# Robots in Theory and Practice

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At the 2014 Robot Championship (held in parallel with, and using some of the same deals as, the 2014 World Bridge Series), the participants demonstrated their bridge strengths and weaknesses. A human expert, upon first seeing the dummy, usually forms a plan or a series of plans. Generally, declarer has an easier time doing this than a defender. Currently, robots mostly do not plan but play each card based on a simulation using the then-available information. Because there are time constraints, the more tricks remaining, the less accurate the choices on average. As in real-life, defense is usually more difficult than declarer play. Therefore, robots do best, often are as effective as human experts, as declarer in end-game positions and worst in the early stages of defense. Here are two examples from the championship that demonstrate these points. The first deal was contested in a round-robin session among robots and in the Mixed Teams semifinals among humans. The critical move is an early defensive duck, a very difficult achievement for a double-dummy-analysis attuned robot defender, which is not oriented toward providing declarer with a false image or a losing option nor toward disrupting transportation between the open and closed hands.

North dealer
East-West vulnerable

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                North
                ♠ A Q 9 7
                ♥ Q 9 2
                ♦ 7
                ♣ Q J 8 6 2
West                          East
♠ K 10 4 3 2                  ♠ 8 6 5
♥ 8 7                         ♥ 10 5 4
♦ K Q J                       ♦ 10 8 6 5 3
♣ K 10 7                      ♣ 5 4
                South
                ♠ J
                ♥ A K J 6 3
                ♦ A 9 4 2
                ♣ A 9 3
```

Among both humans and robots, six hearts was reached at three of the four tables. Regulations constrain robot bidding systems to be much less artificial than those used by humans. In this typical robot auction, North's double showed three hearts and South asked for aces:

| South | West | North | East |
| --- | --- | --- | --- |
| —– | —– | 1 ♣ | Pass |
| 1 ♥ | 1 ♠ | Double | Pass |
| 4 NT | Pass | 5 ♦ | Pass |
| 6 ♥ | (All Pass) | | |

At the three robot slam tables, West led the king of diamonds. Declarer won, ruffed a diamond, then either led the club queen (twice) or played spade ace, spade ruff, diamond ruff, club queen. Each West grabbed the king of clubs, returned a trump or a diamond, and watched declarer easily take 12 tricks.

Artificial human bidding made North declarer twice. At all three of those slam tables, West ducked the queen of clubs. One North declarer took the heart opening lead with the queen, won

the queen of clubs, and followed with the ace and another club. East-West had stayed out of the auction, but, on the spade return, declarer was forced to finesse; she followed with diamond ace, diamond ruff, spade ace to pitch a diamond, spade ruff, diamond ruff: making six. At another table, the North declarer took the heart queen and club queen, then passed the club jack, losing a club and a club ruff. When South was declarer, the play went diamond king to the ace and a club to the queen, then a club to the ace (a spade to the jack might have been a better idea), the spade jack led and passed, and a diamond ruff; a trump promotion in the ending held declarer to 12 tricks. In contrast, consider the end-position reached on this layout in a round-robin session of the robot championship:

and the club ace on the bidding, ruffed two hearts in dummy and ran trumps, coming down to ace-queen of diamonds and the club king in dummy. Robots aren't up to concealing a holding from an opponent. By the time the three-card ending had been reached, both Wests had discarded two diamonds, and the Easts, neither thinking ahead nor intentionally playing deceptively, discarded the jack of diamonds from two-two in the minors. The complete records of all the deals in the 2014 World Computer-Bridge Championship, along with its 18-year history, will be found at: www.allevybridge.com/allevy/computerbridge/ or www.computerbridge.com.

West dealer
North-South vulnerable

```
                        North
                        ♠ K Q 8 5
                        ♥ 8 5
                        ♦ A Q 4 3
                        ♣ K 9 8
West                              East
♠ 6 4                             ♠ 2
♥ A K J 4 3 2                     ♥ 7
♦ 8 7                             ♦ K J 10 6 5 2
♣ J 7 4                           ♣ A Q 10 5 2
                        South
                        ♠ A J 10 9 7 3
                        ♥ Q 10 9 6
                        ♦ 9 6
                        ♣ 3
```

All four dealers preempted in hearts; one was passed out in three hearts; at the other three tables, North-South reached four spades. One robot West cashed two top hearts and switched to a diamond, defeating the contract one trick. The other two Wests tried a third heart, and both declarers, placing East with the diamond king