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Chang-Shing Lee, Mei-Hui Wang, Olivier Teytaud, Yuan-Liang Wang

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Chang-Shing Lee, Mei-Hui Wang,  
and Yuan-Liang Wang  
National University of Tainan, TAIWAN  
Olivier Teytaud  
Universite Paris-Sud, FRANCE

### The Game of Go @ IEEE WCCI 2010

The game of Go originated from China. Around the 7th century, the game was imported to Japan. In the late 16th century, the first Westerner came into contact with Go. There are millions of people that regularly play Go in many countries around the world. Played by two players, Black and White, the stones of their color are placed consecutively on an empty intersection of a square grid. Normally, the weaker player plays Black and starts the game. In the end, the player who controls the most intersections of the board wins the game [1]. Go is a board game that is much more complex than chess. Indeed, the number of possible moves in the game of Go is more important and the size of the tree of possibilities is greater than the number of atoms in the universe [2]. However, despite several decades of artificial intelligence or computational intelligence, there are still no computer Go programs that can challenge a strong professional player in 19x19 games without handicap. This is because Go is a problem with high uncertainty, especially for big board games, like the 19x19 board. Each Go player has his own way of thinking to play with his opponent, and each top professional Go player will take different strategies even though they face the same situation. Thus, in 1997, the IBM's Deep Blue Supercomputer beat the World Chess Champion, Garry Kasparov, while the game of Go is still one of the last board games where the strongest humans are still able to easily win against computers in big board games [3, 4, 5]. Since 2008, National University of Tainan (NUTN) in Taiwan and other academic organizations have hosted or organized several human vs. computer Go-related events, including the 2008 Computational Intelligence Forum & World 9x9 Computer Go Championship (<http://go.nutn.edu.tw/>) [3], and 2009

Invited Games for MoGo vs. Taiwan Professional Go Players (Taiwan Open 2009, <http://go.nutn.edu.tw/2009/>) [4].

Besides, the FUZZ-IEEE 2009: Panel, Invited Sessions, and Human vs. Computer Go Competition ([http://oase.nutn.edu.tw/FUZZ\\_IEEE\\_2009/](http://oase.nutn.edu.tw/FUZZ_IEEE_2009/)) [5] was held at the 2009 International Conference on Fuzzy Systems (FUZZ-IEEE 2009) in Aug. 2009. This event was the first human vs. computer Go competition hosted by the IEEE Computational Intelligence Society (CIS) at the IEEE CIS flag conference, and Dr. David Fogel (2008–2009 IEEE CIS President) also presented a certificate to the invited Go players to recognize their continued commitment and service to the research and development for computer Go at the banquet. MoGoTW was developed based on MoGo 4.86 Sessions and the Taiwan (TW) modifications. This was developed jointly with the Taiwanese colleagues for a National Science Council (NSC)-National Research Agency (ANR) research project between Taiwan and France. The 2010 Invited Game for MoGoTW vs. Human Go Player (<http://go.nutn.edu.tw/2010/>) was held at the NUTN, Taiwan, on Mar. 21, 2010 and MoGoTW was qualified to award three certificates with 1st Dan (1D), 2D, and 3D level on Apr. 2, 2010.

This human vs. computer Go competition (<http://wcci2010.nutn.edu.tw/>), organized by the IEEE CIS, 2010 CIS Emergent Technologies Technical Committee (ETTC), and NUTN, was held in Barcelona, Spain on July 20, 2010. Several Taiwanese Go players, including Chun-Hsun Chou (9th Dan Pro, 9P), Ping-Chiang Chou (4P), Shang-Rong Tsai (6th Dan Amateur, 6D), and Shi-Jim Yen (6D), were invited by NUTN to play against the top four computer Go programs at the human vs. computer Go competition, on July 20, 2010. This included MoGo (France), Fuego (Canada), Zen (Japan), and Many Faces of Go (USA). A main novelty is the initial stage of 13x13 games. There are not so many games against strong humans and computers in 13x13, and the computer Go programs even won against human (6D) in 13x13 Go with handicap two (H2) [6]. Additionally, the computer Go program, MoGoTW, also joined its international competition for the first time. Several important guests

including Prof. Gary Yen (IEEE CIS President), Dr. Piero Bonissone (IEEE CIS Vice-President for Finances), Dr. Gary Fogel (IEEE CIS Vice-President for Conferences), Prof. Hisao Ishibuchi (IEEE CIS Vice-President for Technical Activities), and Prof. Simon Lucas (IEEE TCIAIG EIC) were invited to give a short talk at the opening ceremony. From the games results at the competition, we know that the computer Go programs won 9 out of the total 22 games. The average performance of the computer Go programs is fast approaching to the professional level.

The Games' Results Are Briefly Listed as Follows [6]:

- \* MoGoTW won a 9x9 game against 9P Go player (Chun-Hsun Chou) as White. This makes MoGoTW the first ever bot which won against top professional Go player (9P) both as Black and as White.

- \* MoGo won two 13x13 games against Shang-Rong Tsai (6D) and Shi-Jim Yen (6D) respectively, as Black.

- \* Many Faces of Go also won a game against Shi-Jim Yen (6D) with H2, but lost against Shang-Rong Tsai (6D) in the same configuration (13x13, H2).

- \* Fuego won one of two games against a 4P Go player (Ping-Chiang Chou) in 9x9 game.

- \* Fuego lost twice with H2 against a 6D, showing that it's not so easy to win against strong humans with H2 in 13x13 games.

Zen won three games out of four in 9x9 game against a 6D, confirming that computers are now at a professional level in 9x9 game.

Zen won a 19x19 game with H6 by time against a professional Go player (4P), which means that the computer Go programs have been developed with big strength to compete with humans for the past years.

In future, the FUZZ-IEEE 2011 will continue to hold the human vs. computer Go competition in June 2011.

Additionally, Dr. Gary Fogel and Prof.

Hussein A. Abbass (General Chair of the

WCCI 2012) also expressed their interest to continue having this kind of competition at the WCCI 2012. The

developers of computer Go programs

(Dr. Olivier Teytaud, Prof. Martin Müller, and David Fotland) all expect that the computer Go could have the opportunity to beat the professional Go players by winning four out of seven 9x9 games in 2011 or 2012, and they all consider developing the 13x13 game of Go as one of the future goals to make efforts. Overall, the event at WCCI 2010 was a great success and we would like to express our heartfelt thanks to everyone who joined and watched the games.

Additionally, we would also like to sincerely thank the IEEE CIS and the organizing committee of the WCCI 2010 who rendered kind support and great help. The authors would like to thank the National Science Council of Taiwan for financially supporting this international cooperation research project under the grant NSC 99-2923-E024-003-MY3. Additionally, this work was supported by the French National Research Agency through COSINUS program (project EXPLO-RA ANR08-COSI-004). We are all enthusiastically looking forward to FUZZ-IEEE 2011 (Taipei, Taiwan, June 27-30, 2011) and WCCI 2012 (Brisbane, Australia, June 10-15, 2012).

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FIGURES:

[Removed photography]

Opening ceremony with Prof. Gary Yen (sixth from the left), Dr. Piero Bonissone (sixth from the right), Dr. Gary Fogel (fourth from the left), Prof. Hisao Ishibuchi (third from the left), Prof. Simon Lucas (second from the left), Prof. Shun-Chin Hsu (fifth from the right, chief referee of the competition).

[Removed photography]

Competition venue, where Chun-Hsun Chou (9P) is second from left, and Ping-Chiang Chou (4P) is right of 9P.