

Harry Netzer's cs231 project 1

This first project for Data Structures and Algorithms helped me familiarize myself with object oriented Java programming. Simulating a game of Blackjack was a suitable task because the game lends itself well to objects, where a card, hand, deck, and blackjack game all take their own class. Blackjack also has a relatively simple rule set, allowing for good models out of simple code.

The most interesting part of this project for me was implementing the "basic strategy" of Blackjack. Blackjack is a game without any real complexity or decision making; the best player options for any permutation of visible cards can be summarized in a table. Even following this strategy, the player is bound to lose to the house in the long run. This basic strategy of play is summarized on wikipedia here: http://en.wikipedia.org/wiki/Blackjack#Basic_strategy. I decided to simplify the game by eliminating the double down, split, and surrender rules, but I did implement an ace rule so the player can have a hard or "soft" hand.

I turned that wikipedia table into a rather long playerTurn method with if-then statements and while loops to make the player always take the best choices considering his hand and the dealer's one visible card. Critical to my playerTurn method was having a way to test whether his hand was "hard" or "soft." A hard hand is a hand without an ace, or with an ace that has to be considered low for the player not to bust. A "soft" hand is a hand where the ace can be taken high or low, and the player is not busted either way. There are different strategies for hard and soft hands so I had to make a way to test the hand's hardness. A loop through the hand that finds no aces guarantees that the hand is hard, but a hand with an ace that totals 12 or more when the ace is taken as low is also hard. Only a hand with an ace that values less than 12 is a soft hand. I had to code all of this into an algorithm.

I did the 1000 game simulation using both the ace rule and the no ace rule versions of the game. It was interesting to see that the two versions didn't show much variation in win percentages. Both versions showed the player winning about 43% of the time and losing about 48% of the time, with a standard deviation of about 10 times the difference between the win percentage of the two versions. The conclusion I draw from that is that Blackjack is an arbitrarily complex game that gives the player options that appear to add choice and strategy but really don't change the long term outcome, i.e. losing 5% of your money.

My stats:

	playerwins	dealerwins	draw
no soft	463	445	92
	422	491	87
	427	501	72
	430	486	84
	444	482	74
	425	484	91
	417	503	80
	477	450	73
	414	504	82
	409	504	87
avg	432	485	
stdev	22.0	21.5	
soft	444	463	93
	438	469	93
	441	484	75
	465	439	96
	413	493	94

	415	495	90
	442	476	82
	429	497	74
	418	479	103
	425	478	97
avg	433	477	
stdev	16.1	17.4	