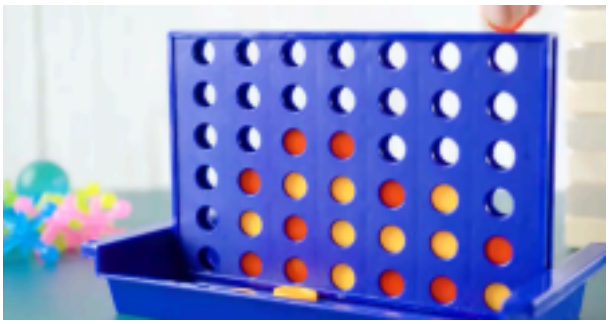
CONNECT 4 GAME

TOPIC: Connect 4 Game, With Minimax Algorithm

Introduction

Connect Four is a two-player connection board game, in which the players choose a color and then take turns dropping coloured discs into a seven-column, six-row vertically suspended grid. The pieces fall straight down, occupying the lowest available space within

the column. The objective of the game is to be the first to form a horizontal, vertical, or diagonal line of four of one's own discs. Connect Four is a solved game. The first player can always win by playing the right moves.



Mini-max Algorithm

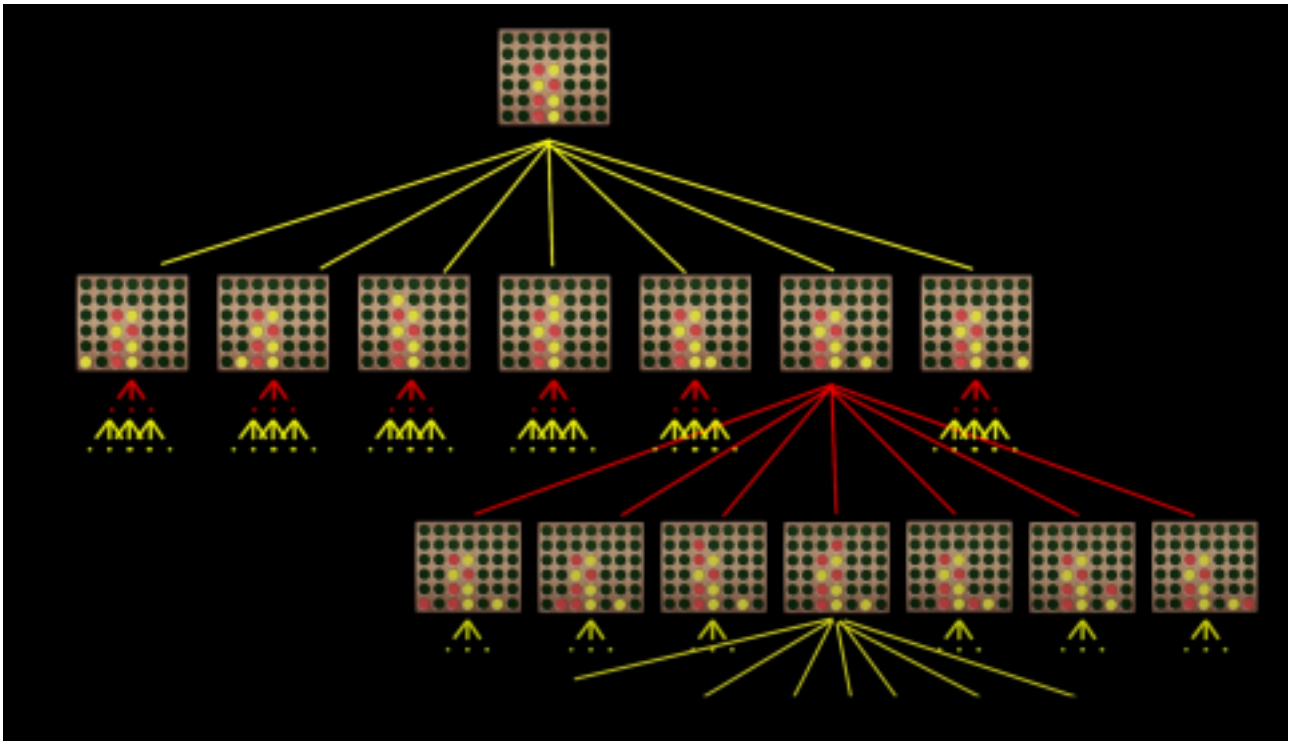
In computer science, a min-max heap is a **complete binary tree data structure** which combines the usefulness of both a min-heap and a max-heap, that is, it provides constant time retrieval and logarithmic time removal of both the minimum and maximum elements in it.

Minimax is a kind of **backtracking algorithm** that is **used in decision making and game theory to find the optimal move for a player**, assuming that your opponent also plays optimally. It is widely used in two player turn-based games such as Tic-Tac-Toe, Backgammon, Mancala, Chess, etc.

In Minimax the two players are called **maximiser** and **minimiser**. The maximiser tries to get the highest score possible while the minimiser tries to do the opposite and get the lowest score possible.

Every board state has a value associated with it. In a given state if the maximiser has upper hand then, the score of the board will tend to be some positive value. If the minimiser has the upper hand in that board state then it will

tend to be some negative value. The values of the board are calculated by some **heuristics** which are unique for every type of game.

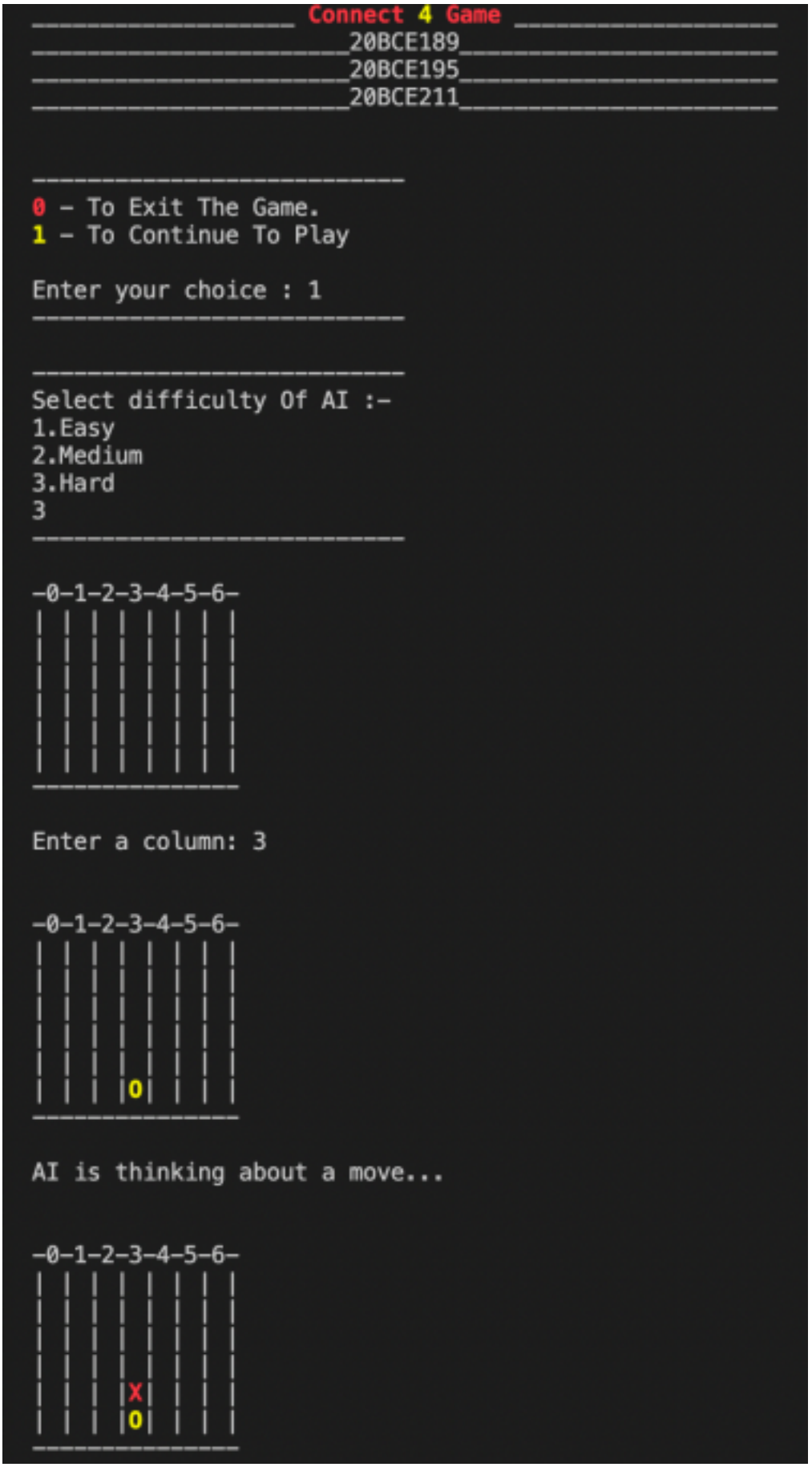


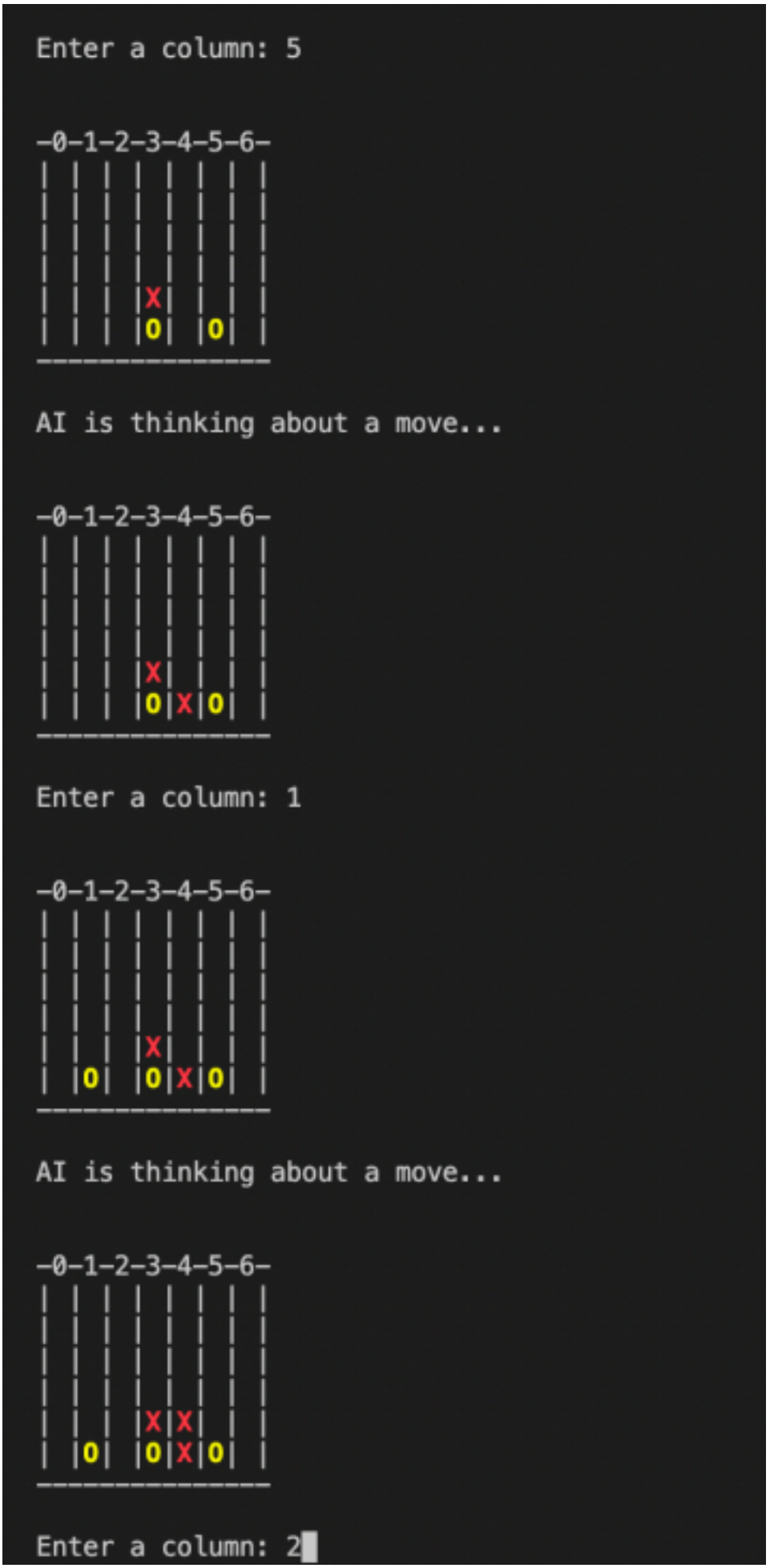
To reduce, time taken to process entire tree, **Alpha-Beta Pruning** is Used. Which Acts As Key To decide whether is there a need to traverse deeper from the node or not. Hence Cutting down, Unimportant Traversal Points.

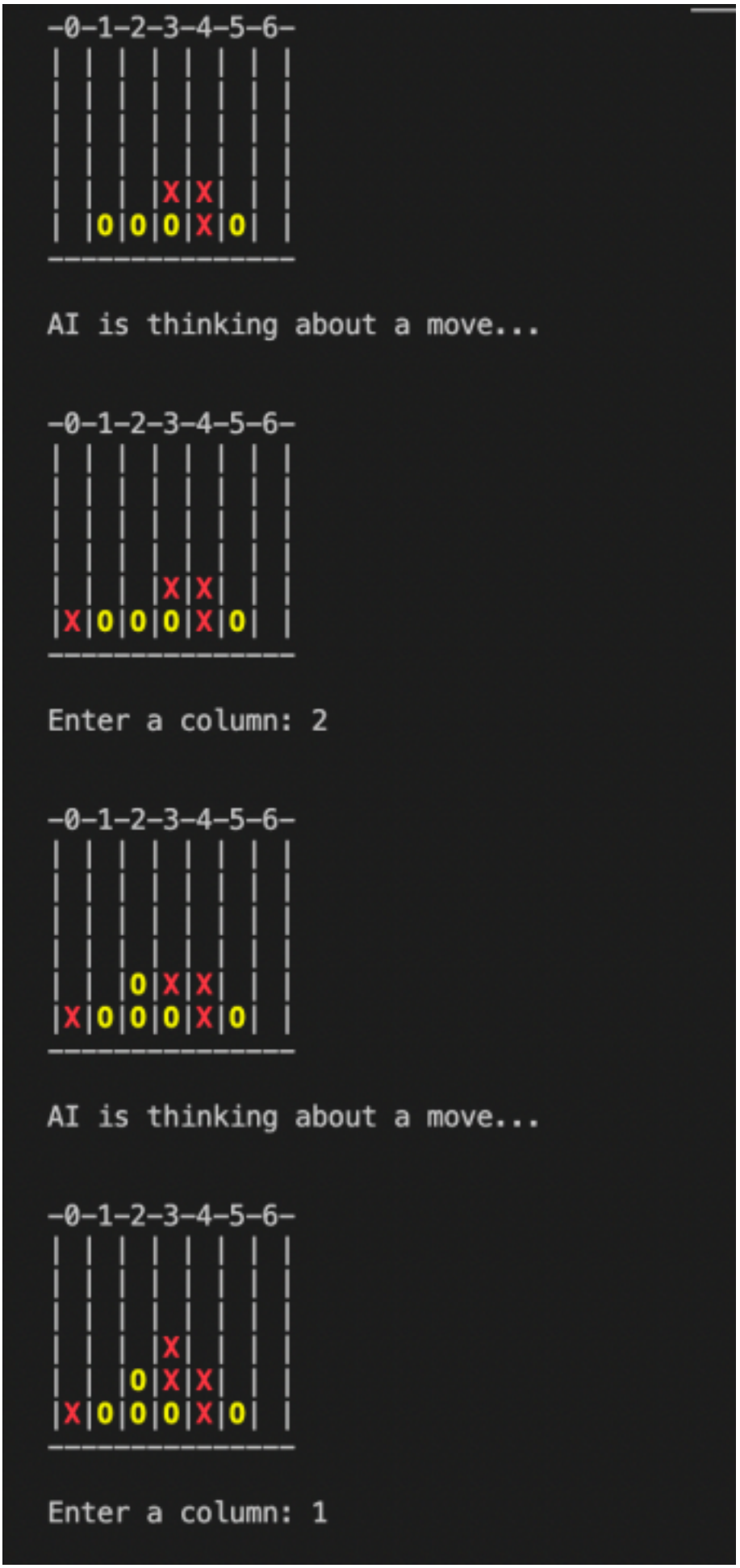
DATA STRUCTURES USED:

1. Complete Heap Tree (In min-max algorithm)
2. 2D Array (Game Board of “6 rows X 7 columns”)
3. 1D Array

OUTPUT SCREEN-SHOTS


Connect 4 Game
20BCE189
20BCE195
20BCE211
0 - To Exit The Game.
1 - To Continue To Play
Enter your choice : 1
Select difficulty Of AI :-
1.Easy
2.Medium
3.Hard
3
-0-1-2-3-4-5-6-
Enter a column: 3
-0-1-2-3-4-5-6-
AI is thinking about a move...
-0-1-2-3-4-5-6-


Enter a column: 5
-0-1-2-3-4-5-6-
AI is thinking about a move...
-0-1-2-3-4-5-6-
Enter a column: 1
-0-1-2-3-4-5-6-
AI is thinking about a move...
-0-1-2-3-4-5-6-
Enter a column: 2

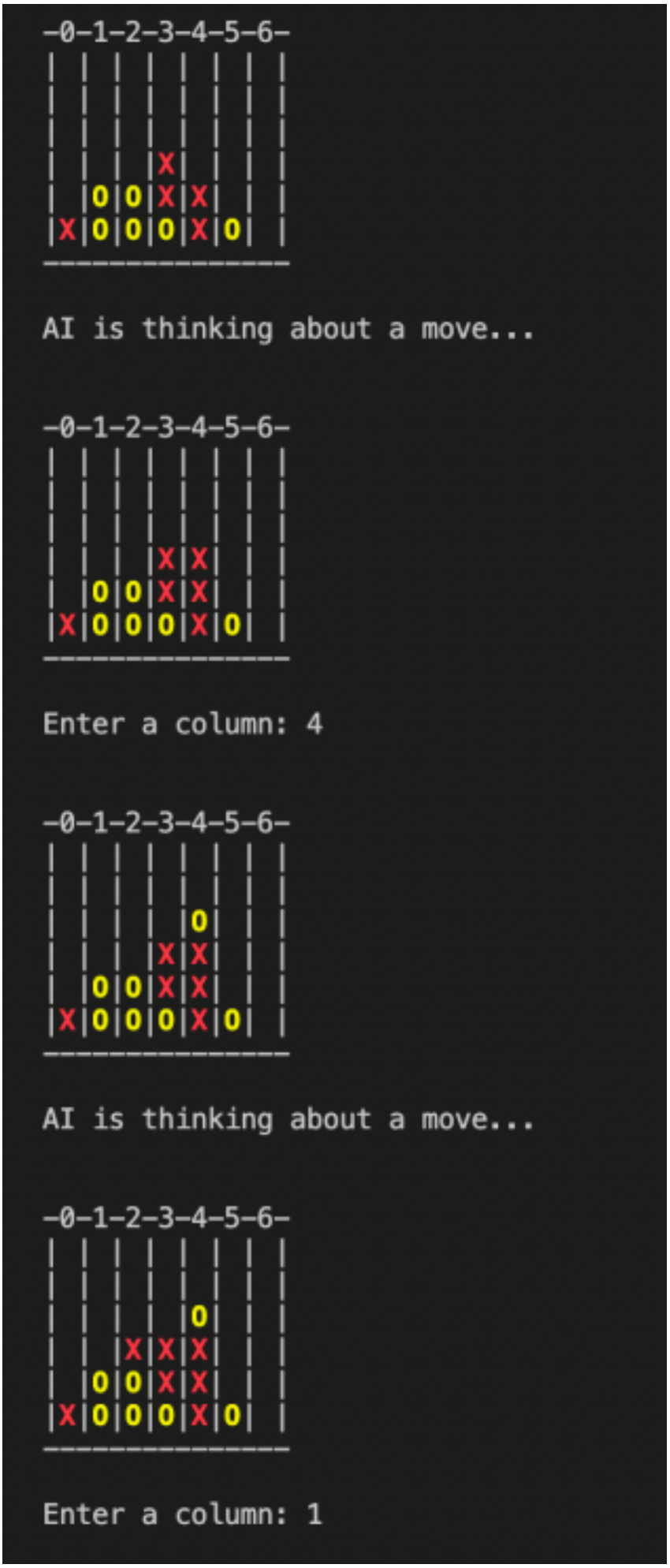

-0-1-2-3-4-5-6-
			X	X		
	0	0	0	X	0	

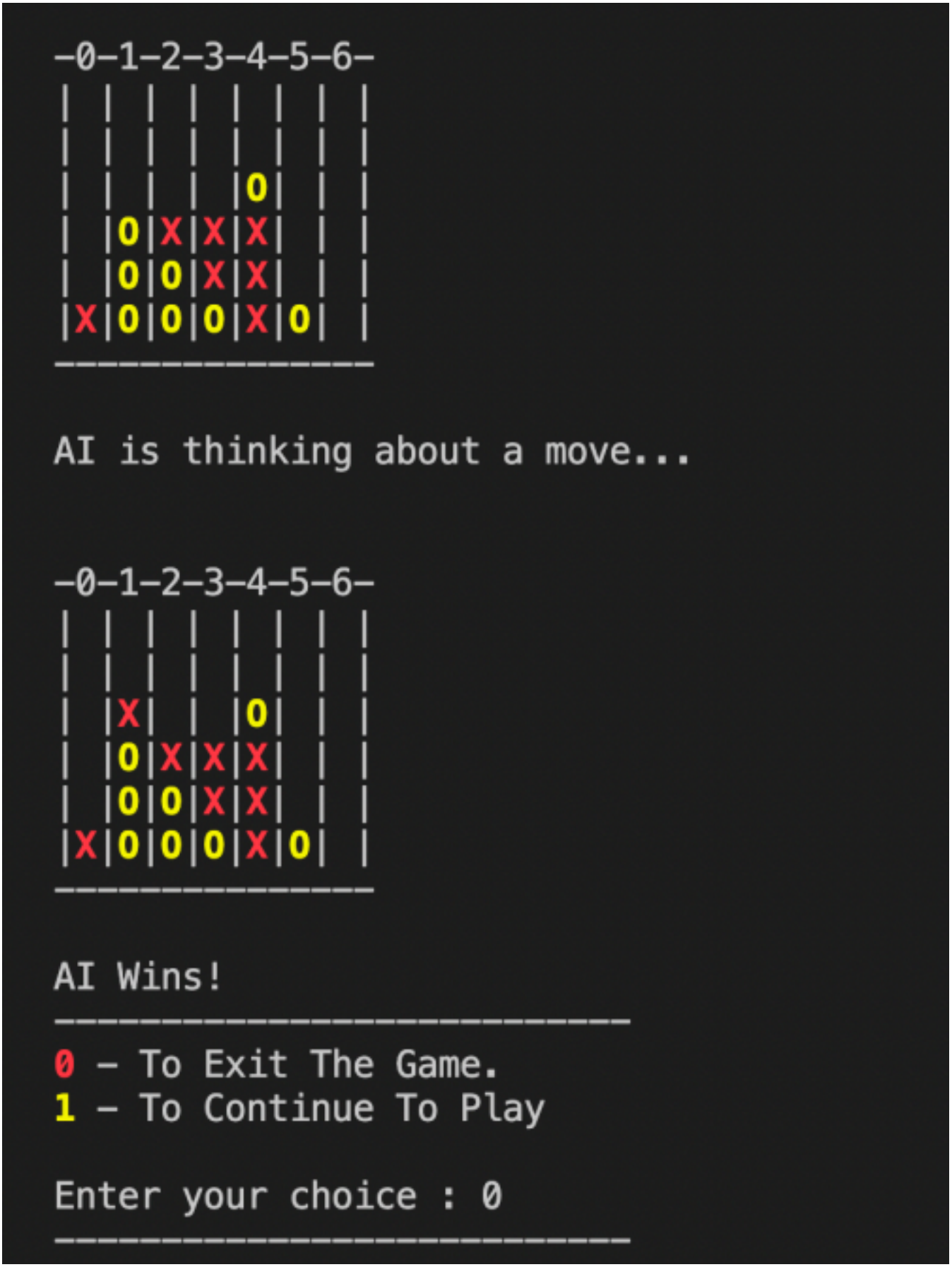
AI is thinking about a move...
-0-1-2-3-4-5-6-
			X	X		
X	0	0	0	X	0	

Enter a column: 2
-0-1-2-3-4-5-6-
		0	X	X		
X	0	0	0	X	0	

AI is thinking about a move...
-0-1-2-3-4-5-6-
			X			
		0	X	X		
X	0	0	0	X	0	

Enter a column: 1


-0-1-2-3-4-5-6-
AI is thinking about a move...
-0-1-2-3-4-5-6-
Enter a column: 4
-0-1-2-3-4-5-6-
AI is thinking about a move...
-0-1-2-3-4-5-6-
Enter a column: 1


-0-1-2-3-4-5-6-
				0		
	0	X	X	X		
	0	0	X	X		
X	0	0	0	X	0	
AI is thinking about a move...
-0-1-2-3-4-5-6-
	X			0		
	0	X	X	X		
	0	0	X	X		
X	0	0	0	X	0	
AI Wins!
0 - To Exit The Game.
1 - To Continue To Play
Enter your choice : 0