



Artificial Intelligence (106266)

Final Project Report

Rock Paper Scissor

AI based game

s.no	Name	I.D	course
1	Fasih Amjad	9465	Artificial Intelligence

Github:

<https://github.com/fasihamjad/rock-paper-scissor-project>

Introduction:

In this project we will make a simple Rock Paper Scissor game which depends on Artificial Intelligence.

If we talk about description. As we have already said that it is an AI Based game, so yeah, in this game player have to play with the computer. First the user will play its turn then the computer. it will get better after understanding the strategy of the user.

Project flow:

We will use an AI (artificial intelligence) algorithm based on Markov Models of one fixed memory length (abbreviated as “single AI”) to compete against humans. The model will predict human competition behavior by combining many Markov Models with different fixed memory lengths “multi-AI” and develop an architecture of multi-AI with changeable parameters to adapt to different competition strategies.

Expected Result:

The final application will allow the human user to play with computer rock paper scissor and the game will get more difficult as much more you will play.

Code Language:

- java
- HTML
- CSS

GUI:

Random ☒ AI

Rock

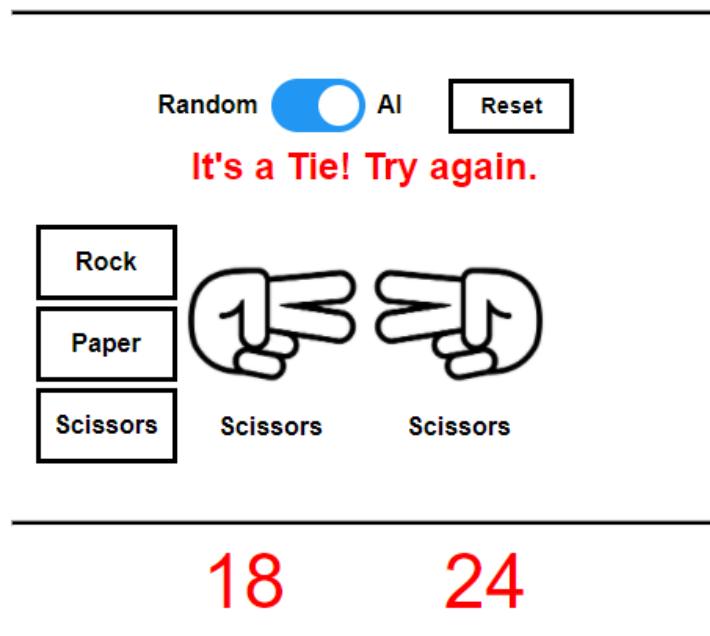
Paper

Scissors

?

?

- -



Move	Player	AI	Winner
Last Move	Scissors	Scissors	Tie
2 Moves Ago	Scissors	Rock	AI
3 Moves Ago	Rock	Rock	Tie
4 Moves Ago	Rock	Paper	AI
5 Moves Ago	Scissors	Paper	Player

Model Implimentation:

Example 1: Rock-Paper-Scissors

- Rock beats Scissors, Scissors beats Paper, Paper Beats Rock

IDEA 3: Set Rock=1, Paper=2, Scissors=3
1 beats 3, 3 beats 2, 2 Beats 1

	1	2	3
1	--	L	W
2	W	--	L
3	L	W	--

Example 1: Rock-Paper-Scissors

- Rock beats Scissors, Scissors beats Paper, Paper Beats Rock

IDEA 3: Set Rock=1, Paper=2, Scissors=3
1 beats 3, 3 beats 2, 2 Beats 1

```
if( Player1 > Player2 ) Player1 wins ??  
(else Player2 wins)
```

NO: only true in 2 out of 3 remaining cases
where $\text{Player1} > \text{Player2}$. And 2 out of 3 of
the other cases.

	1	2	3
1	--	L	W
2	W	--	L
3	L	W	--

Algorithm Development - Further Refinement

Example 1: Rock-Paper-Scissors

- Rock beats Scissors, Scissors beats Paper, Paper Beats Rock

Set Rock=1, Paper=2, Scissors=3
1 beats 3, 3 beats 2, 2 Beats 1

IDEA 3: `if(Player1 > Player2) Player1 wins ??`

NO: only true in 4 out of 6 remaining cases.

IDEA 4: `if(Player1 - Player2 == 1
OR
Player1 - Player2 == -2)
Player1 wins ??`

OK: works in all 6 remaining cases.

	1	2	3
1	--	-1	-2
2	1	--	-1
3	2	1	--

IDEA 5: Modular Arithmetic:

```
if( (Player1 - Player2) mod 3 == 1 )  
Player1 wins ??
```

$-2 \bmod 3 == 1,$
 $-1 \bmod 3 == 2,$
 $0 \bmod 3 == 0,$
 $1 \bmod 3 == 1,$
 $2 \bmod 3 == 2, \dots$

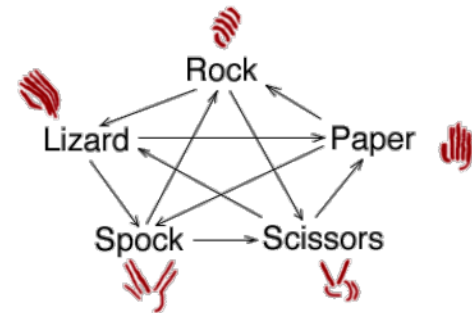
i.e., $\text{Player1} - \text{Player2} == 1$
OR
 $\text{Player1} - \text{Player2} == -2$

	1	2	3
1	--	-1	-2
2	1	--	-1
3	2	1	--

Example 2: Rock-Paper-Scissors-Spock-Lizard

- Rock = 1
- Paper = 2
- Scissors = 3
- Spock = 4
- Lizard = 5

	1	2	3	4	5
1	--	L	W	L	W
2	W	--	L	W	L
3	L	W	--	L	W
4	W	L	W	--	L
5	L	W	L	W	--



Scissors cuts Paper covers Rock crushes
Lizard poisons Spock smashes Scissors
decapitates Lizard eats Paper disproves
Spock vaporizes Rock crushes Scissors.

Example 2: Rock-Paper-Scissors-Spock-Lizard

- Rock = 1
- Paper = 2
- Scissors = 3
- Spock = 4
- Lizard = 5

(Player1 - Player2) mod 5

	1	2	3	4	5
1	0	4	3	2	1
2	1	0	4	3	2
3	2	1	0	4	3
4	3	2	1	0	4
5	4	3	2	1	0

```
if( (Player1 - Player2) mod 5 == 1
    OR
    (Player1 - Player2) mod 5 == 3 )
    Player1 wins
```

```
if( (Player1 - Player2) mod 5
    IS ODD
    )
    Player1 wins
```

```
N is ODD if N mod 2 == 1
N is EVEN if N mod 2 == 0
```

```
if( ((Player1 - Player2) mod 5) mod 2 == 1 )
    Player1 wins
```

- Sometimes, mathematical insights can be used to
 - **Develop algorithms**
(For instance, RSA Algorithm is based on the fact that for certain values of (N,e,d), $M^{ed} \bmod N = M$ for any message M)
 - **Simplify calculations**
(in this example, conditions checking 25 possible combinations of values can be boiled down to 2 conditions:


```
If (Player1 = Player 2) TIE GAME
Else if ((Player1 - Player 2) mod 5) mod 2 == 1)
    PLAYER1 WINS
Else PLAYER2 WINS
```