2000 years history moves forward

Napoleon Tic Tac Toe

History and scoring system

Two thousand years ago, the first member of a family of mind games appeared in the Roman Empire and maybe a lot earlier in Ancient Egypt. It was the tic tac toe (or noughts and crosses, or Xs and Os**)** game, the first in a very long history of billions of players and surprisingly few other members belonging to this family, so much alive today. All it needed was a flat area of sand, pebbles or a piece of wood with which the well known grid and the pawns could be shaped on the sand.

The second, much more complicated member, appeared in Japan and China around 700 AD and was called Gomoku or Pente (which means 5 pieces in a raw) and in the 19th century was brought in Great Britain. This is a very popular game (together with its variant Renju which appeared in 1899), with more than 25 world championships in the last 30 years, in Japan, China, Russia, Finland, Czech Republic, etc, with a number of national associations all over the world and with millions of players involved. All these games are based on the board of Go (9X9, 13X13 or 19X19), another highly complicated (more than chess) very old (more than 2500 years) and interesting Chinese game.

The third, complicated (equally to Gomoku, or more) member, appeared in the year 1999 in Japan and is called Connect6. The main difference from Gomoku is that 6 pieces in a raw are required for a win and that each player places 2 pawns (except from the first move). Professor I-Chen Wu of National Chiao University (NCTU) made it famous in 2005 and the first annual championship at NCTU was held in 2006.

The fourth, somehow more complicated member , appeared as a pencil and paper game in 1974 in Greece and became very desirable for a selected group of highly educated players, who have played thousands games of it . In 2012, MobileFX igaming company obtained the exclusive knowhow of this method and developed a game product for smart devices. This is Napoleon Tic Tac Toe (NT3). MobileFX igaming has the exclusive intellectual property rights of the game and the worldwide exploitation right of it.

Instead of having the rather restricted philosophy of "sudden death" of the other three members of the family (where once a line of either 3, or 5, or 6 is formed, a winner is declared and the game ends) the game method keeps a score for each player according to the number of lines and their length per player. More specifically each line of length 4 counts for 1 point, each line of length 5 counts for 3 points because of the higher difficulty in making it and for the ones of greater length, 3 points are added for each additional pawn of length. This creates a more complicated environment which allows for greater suspense, continuous action at the whole area of the board and possibilities of turnaround of the course of the game, even during the last moves, since a winner can become a loser if the score changes accordingly.

Complexity

In games, the **state space** is about all possible configurations within the game. For tic tac toe, a simple upper bound for the size of the state space is 3^9 = 19,683. (There are three states for each cell and nine cells.) This count includes many illegal positions, such as a position with five crosses and no noughts, or a position in which both players have a row of three. A more careful count, removing these illegal positions, gives 5,478. And when rotations and reflections of positions are considered identical, there are only 765 essentially different positions.

In game theory, a **game tree** is a directed graph whose nodes are positions in a game and whose edges are moves. The **complete game tree** for a game is the game tree starting at the initial position and containing all possible moves from each position. For tic tac toe, a simple upper bound for the size of the game tree is 9! = 362,880. (There are nine positions for the first move, eight for the second, and so on). This includes illegal games that continue after one side has won. A more careful count gives 255,168 possible games. When rotations and reflections of positions are considered the same, there are only 26,830 possible games and this is a good indicator of complexity.

Now, let us investigate the game tree complexity of NT3. We assume that the averaged game length for Gomoku is 30 plies (Allis 1994). From statistical experience, the game plays of NT3 in 9X9 and in 19X19, come to an end (no exploitable empty tiles exist any more, i.e. if pawns are placed at these tiles no increase of score occurs any more for any player), after roughly 85-90 % of the tiles of the board are covered. So, in the case of NT3, out of 361 tiles of the 19X19 board, the 40 are not exploitable and this gives us as a complete game tree the following :

NT3 complete game tree=(361X360X359X…X42X41)=(361)!/(40)! ~10^720

Gomoku complete game tree=(361X360X359X…X330)=(361)!/(300)! ~10^78

It is quite evident that the complexity of NT3 is far greater than the one of Gomoku, even greater than Go (Go complete game tree ~ 10^320, Allis 1994). If a more realistic calculation is followed for the complexity trees of all these games, smaller numbers occur, however this is applicable to all these games and does not change the placement of these games as far as complexity is concerned, on the contrary, the cases for Gomoku to be eliminated are more than the ones of NT3, for example lines of greater length than 5 or more than one line with length 5 are out of place for Gomoku, whereas this is acceptable in NT3.

Game characteristics

The AI algorithm has two levels (easy and hard) and in the hard mode can be very challenging, even for expert players. There are advanced features such as saving games possibility, zoom in and zoom out of the board, scroll forward and backward during the phases of each game, etc. The Napoleon T3 game product has outstanding graphics, especially considering the similar game products available today in the application stores. New and very interesting social features (for facebook, game centres, etc) are to be added in the near future to these products.

The worldwide sales potential of these products is great since there are millions of potential players educated and keen on playing such games. Napoleon T3 offers familiar environment of game, easy rules and learning process, highly sophisticated tactics and a unique balance of tradition and novelty.

Right now there is the 9X9 version and the 19X19 version available at Apple Store and Google Play. There are interesting new versions and enhancements in the pipe line for the coming future as far as this new product family is concerned.

Interesting links

1. Ph.D thesis of V. Allis (1994) "Searching for solutions in games and artificial intelligence"

https://project.dke.maastrichtuniversity.nl/games/files/phd/SearchingForSolutions.pdf

2. Wikipedia entry about Gomoku

http://en.wikipedia.org/wiki/Gomoku

3. Wikipedia entry about Renju

http://en.wikipedia.org/wiki/Renju

4. Wikipedia entry about Connect6

http://en.wikipedia.org/wiki/Connect6