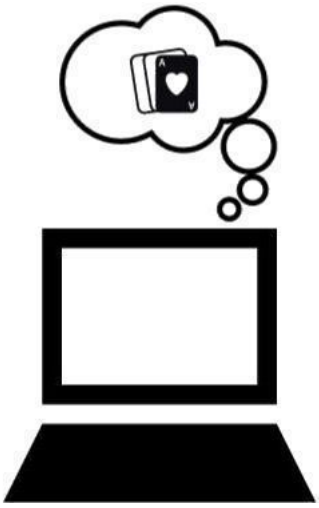
Texas Hold'Em AI Program

Report 2 on work of Week 2

Joseph E. Carrick

September 11, 2015



Application Development Section

1 Vision and Scope

Many of the world's greatest thinkers and leaders in science and technology (Steven Hawking, Bill Gates, Elon Musk, Sam Harris and more) agree on the possibility of true artificial intelligence being achieved in the future. This possibility makes the development of AI all the more interesting and engaging. However, the development of true artificial intelligence (with consciousness and originality) is generally agreed to be long way off. In the mean time, programming machines to mimic human reason in specific situations has proven to be very useful, and has seen a large margin of success. The ideal of this project is to achieve this success in Texas Hold'em strategy. This means creating an AI with actions indistinguishable to those of a proficient player.

Programming a computer to calculate the best odds of winning a hand is computationally straight forward, and is an important consideration in almost any Hold'em strategy. However, deeming this type of program to be AI wouldn't do justice to the ideal of this project. It is therefor the very minimum in this project's scope. Programming a computer to mimic a more complex human process, such as a specific Hold'em strategy that incorporates psychology, is much more true to the vision of artificial intelligence, and is where the scope of this project extends to. Possible variations of the AI program at edge the scope include creating several AIs that individually mimic the style of different Hold'em professionals, and creating an AI that switches between styles of play based the style of it's opponent.

2 Preliminary Software Requirements Specifications

1.
   - Statement: Software needs to run a Texas Hold'em game loop.
   - Evaluation Method: The user can play through a complete game of Texas Hold'em- ending when either player runs out of chips.
   - Dependencies: Card class, Table class
   - Priority: Essential
   - Requirement Revision History: September 11, 2015, Initial software plan for game play mechanics.

2.
   - Statement: Software needs to accept user input for game actions.
   - Evaluation Method: The user can start a new game, end the current game, check, raise, call, and fold; and these actions correctly update the GUI..
   - Dependencies: Card class, Table class, Game Loop, GUI
   - Priority: Essential
   - Requirement Revision History: September 11, 2015, Initial software plan for GUI.

3.
   - Statement: Software needs to accept AI input for game actions.
   - Evaluation Method: The AI can check, raise, call, and fold; and these action correctly update the GUI.
   - Dependencies: Card class, Table class, Game Loop, GUI, AI program
   - Priority: Essential
   - Requirement Revision History: September 11, 2015, Initial software plan for AI program and GUI.

4.
   - Statement: Software needs to run on the Internet.
   - Evaluation Method: The user can access the game via the Internet.
   - Dependency: Card class, Table class, Game Loop, GUI
   - Priority: High
   - Requirement Revision History: September 11, 2015, Initial software plan for user interface.

5.
   - Statement: Software needs calculate hand strength and pot odds.
   - Evaluation Method: The AI program consistently computes the same hand strength as the hand strength calculator on pokernews.com, and can compute the ratio between the call amount versus the pot stack.
   - Dependency: Card class, Table class
   - Priority: Essential

- Requirement Revision History: September 11, 2015, Initial software plan for AI program.

6.
- Statement: Software needs to keep track of how the user plays and adjust it's strategy accordingly.
- Evaluation Method: The AI program has a higher win to loss ratio with adjusting play rather than without.
- Dependency: Hand strength and pot odds calculator, Card and Table classes.
- Priority: Middle
- Requirement Revision History: September 11, 2015, Initial software plan for AI program.

Executive Section

To: Dr. Matt Jadud

From: Joseph Carrick

Subject: Texas Hold'Em AI Program

Date: September 11, 2015

Accomplishments

Created Card and Table classes. Created the game loop and a simple text interface (needs debugging).

Challenges

Checking every hand and determining the winner was a challenge. This was overcome through reviewing the Discrete Math algorithm for determining every combination of 5 items in a group of 7, then writing functions to look for the specific hands (full house, straight, flush, etc.), and finally comparing the players' best hands to each other.

Keeping track of the game sequence was difficult. This was overcome by implementing states for every phase of the game.

Time Spent

8 hours were spent writing the Card and Table classes. 10 hours were spent writing the game loop and text interface. 1 hour was spent on researching the making of on-line games.

Goals

Finish game loop. Create AI that can calculate hand strength and pot odds, and determine a reasonable bet amount. Set up communication between AI and game loop. More research on on-line games.