hexes where Red's pieces have available exit actions with r, Green's with g and Blue's with b. Each marked hex is on the opposite edge of the board from its player's starting position (compare with Figure 1 which shows these starting positions).



(b) In this configuration, only R_1 and G_2 have available exit actions: they occupy hexes marked for their colour in Figure 3a. B_1, B_2 and R_2 also occupy hexes on edges of the board, but they are not on the correct edges to exit for their respective colours. Note that it is *not* possible to 'jump off the board': For example, even though G_1 has an adjacent piece between it and the edge of the board opposite Green's starting position, G_1 does not occupy a hex marked g in Figure 3a, so it has *no available exiting action.*

Figure 3: These diagrams demonstrate the rules for exiting actions.

Ending the game

The game ends as soon as any player has taken 4 exiting actions (as described above). That player wins the game, and the other two players lose the game. Note that it is not enough simply to have 4 pieces 'in position' for exit actions: a turn must be taken to carry out each of the 4 exit actions to win.

Alternatively, the game may end in a draw with no players winning the game. A draw is declared if either of the following conditions are met:

- One board configuration (with the same pieces occupying the same hexes on the same player's turn, ignoring rearrangements of same-coloured pieces) occurs for a fourth time since the start of the game. These repeated board configurations do not need to occur in succession.
- Each player has had their 256^{th} turn (including turns where the player must pass) and no winner has been declared.