Motivation

- Poker is a stochastic, imperfect information game
  - Elements of chance, hidden cards, bluffing
  - Decisions with uncertain information and deception
  - Therefore results may be applicable to real world problems (e.g., negotiation, tendering)
Motivation

- Several competitive poker bots in existence
- University of Alberta
  - http://poker.cs.ualberta.ca/
- Machine vs. Man Poker competition
- AAAI/IJCAI Poker competition
  - www.cs.ualberta.ca/~pokert/

Poker bots use:
- Rule-based systems
- Simulation-based approaches
- Game theoretic optimal solutions
- .......

Could we build a competitive poker bot
- Just using a memory of poker games
- Using simple vanilla case-based reasoning

Texas Hold’em Poker

- Currently the most popular & most strategically complex variation of poker
- Offers the best skill-to-luck ratio
- The best hand usually holds up
- But experts do better than novices
The rules of Texas Hold’em
- **Preflop**

- Each player dealt two cards, face down
- Hole cards
- Round of betting occurs

- **Flop**

- Three community cards dealt
- Players make their best 5 card hand
- Another round of betting

- **Turn**

- Another community card dealt
- Players make their best 5 card hand
- Another round of betting occurs
The rules of Texas Hold’em - The River

- Last community card dealt
- Players make their best 5 card hand
- Last round of betting occurs

The rules of Texas Hold’em - Showdown

- If there are at least two people still left in the hand all players reveal their hidden cards
- Highest ranking hand wins the pot
- Split pot if hands are equal

The rules of Texas Hold’em - Betting

- Limited betting e.g. $10/$20
- First two rounds (preflop and flop) betting in increments of small bet
- Last two rounds (turn and river) betting in increments of big bet
The rules of Texas Hold’em
- Betting

- Fold
  - Exit the hand
- Check/Call
  - Invest the min to stay in hand
- Bet/Raise
  - Increase the sum needed to stay in the hand

Case-base Construction

- ~20,000 hands from University of Alberta poker-bots
- Bots were result of intensive KE process
- Profitable against human competition
- Casper reuses recorded instances
- Therefore, bypasses intensive KE effort
- Retrieval uses a simple k-NN algorithm
- Case reuse is by proportional representation

Results

- Random vs. Casper
  - Makes random decisions
  - Baseline comparison
- Casper01 vs. Alberta Bots
  - ~7000 poker hands
- Casper02 vs. Alberta Bots
  - ~20,000 poker hands
Online Real Opponents – Real Money

![Graph showing profit and loss over time](image)

Discussion

- Proven CBR works – CASPER is competitive against the Alberta bots
- CASPER is competitive against people for play money (but they play badly)
- CASPER loses real money
  - It’s case-base isn’t representative
  - Av. similarity < 60%

Future work

- Ongoing PhD project
- Will improve the bidding system
- Will develop an opponent modelling system
- Plan to compete in the 2010 AAAI poker competition