Artificial Intelligence

Mini Project
Tic Tac Toe Bot

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Team 13

Strategy-

- Use of a non-parametric(learning) form of assigning weights.
- Importance on winning the game rather than scoring more points in mid game.
- Adaptive way of choosing the best straight 4 blocks and capture them.

Assign score for each block by-

- Score of a straight 4 blocks is determined by multiplying ***placement factor * weight factor*** *for all such cells.*
- Placement factor of a cell is
  0 → opponent captured the cell
  1 → we captured the cell
  0.5 → vacant
- Weight factor is also described below.. Ex: consider the block status below. Score example calculated for X and O being the opponent.

X	O	.	.
X	X	.	.
.	.	.	.
.	.	.	.

Placement factor:

1	0	0.5	0.5
1	1	0.5	0.5
0.5	0.5	0.5	0.5
0.5	0.5	0.5	0.5

Weight factor(learnt feature extraction with Linear Regression on **Q**-learning with **Alpha** propagation(And hence the name **AlphaQ**) by extending the idea of Monte Carlo):

3	2	2	3
2	3	3	2
2	3	3	2
3	2	2	3

In this case, score of first row(for X) = (1*0*0.5*0.5) * (3*2*2*3) =0
score for second row = (1*1*0.5*0.5) * (2*3*3*2) = 9

Same way this score is computed for all rows+columns+diagonals and added and score of a block is computed. (for X & O separately as S(X,B) & S(O,B)).

Note*: If a block is won by X/O, all cells are changed to X/O resp.

Assigning score to the game:

- Score for us to win a straight 4 blocks – score for opponent to win the same 4 blocks is calculated. All these scores are added.
- Score for Player X to win straight 4 block is calculated as S(X,B1)*S(X,B2)*S(X,B3)*S(X,B4) where the S(X,Bi) is calculated as described for block score calculation.
- Hence final score is(if we play X) SUMMATION{S(X,B1)*S(X,B2)*S(X,B3)*S(X,B4) – S(O,B1)*S(O,B2)*S(O,B3)*S(O,B4)} for all such straight chain of B1-4.

In alpha-beta pruning we use iterative deepening(with caching) to keep a check on the time and as well as visit more depth. Caching was particularly helpful in increasing the depth during the middle game.