

Project Tasks 6 and 7: Establish Interface for Human vs Random Player and Establish Code to Predict Move Outcome Without Changing Board By Carrie Corcoran

This is the sixth and seventh tasks for my semester-long project of creating heuristic Mancala players. Task 5 involved writing an interface for a human player to play a game of Mancala against a random player. Much of this was similar to the previous task of having 2 random players play against one another, so this was relatively straightforward.

The sixth task was more challenging. It entailed creating a system in which the outcome of a move could be predicted, both in terms of the number of points gained and whether it would result in a bonus move, without changing the state of the board. This was somewhat challenging as it entailed duplication of much of the infrastructure to essentially create a copy of the board and some duplicate functions to work with this copy board.

Task 6 – Interface for Human vs Random Player Code:

```
(defun human-move()
  (draw-board)
  (setf potential-moves (non-empty-spaces 'a 0 '()))
  (format t "Select your move: " ) (setf move (read) )
  (cond
    ((member move potential-moves)
     (format t "Human player picks up stones in ~A ~%" move)
     (setf again (single-move 'a move t))
     )
    (t
     (format t "Sorry, that's not a valid move. Please choose
a bowl with stones in it.~%")
     (human-move)
     )
  )
  (cond
    (again
     (format t "Human player moves again! ~%")
     (human-move)
     )
  )
)
```

```

(defun alternate-moves()
  (format t "~%Human player's turn!~%~%")
  (human-move)
  (cond
    ((not (or (empty-side 'a) (empty-side 'b)))
      (format t "~%Machine player's turn!~%~%")
      (random-move 'b t)
      (cond
        ((not (or (empty-side 'a) (empty-side 'b)))
          (alternate-moves)
        )
      )
    )
  )
)
)
)

```

```

(defun human-vs-random-game ()
  (reset-board)
  (alternate-moves)
  (remaining-pieces 'a)
  (remaining-pieces 'b)
  (format t "Final Score: ~%")
  (format t "Human Player: ~A ~%" (AH))
  (format t "Machine Player: ~A ~%" (BH))
  (cond
    ((> (AH) (BH))
      (format t "Human Player wins! ~%")
    )
    ((< (AH) (BH))
      (format t "Machine Player wins! ~%")
    )
    (t
      (format t "The game is a tie! ~%")
    )
  )
)
)

```

Demo:

```
[1]> (load "mancala.l")
;; Loading file mancala.l ...
;; Loaded file mancala.l
T
[2]> (human-vs-random-game)
```

Human player's turn!

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
4	4	4	4	4	4	4	
0							
							0
4	4	4	4	4	4	4	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Select your move: a3

Human player picks up stones in A3

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
4	4	4	4	4	4	4	
0							
							1
4	4	0	5	5	5		
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Last stone placed in player's mancala

Human player moves again!

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
4	4	4	4	4	4	4	
0							
							1
4	4	0	5	5	5		
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Select your move: a1

Human player picks up stones in A1

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
0	4	4	4	4	4	4	
							1
	0	5	1	6	6	5	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in A5

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
0	4	4	5	5	5	5	
							2
	0	5	1	6	0	6	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in B4

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
0	5	5	0	5	5	5	
							2
	1	6	2	6	0	6	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in A3

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
0	5	5	0	5	5	5	
							2
	1	6	0	7	1	6	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Player picks up and stones in opposite space and places them in the player's mancala

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
5	5	0	5	0	5		
0	—	—	—	—	—	—	
	—	—	—	—	—	—	7
1	6	0	7	1	6		
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Machine player's turn!

Random player picks up stones in B3

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
6	6	1	0	0	5		
1	—	—	—	—	—	—	
	—	—	—	—	—	—	7
2	6	0	7	1	6		
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in A1

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
6	6	1	0	0	5		
1	—	—	—	—	—	—	
	—	—	—	—	—	—	7
0	7	1	7	1	6		
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Human player's turn!

HB	B6	B5	B4	B3	B2	B1	
7	0	2	1	1	0		
1							
							14
1	8	2	8	2	1		
A1	A2	A3	A4	A5	A6	HA	

Machine player's turn!

Random player picks up stones in B4

HB	B6	B5	B4	B3	B2	B1	
8	1	0	1	1	0		
1							
							14
1	8	2	8	2	1		
A1	A2	A3	A4	A5	A6	HA	

Picking up stones in B6

HB	B6	B5	B4	B3	B2	B1	
0	1	0	1	1	1		
2							
							14
2	9	3	9	3	2		
A1	A2	A3	A4	A5	A6	HA	

Player picks up stones in opposite space and places them in the player's mancala

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		0	1	0	1	1	1	
	4	—	—	—	—	—	—	
		—	—	—	—	—	—	
		2	9	3	9	3	0	
	—	—	—	—	—	—	—	
		A1	A2	A3	A4	A5	A6	HA

Human player's turn!

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		0	1	0	1	1	1	
	4	—	—	—	—	—	—	
		—	—	—	—	—	—	
		2	9	3	9	3	0	
	—	—	—	—	—	—	—	
		A1	A2	A3	A4	A5	A6	HA

Select your move: a1

Human player picks up stones in A1

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		0	1	0	1	1	1	
	4	—	—	—	—	—	—	
		—	—	—	—	—	—	
		0	10	4	9	3	0	
	—	—	—	—	—	—	—	
		A1	A2	A3	A4	A5	A6	HA

Picking up stones in A3

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		0	1	0	1	1	1	
	4	—	—	—	—	—	—	
		—	—	—	—	—	—	15
		0	10	0	10	4	1	
	—	—	—	—	—	—	—	
		A1	A2	A3	A4	A5	A6	HA

Last stone placed in player's mancala
Human player moves again!

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		0	1	0	1	1	1	
	4	—	—	—	—	—	—	
		—	—	—	—	—	—	15
		0	10	0	10	4	1	
	—	—	—	—	—	—	—	
		A1	A2	A3	A4	A5	A6	HA

Select your move: a1

Sorry, that's not a valid move. Please choose a bowl with stones in it.

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		0	1	0	1	1	1	
	4	—	—	—	—	—	—	
		—	—	—	—	—	—	15
		0	10	0	10	4	1	
	—	—	—	—	—	—	—	
		A1	A2	A3	A4	A5	A6	HA

Select your move: a2

Human player picks up stones in A2

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
4	0	2	1	2	2	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	16
—	0	0	1	11	5	2	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in B5

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
4	1	0	1	2	2	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	16
—	1	0	1	11	5	2	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Player picks up stones in opposite space and places them in the player's mancala

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
4	0	0	1	2	2	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	17
—	1	0	1	11	5	2	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Machine player's turn!

Random player picks up stones in B2

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
4	0	0	2	3	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	17
1	0	1	11	5	2		
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Picking up stones in B4

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
4	1	1	0	3	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	17
1	0	1	11	5	2		
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Player picks up stones in opposite space and places them in the player's mancala

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
5	1	1	0	3	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	17
0	0	1	11	5	2		
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Human player's turn!

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		1	1	0	3	0	2	
	5							
							17	
		0	0	1	11	5	2	
		A1	A2	A3	A4	A5	A6	HA

Select your move: a4

Human player picks up stones in A4

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		2	2	1	4	1	3	
	5							
							18	
		1	1	1	0	6	3	
		A1	A2	A3	A4	A5	A6	HA

Player picks up and stones in opposite space and places them in the player's mancala

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		2	0	1	4	1	3	
	5							
							20	
		1	1	1	0	6	3	
		A1	A2	A3	A4	A5	A6	HA

Machine player's turn!

Random player picks up stones in B2

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
5	2	0	1	5	0	3	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	20
—	1	1	1	0	6	3	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in B3

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
6	3	1	2	0	0	3	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	20
—	2	1	1	0	6	3	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in A1

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
6	3	1	2	0	0	3	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	20
—	0	2	2	0	6	3	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in A3

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
6	3	1	2	0	0	3	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	20
—	0	2	0	1	7	3	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in A5

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
4	2	3	1	1	4		
6	—	—	—	—	—	—	
	—	—	—	—	—	—	20
0	2	0	1	0	4		
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
7	0	2	3	1	1	4	
—	—	—	—	—	—	—	—
	—	—	—	—	—	—	20
	1	3	1	1	0	4	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
7	0	2	3	1	1	4	
—	—	—	—	—	—	—	—
	—	—	—	—	—	—	20
	1	3	1	1	0	4	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Human player picks up stones in A6

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
7	0	2	3	2	2	5	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	21
—	1	3	1	1	0	0	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in B3

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
7	0	3	4	0	2	5	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	21
—	1	3	1	1	0	0	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in B5

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
7	1	0	4	0	2	5	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	21
—	2	4	1	1	0	0	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in A2

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
7	1	0	4	0	2	5	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	21
—	2	0	2	2	1	1	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Player picks up and stones in opposite space and places them in the player's mancala

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
1	0	4	0	2	0		
7	—	—	—	—	—	—	
	—	—	—	—	—	—	26
2	0	2	2	1	1		
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Machine player's turn!

Random player picks up stones in B4

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
2	1	0	0	2	0		
8	—	—	—	—	—	—	
	—	—	—	—	—	—	26
3	0	2	2	1	1		
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Picking up stones in A1

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
2	1	0	0	2	0		
8	—	—	—	—	—	—	
	—	—	—	—	—	—	26
0	1	3	3	1	1		
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Picking up stones in A4

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		2	1	0	0	2	1	
	8							
							26	
		0	1	3	0	2	2	
		A1	A2	A3	A4	A5	A6	HA

Player picks up stones in opposite space and places them in the player's mancala

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		2	1	0	0	2	1	
	10							
							26	
		0	1	3	0	2	0	
		A1	A2	A3	A4	A5	A6	HA

Human player's turn!

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		2	1	0	0	2	1	
	10							
							26	
		0	1	3	0	2	0	
		A1	A2	A3	A4	A5	A6	HA

Select your move: a2
Human player picks up stones in A2

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
10	2	1	0	0	2	1	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	26
—	0	0	4	0	2	0	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Picking up stones in A3

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
10	2	1	0	0	2	1	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	27
—	0	0	0	1	3	1	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Last stone placed in player's mancala
Human player moves again!

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
10	2	1	0	0	2	1	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	27
—	0	0	0	1	3	1	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Select your move: a6

Human player picks up stones in A6

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		2	1	0	0	2	1	
	10							
							28	
		0	0	0	1	3	0	
		A1	A2	A3	A4	A5	A6	HA

Last stone placed in player's mancala
Human player moves again!

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		2	1	0	0	2	1	
	10							
							28	
		0	0	0	1	3	0	
		A1	A2	A3	A4	A5	A6	HA

Select your move: a4

Human player picks up stones in A4

	HB	B6	B5	B4	B3	B2	B1	
	—	—	—	—	—	—	—	
		2	1	0	0	2	1	
	10							
							28	
		0	0	0	0	4	0	
		A1	A2	A3	A4	A5	A6	HA

Picking up stones in A5

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
10	2	1	0	0	3	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	29
—	0	0	0	0	0	1	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Picking up stones in B2

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
10	2	2	1	1	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	29
—	0	0	0	0	0	1	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Picking up stones in B5

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
10	3	0	1	1	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	29
—	1	0	0	0	0	1	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Player picks up stones in opposite space and places them in the player's mancala

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
10	0	0	1	1	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	32
—	1	0	0	0	0	1	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Machine player's turn!

Random player picks up stones in B3

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
10	0	0	2	0	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	32
—	1	0	0	0	0	1	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Picking up stones in B4

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
10	1	1	0	0	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	32
—	1	0	0	0	0	1	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Player picks up stones in opposite space and places them in the player's mancala

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
11	1	1	0	0	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	32
—	0	0	0	0	0	1	
—	—	—	—	—	—	—	—
	A1	A2	A3	A4	A5	A6	HA

Human player's turn!

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
11	1	1	0	0	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	32
0	0	0	0	0	0	1	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Select your move: a6

Human player picks up stones in A6

HB	B6	B5	B4	B3	B2	B1	
—	—	—	—	—	—	—	—
11	1	1	0	0	0	2	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	33
0	0	0	0	0	0	0	
—	—	—	—	—	—	—	—
A1	A2	A3	A4	A5	A6	HA	

Last stone placed in player's mancala

Final Score:

Human Player: 33

Machine Player: 15

Human Player wins!

NIL

Task 7- Move Result Prediction

Code:

```
(setf *side-B-copy* '(B6-copy B5-copy B4-copy B3-copy B2-copy
B1-copy))
(setf *side-A-copy* '(A1-copy A2-copy A3-copy A4-copy A5-copy
A6-copy))
```

```
(setf (symbol-plist 'A1-copy) '(next-for-a A2-copy next-for-b
A2-copy opposite B6-copy))
(setf (symbol-plist 'A2-copy) '(next-for-a A3-copy next-for-b
A3-copy opposite B5-copy))
(setf (symbol-plist 'A3-copy) '(next-for-a A4-copy next-for-b
A4-copy opposite B4-copy))
```

```

(setf (symbol-plist 'A4-copy) '(next-for-a A5-copy next-for-b
A5-copy opposite B3-copy))
(setf (symbol-plist 'A5-copy) '(next-for-a A6-copy next-for-b
A6-copy opposite B2-copy))
(setf (symbol-plist 'A6-copy) '(next-for-a AH-copy next-for-b
B1-copy opposite B1-copy))

(setf (symbol-plist 'AH-copy) '(next-for-a B1-copy value AH-
value))

(setf (symbol-plist 'B1-copy) '(next-for-a B2-copy next-for-b
B2-copy opposite A6-copy))
(setf (symbol-plist 'B2-copy) '(next-for-a B3-copy next-for-b
B3-copy opposite A5-copy))
(setf (symbol-plist 'B3-copy) '(next-for-a B4-copy next-for-b
B4-copy opposite A4-copy))
(setf (symbol-plist 'B4-copy) '(next-for-a B5-copy next-for-b
B5-copy opposite A3-copy))
(setf (symbol-plist 'B5-copy) '(next-for-a B6-copy next-for-b
B6-copy opposite A2-copy))
(setf (symbol-plist 'B6-copy) '(next-for-a A1-copy next-for-b
BH-copy opposite A1-copy))

(setf (symbol-plist 'BH-copy) '(next-for-b A1-copy))

(setf *copies* '((A1 . A1-copy) (A2 . A2-copy) (A3 . A3-copy) (A4 .
A4-copy)
  (A5 . A5-copy) (A6 . A6-copy) (AH . AH-copy) (B1 . B1-copy) (B2 .
B2-copy)
  (B3 . B3-copy) (B4 . B4-copy) (B5 . B5-copy) (B6 . B6-copy) (BH .
BH-copy)))

;-----Move prediction

;Predicts whether a given move will result in an extra turn
(defun predict-move-again (player space)

  (setf move (cdr (assoc space *copies*)))

  (setf (get 'a1-copy 'value) (A1))
  (setf (get 'a2-copy 'value) (A2))
  (setf (get 'a3-copy 'value) (A3))
  (setf (get 'a4-copy 'value) (A4))

```

```

(setf (get 'a5-copy 'value) (A5))
(setf (get 'a6-copy 'value) (A6))
(setf (get 'ah-copy 'value) (AH))
(setf (get 'B1-copy 'value) (B1))
(setf (get 'B2-copy 'value) (B2))
(setf (get 'B3-copy 'value) (B3))
(setf (get 'B4-copy 'value) (B4))
(setf (get 'B5-copy 'value) (B5))
(setf (get 'B6-copy 'value) (B6))
(setf (get 'BH-copy 'value) (BH))

(setf again(single-move-test player move))

again

)
;Predicts the number of stones in a player's mancala after a
given move
(defun predict-move-score (player space)

  (setf move (cdr (assoc space *copies*)))

  (setf (get 'a1-copy 'value) (A1))
  (setf (get 'a2-copy 'value) (A2))
  (setf (get 'a3-copy 'value) (A3))
  (setf (get 'a4-copy 'value) (A4))
  (setf (get 'a5-copy 'value) (A5))
  (setf (get 'a6-copy 'value) (A6))
  (setf (get 'ah-copy 'value) (AH))
  (setf (get 'B1-copy 'value) (B1))
  (setf (get 'B2-copy 'value) (B2))
  (setf (get 'B3-copy 'value) (B3))
  (setf (get 'B4-copy 'value) (B4))
  (setf (get 'B5-copy 'value) (B5))
  (setf (get 'B6-copy 'value) (B6))
  (setf (get 'BH-copy 'value) (BH))

  (single-move-test player move)

  (cond
    ((eql player 'a)
      (get 'ah-copy 'value)
    )
    (t

```

```

        (get 'bh-copy 'value)
    )
)

;Checks whether a given side is empty
(defun empty-side-test (side)
  (cond
    ((eql side 'a)
     (setf checking *side-a-copy*)
    )
    (t
     (setf checking *side-b-copy*)
    )
  )
  (recursive-empty-side checking 0)
)

;Runs a single move with the testing spaces
(defun single-move-test (player space)
  (setf start-value (get space 'value))
  (setf (get space 'value) 0)
  (cond
    ((eql player 'a)
     (setf start-space (get space 'next-for-a))
    )
    (t
     (setf start-space (get space 'next-for-b))
    )
  )
  (setf new-space (single-sequence player start-space start-
value))
  (setf new-value (get new-space 'value))
  (cond
    ((eql new-space 'ah-copy)
     (cond
       ((not (empty-side-test 'a))
        t
       )
       (t
        nil
       )
     )
    )
  )
)

```

```

)
((eq1 new-space 'bh-copy)
 (cond
  ((not (empty-side-test 'b))
   t
  )
  (t
   nil
  )
 )
)
)
(> new-value 1)
(single-move-test player new-space)
)
((and (member new-space *side-a-copy*) (eq1 player 'a))
 (setf opp (get new-space 'opposite))
 (setf (get 'AH-copy 'value) (+ (get opp 'value) (get 'AH-
copy 'value))))
 (setf (get opp 'value) 0)
 nil
)
((and (member new-space *side-b-copy*) (eq1 player 'b))
 (setf opp (get new-space 'opposite))
 (setf (get 'bh-copy 'value) (+ (get opp 'value) (get 'BH-
copy 'value))))
 (setf (get opp 'value) 0)
 nil
)
(t
 nil
)
)
)
)

```

```

;Testing prediction code
(defun predict-move-test ()
  (format t "Testing predict move code ~%" )
  (format t "Will starting move A3 result in an extra turn? ~A
~%" (predict-move-again 'a 'a3))
  (format t "Will starting move A4 result in an extra turn? ~A
~%" (predict-move-again 'a 'a4))
  (format t "What score will starting move A3 result in? ~A ~%"
(predict-move-score 'a 'a3))

```

```
(format t "What score will starting move A4 result in? ~A ~%"
(predict-move-score 'a 'a4))
)
```

Demo:

```
[1]> (load "mancala-test.l")
;; Loading file mancala-test.l ...
;; Loading file mancala.l ...
;; Loaded file mancala.l
;; Loaded file mancala-test.l
T
[2]> (predict-move-test)
Testing predict move code
Will starting move A3 result in an extra turn? T
Will starting move A4 result in an extra turn? NIL
What score will starting move A3 result in? 1
What score will starting move A4 result in? 6
NIL
```