

Intelligent Poker Player

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Abstract:

We made a client/server poker game which can play with real or automated players. We created several intelligent players and evaluated them based on their heads up (one on one) performance against each other.

Motivation:

In the past few years, Texas Hold'em has been popularized through its now numerous television programs and gambling sites on the Internet. Texas Hold'em is of interest because it is a game of imperfect information where playing your opponent is just as important as playing your cards. Although we did not expect to create the perfect AI player, we wanted to learn what strategies make a winning player (such as Greg Raymer below) successful.



Greg Raymer (left), winner of 2004 World Series of Poker

Project Description:

We created a client-server no-limit Texas Hold'em poker game where human and automated players can play against each other. We created several players that use various strategies. We evaluated our different players based on their success playing heads up against other automated players with various styles of play. Our results show that certain strategies are more successful than others in heads up play. Even though our players show signs of success, no strategy is infallible so we do not expect them to consistently beat every opponent they face.



Phil Hellmuth (left) and David Sklansky: Professional Poker Players and Authors.



Different Styles of Play:

There are many different styles that a player can have in poker. Although coding these various styles into our automated players was challenging, there are definite characteristics that each style possesses. Hellmuth and Sklansky describe these strategies in detail: **Tight:** This type of player plays a limited number of hands. These hands tend to be the best starting hands possible.

Loose: This type of player tends to play a vast amount of hands. A loose player will tend to play good, mediocre, or even poor hands.



Dan Harrington (left), a tight player, and Daniel Negreanu, a loose player



Passive: This type of player tends to play his hand cautiously. They check and call bets more often than raising or reraising.

Aggressive: This type of player bets frequently and bets larger amounts. This style of play is risky but may also be advantageous.

Loose/Aggressive: This type of player plays many hands and plays them very aggressively. This style is a very difficult one to play against because it is hard to decide whether or not he is bluffing.

Tight/Aggressive: This type of player plays fewer hands but when he does have a good hand, he plays it very aggressively. Many people argue that this style is the most solid one overall.



Sam Farha (left), an aggressive player. Gus Hansen (center), a loose/aggressive player.

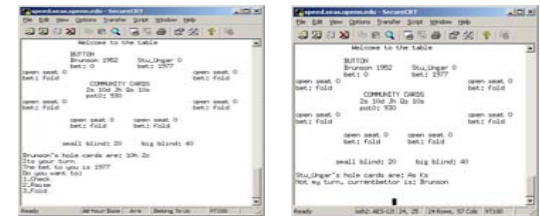


Phil Ivey (right), a tight/aggressive player.



Results:

To evaluate the performances of all of our automated players, we ran simulations for all possible head-to-head combinations. Each simulation involved 2 of our 6 players and ran for 10 rounds each. First, we ran simulations between the 4 basic strategies. Of these, the aggressive and loose players performed equally well. They both won the majority of their hands and rounds against the tight and passive players. Each won 8 out of 10 rounds in their simulations against the passive player. The aggressive player won 53.45% of the hands in this match-up and the loose player won 57.89% of the hands. Each player also won 6 out of 10 rounds against the tight player, with the aggressive player winning 55.52% of the hands in his match-up and the loose player winning 56.22%. The match-up between the aggressive and loose players themselves ended in a 5-5 tie, with both players winning about half of the hands. We then tested the loose/aggressive and tight/aggressive players. The loose/aggressive player did not do as well as we expected, although it did win many more hands than all of its opponents as would be expected. The only match-up in which the loose/aggressive player showed a substantially better performance was against the tight/aggressive player, where it won 7 out of 10 rounds and 59.21% of the hands. The tight/aggressive player seemed to be better overall against all other opponents.



Sample screenshots of how our program looks and works

Conclusion:

We would be lying if we said that we found the perfect strategy but from this substantial amount of data that we collected, we can say that certain strategies are more successful than others. These include the aggressive and the loose strategies. However, just because these strategies played well against other automated players, doesn't mean that they would be successful against human players. We based our strategies on known criteria found in books on poker, but there may exist other criteria that are not yet known about or studied thoroughly. This could potentially lead to superior strategies that have not been discovered during this project.

