

## JadeHare wins Honeymoon Bridge tournament in ICGA 2022

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The Honeymoon Bridge tournament was part of the 25<sup>th</sup> Computer Olympiad which was held online as an event of ICGA 2022. This competition started on July 23<sup>rd</sup> (Saturday) and finished on July 29<sup>th</sup> (Monday), 2022. There are three participants this year. The participants are listed in Table 1.

Table 1  
The participants of Honeymoon Bridge tournament (ICGA 2022)

Program Name	Author(s)	Operator	Country
JadeHare	Chieh-Yu Chen Shun-Shii Lin	Chieh-Yu Chen	Taiwan
GodJimmy	Chen-En Yang Yen-Chi Chen Shun-Shii Lin	Chieh-Yu Chen	Taiwan
aiia_bridge	Jun-Bao Lin Jun-Yen Lin Jen-Bun Yeh Hsin-Hung Chou	Jun-Yen Lin	Taiwan

The game of Honeymoon Bridge is a variation of Contract Bridge for two players. There are several versions in Honeymoon Bridge. The rules of Honeymoon Bridge in this tournament are described in detail as follows.

In this tournament, we use a 52-card pack, with suits and cards in each suit ranking as in Bridge. At the start of the game, each player gets 13 cards. The remaining 26 cards are placed face down to form a pile called stock. Then enters the first stage: bidding. The bidding stage is just like Contract Bridge. The players bid for the trump suit as well as the number of tricks they will make in this stage. No-trump contract is not allowed in this tournament.

The bid will reflect the number of tricks the bidder plans on taking in excess of 6. This would mean a bid of 1 would actually be a bid of taking at least 7 tricks to win the game. The dealer bids first. Each player in turn must either bid higher than the previous bid or pass. The auction continues for as many rounds as necessary, until a bid is passed by a player.

The second stage is the exchanging stage. There are 13 cards(tricks) for each player to be exchanged in this stage. At first, the top card of the stock will be turned face up. The highest bidder then makes the opening lead, and may lead any card. The other player must follow suit if possible. If a player cannot follow suit, they may play any card. The winner in this trick will get the face-up card and the

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other will get one face-down card in the stock. In the exchanging stage, every trick does not count towards the score and the winner will lead the next trick. The above actions will be repeated 13 times.

After 13 cards are exchanged for each player, it is the playing stage. Its rules are just like Contract Bridge's playing stage. The player who wins the latest trick in the exchanging stage will lead the first trick in this stage. The other player must follow suit when possible. If he is unable to do so, he may either play trump or throw off (play any unwanted card from his hand). Highest suited card will win the trick. If a trump has been played, the highest trump card will take the trick. Winner of the trick will lead the next card. At the end of the game, the highest bidder wins if he can take at least (6 + the bidding number) tricks.

The participants of this competition and their techniques are described as follows. *aiaa\_bridge* uses tree search and rule-based methods. *GodJimmy* (Yang (2020)) uses the endgame database (Yang et al. (2020)) in the playing stage, uses the card score table in the exchanging stage, and uses the state simulation in the bidding stage. *JadeHare* (Chen (2022)) uses the endgame database in the playing stage, uses the card score table and the state simulation method (Chen et al. (2022)) in the exchanging stage, and uses the card score table in the bidding stage. Moreover, it combines the technology of bitboard for implementation to improve the performance.

In the honeymoon bridge, each stage is very important. If the player records the operations of both players in the exchanging stage, both players should actually know all the opponent's hands at the beginning of the playing stage. In the tournament, both *JadeHare* and *GodJimmy* use the endgame database (Chen et al. (2019)) that covers all possible cases in the playing stage. This means there will have no mistakes during the playing stage. However, in the exchanging stage, the strategy mode of the card score table used by *GodJimmy* could not cover all possible situations, so it was at a disadvantage in the competition with *JadeHare*. In the course of the competition, there was a game that *JadeHare* made a two club contract and then won all 13 tricks. The starting hands of both sides are shown in Fig. 1(a). After the exchanging stage, the hands of both sides become Fig. 1(b). It can be seen that *JadeHare* not only holds the advantage of the original hand but has further widened the gap between the two sides, which also shows that the card exchanging stage has a great consequence on the outcome of the game.

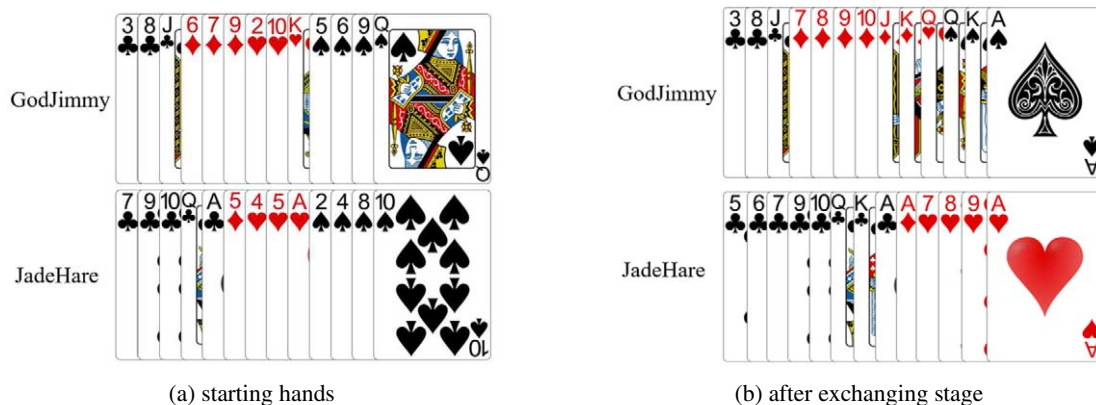


Fig. 1. An exchanging stage example.

In this tournament, each player played against the others. During the battle, the two sides took turns to be the dealer. There are 100 games in total, and the player with the most wins in these 100 games will get 1 point. The results of the Honeymoon Bridge tournament are shown in Table 2. Finally, *JadeHare*

won the gold medal by winning all games with 2 points. GodJimmy earned the silver medal with 1 point.

Table 2  
The cross table of the Honeymoon Bridge tournament in ICGA 2022

Program	JadeHare	GodJimmy	aiia_bridge	Score	Rank
JadeHare	-	1	1	2	1
GodJimmy	0	-	1	1	2
aiia_bridge	0	0	-	0	3

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