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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 19×19 games without handicap. This is because Go is a problem with high uncertainty, especially for big board games, like the 19×19 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
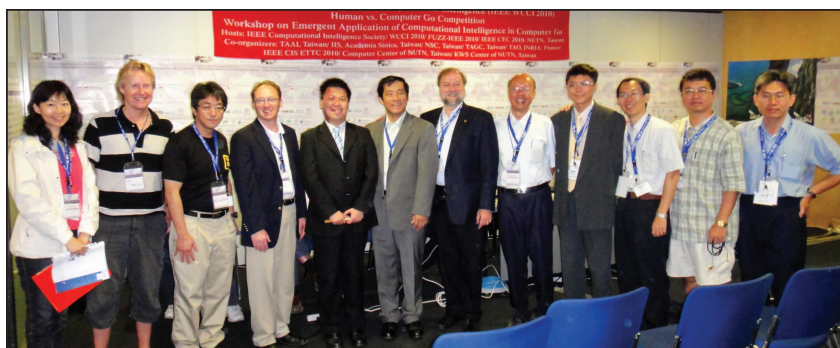
Opening ceremony with Prof. Gary Yen (sixth from the left), Dr. Piero Bonissone (sixth from the right), Dr. Gary Fogel (fourth from the left), Prof. Hisao Ishibuchi (third from the left), Prof. Simon Lucas (second from the left), Prof. Shun-Chin Hsu (fifth from the right, chief referee of the competition).

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 9 × 9 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/) [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 IEEE World Congress on Computational Intelligence (WCCI 2010), IEEE 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 13 × 13 games. There are not so many games against strong humans and computers in 13 × 13, and the computer Go programs even won against human (6D) in 13 × 13 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 9 × 9 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 13 × 13 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 (13 × 13, H2).

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

❏ *Fuego* won one of two games against a 4P Go player (Ping-Chiang Chou) in 9 × 9 game.
❏ *Fuego* lost twice with H2 against a 6D, showing that it's not so easy to win against strong humans with H2 in 13 × 13 games.
❏ *Zen* won three games out of four in 9 × 9 game against a 6D, confirming that computers are now at a professional level in 9 × 9 game.
❏ *Zen* won a 19 × 19 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 9 × 9 games in 2011 or 2012, and they all consider developing the 13 × 13 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.

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