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## NEW FINDINGS IN TETRIS

The divide between puzzles and games is small. An acceptable definition may be that single-agent games are puzzles. However, under this definition Tetris is a clear exception. Tetris was invented by Alexey Pajitnov in 1985. It is a competitive game in which skilful play, intuition, knowledge, and fast reaction are necessary ingredients for good performance. Next to being a game, Tetris is also a small domain of scientific research. It is a decision game with heuristics and an evaluation function. The stochastic nature of the game has triggered many researchers to investigate whether a player (or an artificial controller) is able to maximize the average number of lines. A first question is, of course: is the number finite or infinite?

In the second half of the 1980s and in the 1990s the game was quite popular and one can imagine that it was then thought that, say, 500,000 lines would be an impressive achievement. Let me be clear, for a human being that would be a world-class performance and may even be reachable. Then, a second main question is: can a computer do better?

As to the first question, in 1997 Burgiel showed that every Tetris game finishes with probability 1. Yet, the game is computationally hard to solve, since its number of distinct board configurations almost amounts to  $10^{60}$ . Therefore, finding a strategy that maximizes the average score is an NP-complete problem.

The history of Tetris is interesting, full of new ideas and complex subtleties. For instance, the introduction of an automatic controller put the level of play into another class. The (second) question thus reads: how many millions of lines can an automatic controller achieve? This was one of the questions to be addressed in the 2008 Tetris domain Reinforcement Learning Competition.

Two young French researchers, Christophe Thiery and Bruno Scherrer, from LORIA-INRIA Lorraine, won the competition with their program BCTS (Building Controllers for Tetris Systems) by achieving some 35 millions of lines

They submitted an interesting article to our Journal with appropriate background, their experiences, and their algorithmic ideas. The referees had some comments, as usual, and they raised a fundamental question: did the scientific contribution warrant publication of the submission as an (original) scientific article? This was a very difficult question. The article was well written; moreover, the article was interesting and had something to say. However, when looking at the contents in depth, the contribution by Thiery and Scherrer added only two original features to the evaluation function, viz. (1) the hole depth and (2) the number of rows with holes.

Of course, the evaluation function had to be tuned – the authors used the cross-entropy optimization of weights – and a selection of features had to be chosen, but scientifically seen, this was not fundamentally new. A discussion between the referees and the authors arose. In the end, the Editor saw his suggestion accepted to publish the interesting material in two separate contributions: an article and a note. We did earlier publish an article and a note on the same topic in one issue of the Journal, see *ICCA Journal*, Vol. 23, No. 1, regarding the game of Roshambo (Rook, Paper, Scissors).

A key element in the Editorial decision was Shay Bushinsky's remark that an evaluation function with all weights totally wrong but having all relevant features in it is by far to be preferred over an evaluation function with all weights correct but missing one essential feature. Thiery and Scherrer have convincingly proven that the hole depth and the number of rows with holes are essential features. Thank you for this contribution.

With much sadness we pay two tributes to the very valuable ICGA members: Donskoy and Van der Storm. Misha Donskoy suddenly passed away in January 2009. He was head of the KAISSA team that won the first World Computer-Chess Championship in Stockholm in 1974. Moreover, he was Guest of Honour at the 9<sup>th</sup> World Computer-Chess Championship in Paderborn in 1999. ICGA President David Levy shares his memories on Misha with us in a well-written obituary. Theo van der Storm also passed away in January 2009, albeit after a long period of illness and partial recovery. He suffered from cancer, but to the very last moment he was interested in his brainchild, the website of the CSVN (Computer Chess Association of the Netherlands) and the continuation of his computer-chess tournament collection for the ICGA. He was very pleased with Rémi Coulom continuing his initiative. The obituary by Jaap van den Herik is on behalf of the ICGA and the CSVN.

Jaap van den Herik

#### NEW SUCCESS FOR MOGO-TITAN

Amsterdam/Tainan (Taiwan), February 25, 2009 - At the Taiwan Open 2009 held in Taiwan from February 10-13, MOGO-TITAN running on the Dutch national supercomputer Huygens, which is located at SARA Computing and Networking Services in Amsterdam, defeated two human Go professionals in an official match. This is a next step by MOGO-TITAN against professional players. During the first two days of the event, the Go program MOGO-TITAN sets two new world records by winning a 19x19 competition with a 7-stones handicap against the 9P dan professional Go player Jun-Xun Zhou, and a 19x19 competition with a 6-stones handicap against the 1P dan professional Go player Li-Chen Chien.

The first victory of the Huygens supercomputer was achieved in August 2008 at the 24th Annual Congress of the Go competition, held in Portland, Oregon when the 8P dan human Go professional Kim MyungWan was defeated in an official match with a 9-stones handicap. The program MOGO-TITAN, developed by INRIA France and Maastricht University, runs on the Dutch national supercomputer Huygens, which is one of the PRACE prototypes. The French partners are Tao, INRIA, CNRS, LRI, Université Paris-Sud, Grid5000 with "top" contributors Jean-Baptiste Hoock, Arpad Rimmel, and Olivier Teytaud. Top contributor for the Maastricht University was Guillaume Chaslot. Other contributors were Christophe Fiter, Sylvain Gelly, Julien Perez, Yizao Wang. The games were organized mainly by Chang-Shing Lee and MeiHui Wang, National University of Tainan (Taiwan).

Huygens, an IBM Power 575 Hydro-Cluster system, is the Dutch national supercomputer, located at SARA Computing and Networking Services in Amsterdam. The system, which is in production since August 2008, has a peak speed of 60 trillion calculations per second (Teraflop/s), 3328 Power6 processor cores at 4.7 GHz, a total memory capacity of more than 15 TB, and almost 1,000 TB disk capacity.

The credits of the photographs in this issue are to: Andrew Donskoy and Eric van Reem.