

TCGA 2014 COMPUTER GAME TOURNAMENT

Shun-Shii Lin¹, Chih-Hung Chen¹, Shun-Chin Hsu², I-Chen Wu³, Shi-Jim Yen⁴ and Jr-Chang Chen⁵

TCGA 2014 computer game tournaments were held in National Taiwan Normal University, Taipei, Taiwan, from June 27th to June 28th, 2014, as a related event of the 2014 TCGA Computer Game Workshop (TCGA 2014). In this event, there were 11 game tournaments including Chinese Chess, Chinese Dark Chess, Connect6, Go 9×9, NoGo, KillallGo, Mahjong, Nonogram, Mini Shogi, Othello and Outer-Open Gomoku. Totally, 50 teams from Japan, France and Taiwan participated in the tournaments. The results are shown in Table 1. The game of Outer-Open Gomoku (Lin and Chen, 2012) was invented by Prof. Shun-Shii Lin in 2012 and this is the first time that Outer-Open Gomoku is played in a formal setting in a big tournament. Its playing rules are the same as the free-style Gomoku but they only restrict Black to play at the two outer rows (or columns) of the board on the first move. From the second move, there are no prohibited moves for both sides.

TCGA invited Prof. Takeshi Ito from the University of Electro-Communications, Japan, as the keynote speaker. He is currently the chairman of the Game Informatics Research Group, Information Processing Society of Japan (IPSI). The title of his talk was *Contemporary Computer Shogi, and the Future*.

From Table 1 we see that the teams from National Taiwan Normal University (NTNU), National Dong Hwa University (NDHU), National Chiao Tung University (NCTU), Chung Yuan Christian University (CYCU) and Chang Jung Christian University (CJCU) won 13 gold medals in total, viz. four, four, three, one and one gold medals, respectively. Both Othello and Outer-Open Gomoku had two champions.

According to the new rules proposed in TCGA 2012, there should be at least three participants in each computer game tournament, and if there should be three and only three, only gold and silver medals are awarded. Since the four game tournaments, for Connect6, NoGo, KillallGo, and Nonogram had three participants, only gold and silver medals are awarded according to the new rules. The Go 13×13 and Go 19×19 tournaments were not held this time since fewer than three teams had registered.

Chinese Dark Chess (Chen, Shen, and Hsu, 2010) is a popular game played by many Taiwanese and Chinese. The Chinese Dark Chess tournament in which 10 teams participated was the most popular tournament in TCGA 2014. This tournament used the competition platform developed by a team from Chung Yuan Christian University (CYCU), Taiwan. The platform could save a large amount of operation times and also prevent the participants from making operation errors. In this tournament, YAHARI, DARKKNIGHT and OBSERVER won the gold, silver and bronze medal, respectively. The champion YAHARI relies mainly on alpha-beta search (Chen, Lin, and Hsu, 2014). It also has implemented a transposition table and uses a bitboard structure. The evaluation function is based on the capturing ability of all pieces dynamically. The authors focussed on a new design of the endgame procedure. For instance, YAHARI has a 6-man endgame database as well as a table of the equivalence classes among all material combinations. YAHARI run with one core of Intel(R) Core™ i7-4930K 3.40GHz. The search depth reaches 15 plies on average. The second place was for DARKKNIGHT that uses Monte Carlo Tree Search (MCTS) as main algorithm. For flipping moves, it incorporated the chance node concept presented by Yen *et al.* (Yen, Chou, Chen, Wu, and Kao, 2015). To improve search performance, the bitboard structure is also used. Moreover, parallelization of MCTS helped to increase the number of simulations. As a result, on a 12 cores Intel i7 CPU machine, the program can reach about 540,000 simulations per second on average.

Chinese chess, similar to chess, is a popular game in China and Taiwan. In the Chinese chess tournament, four teams participated. SHIGA, SHARK and CHIMO obtained the gold, silver and bronze, respectively. The champion is the same as that in TCGA 2011, 2012 and 2013 tournaments.

¹ Dept. of Computer Science and Information Engineering, National Taiwan Normal University, Taipei, Taiwan. Email: linss@csie.ntnu.edu.tw, honhonzone@gmail.com.

² Dept. of Information Management, Chang Jung University, Tainan, Taiwan. Email: schsu@mail.cjcu.edu.tw.

³ Dept. of Computer Science, National Chiao Tung University, Hsinchu, Taiwan. Email: icwu@csie.nctu.edu.tw.

⁴ Dept. of Computer Science and Information Engineering, National Dong Hwa University, Hualien, Taiwan. Email: sjyen@mail.ndhu.edu.tw.

⁵ Dept. of Applied Mathematics, Chung Yuan Christian University, Taoyuan, Taiwan. Email: jecchen@cycu.edu.tw.

Game	# of teams	Rank	Program Name	Author(s)	Affiliation(s)
Chinese Chess	4	1	SHIGA	Ming-Cheng Cheng, Shi-Jim Yen	National Dong Hwa University (NDHU), Taiwan
		2	SHARK	Meng-Chien Liu	National Taiwan Normal University (NTNU), Taiwan
		3	CHIMO	Wen-Jie Tseng, Po-Han Lin, Ching-Hua Kuo, Chien-Yu Chen, I-Chen Wu, Jr-Chang Chen, Shun-Chin Hsu	National Chiao Tung Univerty (NCTU), Taiwan
Chinese Dark Chess	10	1	YAHARI	Jr-Chang Chen, You-Cheng Syu, Gang-Yu Fan, Ting-Yu Lin, Tsan-sheng Hsu	Chung Yuan Christian University (CYCU), Academia Sinica, Taiwan
		2	DARKKNIGHT	Wen-Jie Tseng, I-Chen Wu	NCTU, Taiwan
		3	OBSERVER	Ta-Kai Hsu	NTNU, Taiwan
Connect6	3	1	NCTU6	Ping-Hung Lin, Hsin-Ti Tsai, Hao-Hua Kang, Chieh-Min Chang, Yi-Shan Lin, I-Chen Wu, Ting-Han Wei	NCTU, Taiwan
		2	MOBILE6	Ji-Hong Zheng, Chia-Yun Hu, I-Chen Wu, Wen-Jie Tseng, Ching-Hsuan Wei, Hung-Hsuan Lin, Chieh-Min Chang, Hao-Hua Kang, Hsiu-Chuan Lin	NCTU, Taiwan
		3	KAVALAN	Jung-Kuei Yang and Shi-Jim Yen	NDHU, Taiwan
Go 9×9	5	1	COLDMILK	Cheng-Wei Chou, Shi-Jim Yen	NDHU, Taiwan
		2	CGI	Ting-Fu Liao, Ting-Chu Ho, Guan-Wen Chen	NCTU, Taiwan
		3	WINGO	Hsin-Hung Chou & Wen-Chen Chen	Chang Jung University (CJU), Taiwan
NoGo	3	1	HAPPYNOGO	Po-Hsuan She, Yi-Chang Shan, Ting-Fu Liao, I-Chen Wu	NCTU, Taiwan
		2	COLDMILK	Cheng-Wei Chou, Shi-Jim Yen	NDHU, Taiwan
		2	HAHA	Li-Cheng Lan	NCTU, Taiwan
KillallGo	3	1	COLDMILK	Cheng-Wei Chou, Shi-Jim Yen	NDHU, Taiwan
		2	CGI13KILLALL	Ting-Fu Liao, Ting-Chu Ho, Guan-Wen Chen, Chung-Chin Shih	NCTU, Taiwan
		3	JACK_GO	Shun-Chieh Chan	National Taiwan University (NTU), Taiwan
Mahjong	4	1	THOUSANDWIND	Shin-Yang Chen	NTNU, Taiwan
		2	LONGCAT	Cheng-Hong Lin, Ching-Hsuan Wei, Li-Kai Chuang, I-Chen Wu	NCTU, Taiwan
		3	AFKMJ	Hai-Yang Tzeng	NDHU, Taiwan
Nonogram	3	1	LALAFROGKK	Kan-Yueh Chen, Ching-Hua Kuo, Hao-Hua Kang, Der-Johng Sun, I-Chen Wu	NCTU, Taiwan
		2	SCREAM	Jia-Jun Ye	National Taichung University of Education (NTCU), Taiwan
		3	THUNONO	Lung-Pin Chen	Tunghai university (THU), Taiwan
Mini Shogi	5	1	WONDERS	Huai-Wen Chang	NTNU, Taiwan
		2	EVG 1.4	Shun-Chin Hsu	CJCU, Taiwan.
		3	MOSHO	Takeshi Ito and Shintaro Sato	University of Electro-Communications, Japan
Othello	5	1	NEKO	Chun-Chieh Chen	CJCU, Taiwan
		1	TOWER OF OHELLO	Shi-Jim Yen, Tsan-Cheng Su	NDHU, Taiwan
		3	OBELONGKUN	Cheng-Wei Chou, Shi-Jim Yen	NDHU, Taiwan
Outer-Open Gomoku	5	1	OOGIVEME FIVE	Chih-Hung Chen	NTNU, Taiwan
		1	SHARK	Meng-Chien Liu	NTNU, Taiwan
		3	THATCH	Yu-Hsing Chen	NTNU, Taiwan

Table 1: The final standings of all game tournaments.

Connect6 is a kind of six-in-a-row game that was introduced by Wu *et al.* (Wu, Huang, and Chang, 2005), and has become one of the games on Computer Olympiad since 2005. In the Connect6 tournament, three teams participated and NCTU6 won the gold while MOBILE6 won the silver. NCTU6 won all the six games against MOBILE6 and KAVALAN in this tournament. NCTU6 used the technique dovetailing (see Hoki, Kaneko, Kishimoto, and Ito, 2013), a kind of simultaneously searching with multiple settings.

The Go tournaments included Go 9×9, Killall Go, and NoGo. The platform for all Go competitions was KGS. In the Go 9×9 tournament, there were five participants. COLDMILK won the championship. CGI and WINGO achieved the silver and bronze medal respectively. Besides the tournament, another competition between COLDMILK and professional Go human player was held. In total there were seven games, COLDMILK won four, draw one and lost one against a professional 2 dan player, named Ai-Lin Hsiao.

NoGo is another variant of Go of which the rules are the same as for Go except for the following. The first player who either suicides or kills a group loses the game. The board size was 9×9 and the thinking time was 20 minutes. Only three participants joined the NoGo tournament. HAPPYNOGO won the gold medal and COLDMILK and HAHA won the silver. HAPPYNOGO was developed on a framework developed at NCTU. The framework was developed to facilitate the development of MCTS algorithms.

Killall Go is a variant of Go. In Killall Go, the goal of Black is to *kill all* white stones, while the goal of White is to live with at least one group. More specifically, in Killall Go, the handicap is 2 and the komi is 48.5 in 7×7 Go. In the Killall Go tournament, only three teams participated and the thinking time was 10 minutes. COLDMILK won the gold medal and CGI13KILLALL won the silver.

Mahjong is a game that originated in China, commonly played by four players. It is an imperfect information game, and each player cannot read other players' tiles. Similar to Chinese Dark Chess, Mahjong is a game of skill, strategy and calculation that is involved in a certain degree of chance. In the Mahjong tournament, four teams participated and THOUSANDWIND got 50000 scores in the 192 games and won the gold. LONGCAT and AFKMJ got 37000 and -27500 scores and won the silver and bronze, respectively. The competitions were held based on a framework (Wu, Lin, Shan, 2011). This tournament used the competition platform developed by (Wu, Lin, Shan, 2011), which could save a lot of operation times and support up to 192 games in the competition. Besides the tournament, another competition among THOUSANDWIND, LONGCAT and two professional Mahjong human players, named Yeah-Ping Li and Xiao-Ping Yu, was held. This is also the first time to hold such kind of event. In the total 40 games (due to the time limit), LONGCAT got 30500 scores and won the gold. Yeah-Ping Li, THOUSANDWIND, and Xiao-Ping Yu got -4500, -12000 and -14000 scores, respectively.



Go 9×9 Man-Machine Tournament



Mahjong Man-Machine Tournament

Nonogram, a puzzle game, is an NP-complete problem (Kendall, Parkes, and Spoerer, 2008). The tournament was originally proposed by Shi-Jim Yen in the 15th Computer Olympiad in Kanazawa, Japan (Yen *et al.*, 2011). The tournament rule used an open random generator to generate 1,000 25×25 puzzles with a random seed determined by all the participants. The puzzles must be solved in the generated order which is difficulty-increasing and unskippable within 70 minutes. Only one solution needs to be generated for every puzzle. The ranking is mainly determined by the number of solved puzzles. However, solving time determined the ranking whenever more than two teams solved the same number of puzzles. In the

Nonogram tournament, there were three participants from NCTU, NTCU, and THU. LALAFROGKK, and SCREAM won the gold and silver, respectively.

Mini Shogi is a mini-version of Shogi. The board size is 5×5 , and the rules are similar to Shogi. In the Mini Shogi tournament, five teams participated. WONDERS won the gold while EVG 1.4 and MOSHO won the silver and bronze, respectively. In the tournament last year, Both EVG 1.4 and KANI won the gold.

In the Othello tournament, three teams participated, and both NECO and TOWER OF OTHELLO obtained the gold. This is the first time that TCGA held the game.

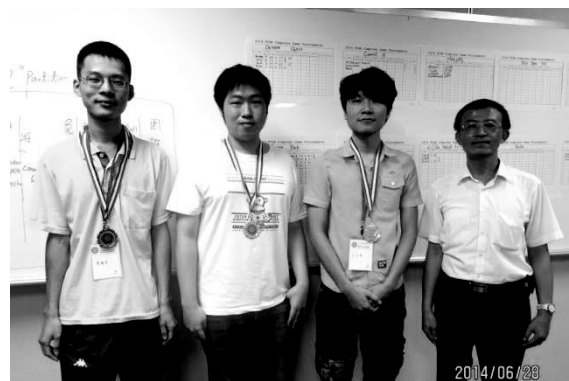
The game of Outer-Open Gomoku was invented by Prof. Shun-Shii Lin in 2012 and this is the first time that Outer-Open Gomoku is played in a formal setting in a big tournament. Its playing rules are the same as the free-style Gomoku but it only restricts Black to play at the two outer rows (or columns) of the board for the first move. From the second move, there are no prohibited moves for both sides. Five teams participated. Both OOGIVEMEFIVE and SHARK won the gold while THACH won the bronze. From the game records, both sides have about the same chance to win and hopefully this will be a good new game rule for Gomoku in the future.

References

- Chen, B.-N., Shen, B.-J., and Hsu, T.-S. (2010). Chinese Dark Chess. *ICGA Journal*, Vol. 33, No. 2, pp. 93-106.
- Chen, J.-C., Lin, T.-Y., Hsu, T.-S. (2014). Equivalence Classes in Dark Chess Endgames. *IEEE Transactions on Computational Intelligence and AI in Games*. (DOI: 10.1109/TCIAIG.2014.2317832)
- Hoki, K., Kaneko, T., Kishimoto, A., and Ito, T. (2013). Parallel Dovetailing and its Application to Depth-First Proof-Number Search. *ICGA Journal*, Vol. 36, No. 1, pp. 22-36.
- Kendall, G., Parkes, A., and Spoerer, K. (2008). A survey of NP-complete puzzles. *ICGA Journal*, Vol. 31, No. 1, pp. 13-34.
- Lin, S.-S., Chen, C.-Y. (2012). How to rescue Gomoku? The introduction of Lin's new rule.(in Chinese) *The 2012 Conference on Technologies and Applications of Artificial Intelligence (TAAI 2012)*, Tainan, Taiwan, November 2011.
- Wu, I.-C., Huang, D.-Y., and Chang, H.-C. (2005). Connect6. *ICGA Journal*, Vol. 28, No. 4, pp. 234-242.
- Wu, I.-C., Lin, C.-H., and Shan, Y.-C. (2011). Tournament Framework for Computer Mahjong Competitions. *The International Workshop on Computer Games (IWCg 2011)*, Chunli, Taiwan, November 2011.
- Yen, S.-J., Chiu, S.-Y., Chou, C.-W., and Chen, J.-C. (2011). CPUZLER Wins Nonogram Tournament. *ICGA Journal*, Vol. 34, No. 1, pp. 34-35.
- Yen, S.-J., Chou, C.-W., Chen, J.-C., Wu I.-C., and Kao, K.-Y. (2015). Design and Implementation of Chinese Dark Chess Programs. *IEEE Transactions on Computational Intelligence and AI in Games (IEEE TCIAIG)*, Vol. 7, No. 1, March 2015.



Computer Game Tournament



Hai-Yang Tzeng (AFKMJ), Shin-Yang Chen (THOUSANDWIND), Li-Kai Chuang (LONGCAT), Shun-Shii Lin