# Computational Intelligence Meets the Game of Go @ IEEE WCCI 2012

Chang-Shing Lee, Olivier Teytaud, Mei-Hui Wang, Shi-Jim Yen

## HAL Id: hal-00744982
## https://hal.inria.fr/hal-00744982

Submitted on 24 Oct 2012

results of these games. The computer was *MoGoTW* and *MoGoTW* was able to play with various handicaps. The level assessment was performed for several players, and *MoGoTW* was programmed so that its level could be modified in real time. We got the following results:

- For Chun-Hsun Chou (9P), the estimated level was 2 stones stronger than *MoGoTW* playing with its strongest setting.
- For Shi-Jim Yen (6D), the level was consistent with the strength of the program.

Physiological measurements are briefly discussed below.

- **Results for physiological measurements:** The physiological measurements were based on the analysis of various signals, including electroencephalography (EEG), electrocardiography (ECG), and others. The goal was to check whether the physiological signals are impacted by various conditions, such as the board size, the strength of the opponent, and the difficulty of the game. The results show that physiological signals are indeed impacted by these conditions, but the analysis is still ongoing and more detailed results will be published in the future.

We now provide more details on the participants and the organization of the event.

The organizers would like to thank the sponsors of the event, including the IEEE Computational Intelligence Society, the National University of Tainan, and other academic and industrial partners. The organizers would also like to thank all the participants, both human players and computer Go program developers, for their contributions to the success of the event.

The remainder of this paper provides more details on the games and the results, and discusses the implications for the future of computer Go and computational intelligence.

ELO model [7]. We performed such tests on players from kyu level to 6D, using *MoGoTW* playing on many computers in Taiwan in May 2012. We have then seen that in 5 games, we can estimate the strength of players somehow efficiently. This has direct applications for eLearning because evaluating Go players (by playing games) is similar to evaluating students (by proposing exercises). This time, in June 2012, each player also played only 5 games and we tried to compare three 6D players, a difficult task because they have a very similar strength. The games' results show that *MoGoTW* could nonetheless find out that Shang-Rong Tsai (6D) is a particularly strong 6D player. This shows that our artificial player is also able to analyze the strength of strong players. Importantly, along with this ability to evaluate the strength of humans, the computer can adaptively adjust its strength to the opponent, in order to increase entertainment, which is helpful for motivating children to learn.

- **Measurement in physiological signals**

Signal measurement is a good way to understand more about the difference in physiological signals between (1) normal people and Go players, (2) playing under hard and easy situation, (3) playing on small-size and big-size boards, and (4) playing usual Go and unnatural Go (kill-all Go) or blindfolded Go. In the competition, the measured physiological signals contained brain wave (electroencephalogram, EEG), skin temperature, skin conductance, heart rate, blood volume pulse, and respiratory wave during playing the game. With the collected physiological signals, it will be feasible to analyze game-level statistics to understand the variance of strategies employed by the human and computer in each game.

Participatnts attending the opening ceremony, including Gary Fogel, Hisao Ishibuchi, Hussein Abbass, and Marios Polycarpou (foreground, left 1, left 5, left 7, and right 5, respectively).



Hussein Abbass (background, right 2) and Chang-Shing Lee (background, left 2) with Shi-Jim Yen (foreground, left 1) measuring the physiological signals.

## References

[1] C. S. Lee, M. H. Wang, C Chaslot, J. B. Hoock, A. Rimmel, O. Teytaud, S. R. Tsai, S. C. Hsu, and T. P. Hong, "The computational intelligence of MoGo revealed in Taiwan's computer Go tournaments," *IEEE Transactions on Computational Intelligence and AI in Games*, vol. 1, no. 1, pp. 73-89, Mar. 2009.

[2] A. Rimmel, O. Teytaud, C. S. Lee, S. J. Yen, M. H. Wang, and S. R. Tsai, "Current frontiers in computer Go," *IEEE Transactions on Computational Intelligence and AI in Games*, vol. 2, no. 4, pp. 229-238. Dec. 2010.

[3] C. S. Lee, M. H. Wang, O. Teytaud, and Y. L. Wang, "The game of Go @ IEEE WCCI 2010," *IEEE Computational Intelligence Magazine*, vol. 5, no. 4, pp. 6-7, Nov. 2010.

[4] S. J. Yen, C. W. Chou, C. S. Lee, H. Doghmen, and O. Teytaud, "The IEEE SSCI 2011 Human vs. Computer Go Competition," *ICGA Journal*, vol. 34, no. 2, pp. 106-107, Jun. 2011.

[5] S. J. Yen, S. Y. Chiu, C. W. Chou, C. S. Lee, H. Doghmen, F. Teytaud, and O. Teytaud, "Human vs. Computer Go Competition in FUZZ-IEEE 2011," *ICGA Journal*, vol. 34, no. 4, pp. 243-247, Dec. 2011.

[6] C. W. Chou, P. C. Chou, H. Doghmen, C. S. Lee, T. C. Su, F. Teytaud, O. Teytaud, H. M. Wang, M. H. Wang, L. W. Wui, and S. J. Yen, "Towards a solution of 7×7 go with meta-MCTS," *Advances in Computer Games 13 Conference* (ACG13), Tilburg, The Netherlands, Nov. 20-22, 2011.

[7] A. Elo, The Rating of Chess Players, Past and Present, Arco. ISBN 0-668-04721-6, 1978.