3 Card Pickup

Goals:

* Make a better 5-card Poker hand than your opponent.
* Design a winning strategy that is robust to change and uncertainty.
* Consistently win round-robin tournaments against all other agents.

Rules:

* Each player is dealt 2 private cards from a standard 52-card deck.
* Players will then take turns traversing a connected graph containing cards.
* Graphs will be generated randomly based on a set of parameters.
* The graph has a max of 48 nodes (4 cards have already been dealt) but expect the graphs to be much smaller.
* Players will start at separate random nodes and can see the entire graph.
* Players can only move along one edge each turn.
* At each node a player can decide to pick up the node’s card which is put in their hand.
* Each node contains a set of possible cards only one of which is the actual card.
* The size of the possible card set is parameterized.
* Picking up the card removes it from the graph and is shown to all players.
* A player must pick up 3 cards by the end of the game or automatically lose.
* Players will not be allowed to pick up more than 3 cards.
* The number of turns in the game is also parameterized.
* Parameters can only change between tournaments not during a match.

For fairness each game will be played twice where agents swap starting positions and starting hands. They will not be allowed a history of the previous match.

Standard Poker Rankings

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Hand** | **Frequency** | **Probability** | **Cumulative** | **Odds** |
| Royal flush | 4,324 | 0.0032% | 0.0032% | 30,939 : 1 |
| Straight flush (excl. royal flush) | 37,260 | 0.0279% | 0.0311% | 3,589.6 : 1 |
| Four of a kind | 224,848 | 0.168% | 0.199% | 594 : 1 |
| Full house | 3,473,184 | 2.60% | 2.80% | 37.5 : 1 |
| Flush | 4,047,644 | 3.03% | 5.82% | 32.1 : 1 |
| Straight | 6,180,020 | 4.62% | 10.4% | 20.6 : 1 |
| Three of a kind | 6,461,620 | 4.83% | 15.3% | 19.7 : 1 |
| Two pair | 31,433,400 | 23.5% | 38.8% | 3.26 : 1 |
| One pair | 58,627,800 | 43.8% | 82.6% | 1.28 : 1 |
| No pair | 23,294,460 | 17.4% | 100% | 4.74 : 1 |
| **Total** | 133,784,560 | 100% | 100% | 0 : 1 |

Source: <http://en.wikipedia.org/wiki/Poker_probability>

Example Graph:

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{K♠, 9♥, 3♦, 9♣}

{8♥, 7♥, 4♦, J♣}

{K♠, 2♠, 4♠, 3♣}

{3♦, A♦, 6♦, 3♣}

{J♣, 6♣, 4♣, K♣}

{7♥, 8♥, 4♥, 5♥}

{Q♠, 8♥, 7♦, 2♣}

4♠ 6♠

9♠ 9♣