Etan Cohn

**Project Description:** The name of my project is Program Poker. It will be a game of Texas Hold’em poker that incorporates graphics, AI, and also multiplayer using Sockets.

**Competitive Analysis:** There are several other poker 112 projects. Many of them are not multiplayer, although one that I found does. Many implement AI with Monte Carlo methods. I will implements my AI instead by using combinatorics to figure out the probabilities of getting future hands, and weighting hands accordingly by also using combinatorics.

One project that I found was able to show the probabilities of getting future hands which I had already been thinking about, and by using the same combinatorics strategies as I am using for the AI, I will be able to have this feature as well.

**Structural Plan:** My project is going to be a modal app, having a Title Screen, Instructions Screen, Game Mode, and maybe more, like a Final Screen. I will have classes for cards and decks, as well as for players, with AI players being different from real players. I will have a class called Card Functions full of static methods which check a given hand to see what kind of hand it is, and also give that hand a given point value that determines its value at the specific time of the game.

**Algorithmic Plan:** A tricky part of this project is going to be implementing the AI. My plan for this is that my program will assign a value to a given hand. First, it will determine its hand type, such as a pair or a flush. Then it will determine the weight of this hand, i.e. what the probability of this hand beating a random hand. It will use combinatorics to figure out how likely the hand is to be another type once the rest of the cards come out. For example, if a hand is one card away from a flush, it will add in the probability of a card coming out to complete the flush and consider the weight of such a hand.

Once the final value is determined that assigns a value for the AI’s hand, the AI will decide to bet, check, or fold based on this and also on what the current bet is. Then, if it decides to bet, it will use this number to also determine how much to bet. The hand value will assign a monetary bet on the top of a curve similar to a bell-curve that will be used to determine how much the computer is actually going to bet. The curve is actually going to increase sharply at its tail to give the chance for the AI to bluff.

**Timeline Plan:** I already have a Title Screen, and in my Game Mode, I am currently able to generate a 7-card hand, evaluate its type, and assign a preliminary value to the hand based on the cards that make it up. I will plan to work in the next few days on implementing preliminary rounds with dummy AI characters, and go into the weekend with a program that is able to go through each round of a poker game with dummy AI. Then, during the weekend I will work on adding bets, checks, and folds, both for the real person and the AI. During the following week, I will work on the complicated aspects of the AI as well as adding some graphics features and finishing touches on the game at that point. After next week, I will then begin to shift my focus to implementing a multiplayer with Sockets. I will need to have time to fully focus my attention on this, as I have little experience with this.

A screenshot of a cell phone

Description automatically generated**Version Control Plan:** I will periodically save my code (when it is working) in versions into the Cloud through Google Drive.

**Module List:** Sockets, CMU\_112\_graphics

**TP2 Update:** I do not have any changes to my design, although I am not sure yet if I will get to doing sockets.

**TP3 Update:** The main feature that I added was the AI. The AI uses a Monte Carlo method to calculate the strength of its hand before each of its turns, and this factors into its decisions to bet, fold, or call, and how much it will bet. I also added buttons for folding, betting, raising, calling, and checking, instead of having to type into a user input to do everything. The computer cards are now flipped to their backs. I also have two icons at the top of the game mode screen that take you to different sections. The dice icon takes you to a screen that shows your own probabilities of getting different hand types, calculated with the Monte Carlo method. The cards icon takes you to a list of hand classifications and their ranks. Your money is now shown on a poker chip. The title screen is redesigned, and the instructions screen now has actual instructions. There are also other minor changes and fixes.