# LONGCAT WINS MAHJONG TOURNAMENT IN ICGA 2013

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The computer Mahjong tournament was held as part of the 17th Computer Olympiad, which took place in Yokohama, Japan, form August 12th to 18th, 2013. Four teams participated in the Mahjong tournament. Table 1 lists the participants and the final standings. The four teams were LONGCAT, THOUSANDWIND, MAJO, and GRANDSLAM. They obtained scores of 44,500, 43,000, -21,500 and -66,000, respectively.

| Ranking | Program | Author(s) | Scores |
|---|---|---|---|
| 1 | LONGCAT | Cheng-Hung Lin, Ching-Hsuan Wei, and I-Chen Wu | 44,500 |
| 2 | THOUSANDWIND | Shin-Yang Chen and Shun-Shii Lin | 43,000 |
| 3 | MAJO | Kai-Min Chuang, Yueh-Ju Chen, and Shun-Shii Lin | -21,500 |
| 4 | GRANDSLAM | Cheng-Wei Chou and Shi-Jim Yen | -66,000 |

**Table 1:** The participants and final standings.

In general, the rules for Mahjong are quite complex. Besides, many different variations of Mahjong are using different rules in the world. This tournament used the version commonly played in Taiwan, which are described by Lin, Shan, and Wu (2011) in greater detail. The total tiles of Mahjong are 144 pieces, classified into six kinds of suits, which include *Wan* (ten thousand, or 萬 in Chinese), *Tiao* (rope, 條 or 索), *Tong* (dot, or 筒), *Wind* (風), *Dragon* (箭), and *Flower* (花). Wan includes 1-Wan to 9-Wan; and Tiao and Tong are similar. Wind includes East, West, South, and North Winds; and Dragon has Red, Green, and White Dragons. Each of them has four tiles. Flowers are related to extra bonus or chances and have nothing to do with win-loss. Players initially obtain 16 tiles from a pool, and then take turns to bid a new tile (the 17th) and discard a tile to exchange tiles after bidding a tile.

In Mahjong, players win the game by making a *winning pattern*, including five *sets* of tiles and a *pair* of tiles (17 tiles in total). A set of tiles is either three identical tiles, say three 2-Wans, or three consecutive tiles, say 2-Wan, 3-Wan, and 4-Wan. If a player A wins (or makes a winning pattern) by bidding a card discarded by another player B, it is said that A wins by *Hu* (胡) in Chinese. The player B is called *Chucker*. Only B loses points $S_A$ (or scores) to A, where $S_A = V_{Base} + N_T * V_{Tai}$, where $V_{Base}$ and $V_{Tai}$ are constants designated before games, and $N_T$ is the number of Tais, calculated based on Mahjong rules (see Lin, Shan, and Wu, 2011). If the player A wins by bidding one card from the pool, it is said that A wins by *Self-Mo* (自摸) in Chinese. All the other three players lose $S_A$ points to A. In Mahjong, the final winner is the one who obtains the highest number of points (or scores). More rules and terminologies can be found in Lin, Shan, and Wu (2011).

Since the game is quite complex, this tournament leveraged the Mahjong network game system of a web game server, currently supported by ThinkNewIdea Ltd. The architecture of the tournament system is described in more detail in Lin, Shan, and Wu (2011). The following tournament rules are used (also for fairness without concerning uncertainty to a large extent).

1. The time limitation for each move of players is three seconds.
2. The values $V_{Base}$ and $V_{Tai}$ are 1000 and 500, respectively.
3. 12 *Jongs* (將) are played. A Jong consists of four rounds. Each round has four games, in which each player serves as the dealer (or banker) once. Thus, a total of 192 games were played in the tournament.
4. For each of the four games in a round, the system uses the same random seed.

The above rule 4 is important. So, each player will serve as a dealer once and obtain the same initial cards. Thus, using the same random seed would make the situation fairer.

According to the rules of Mahjong, the winner is the one who obtains the highest scores, instead of the one who obtains the highest number of winning games. From Table 2 (below), we observe that LONGCAT won the gold medal of the 17th Computer Olympiad by a small margin. The next three teams THOUSANDWIND, GRANDSLAM, and MAJO, received the silver, bronze, and 4th place.

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| Program | Scores | Numbers of winning games | Number of Self-Mos | Number of Chuckers |
|---|---|---|---|---|
| LONGCAT | 44500 | 51 | 15 | 35 |
| THOUSANDWIND | 43000 | 50 | 13 | 39 |
| MAJO | -21500 | 48 | 5 | 30 |
| GRANDSLAM | -66000 | 37 | 5 | 44 |

**Table 2:** The statistics of Hus, Self-Mos, and Chuckers in tournament.

This report comments two important games in this tournament. Before the 190th game, LONGCAT had been leading. But, THOUSANDWIND won 12,500 points by Self-Mo in the game, becoming leading. In this game, THOUSANDWIND started with very good initial cards. THOUSANDWIND became ready to win when 36 tiles remained to draw, and successfully got a self-Mo when 32 tiles remained as shown in Figure 1. In Mahjong rules, the player winning with Self-Mo wins points from all the other three, so the player can win a large number of scores by Self-Mo. Interestingly, in the last game (the 192th game), LONGCAT won 5,000 points by Self-Mo when 26 tiles remained as shown in Figure 2. This win made LONGCAT obtain the final win.

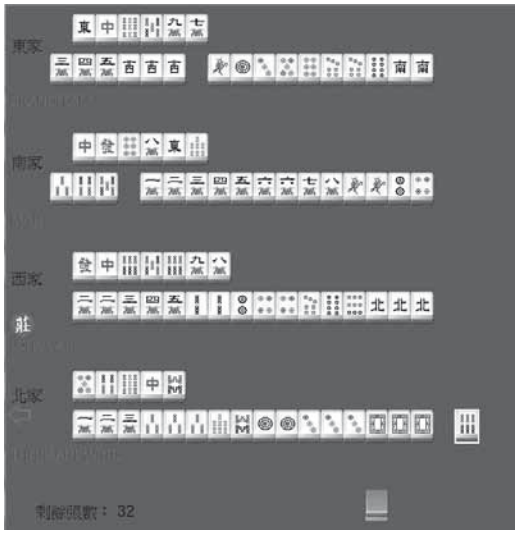

**Figure 1:**
32 tiles remaining to draw in the 190th game.

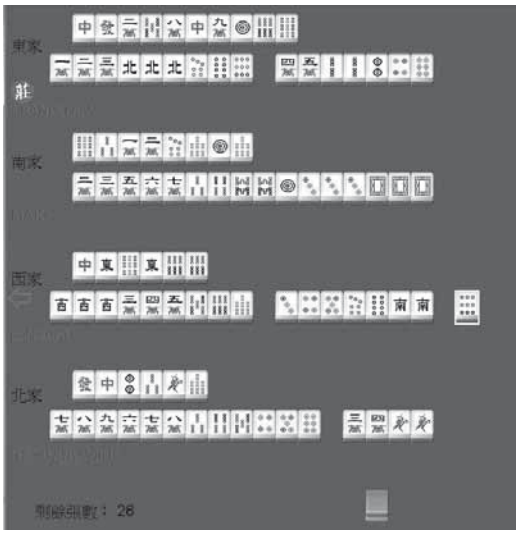

**Figure 2:**
26 tiles remaining to draw in the 192th game.

**F.l.t.r.** THOUSANDWIND (Silver), LONGCAT (Gold), GRANDSLAM (Bronze), and Professor J. van den Herik.

## References

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