Laura (Kai Sze) Luk
Section C

Project Proposal

TP3 UPDATE:

The pong/chi tiles for each player will be displayed. There are now images replacing the tiles. The start and help screens are also included. The winning hand will be displayed during the message signaling a player winning the game. The 'win message' includes the winning hand.

TP2 UPDATE:

Instead of the player pressing spacebar to progress through the game (signaling CP1, CP2, CP3 to get tile/discard tile), it will be automated by the timerFired function with a time delay in order for the player to see what tiles are being put down by the AI.
As of right now, I plan to display the pong/chi tiles for each player (might change).
The Mahjong tiles are represented by white rectangles with text of the name of the tile on them. They will be the actual images of the tiles later.
The files in this project are also updated:

- startScreen.py (not written yet)
    - will have 2 options (press to play, press for help)
- helpScreen.py (not written yet)
    - will have basic instructions about the game
- __init__.py
    - initializes all variables used and draws board
- player.py
    - randomly deals tiles to the player and the 3 CPs
    - controls the player's key/mouse presses + timerFired
- cp.py
    - controls the AI portion of figuring out which tile is the best to discard
    - controls when CPs will pong/chi/win
    - draws on canvas to signal who's turn it is
- pong.py
    - controls when CPs/player can pong
    - draws signal message to player asking if they want to pong and when CPs pong
    - will draw the tiles used in the pong
- chi.py
    - controls when CPs/player can chi
    - draws signal message to player asking if they want to chi and when CPs chi
    - will draw the tiles used in the chi
- win.py
    - controls when a player has a winning hand

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Mahjong AI: Mahjong, a popular game in Asian cultures, consists of 4 players. The goal is for each player to take the shortest time to have a winning hand (4 sets of 3 and 1 pair). This will be a single player game where the other players will be played by the computer, represented by CP1, CP2, and CP3. The instant a player wins, a game over screen/message will be displayed.

Competitive Analysis:
(https://www.gamedesign.jp/flash/mahjong/mahjong_e.html)

This is an online single player Mahjong AI game. It is modeled after Japanese Mahjong, which is very similar to the Chinese version. The graphics of this game consists of a start menu and a list of instructions on how to play. A mouse click will take the player to the game where there is a background representing the table. Mouse clicks from the player controls the game. Each time a new round begins, the graphics imitate shuffling of tiles and then displays the player's hand of tiles, first in the order that was "drawn" and then reordering them in a consecutive manner. The player's hand is towards the bottom of the table and the other 3 AI players' hands around the table are displayed by the backs of their tiles. Each time a player discards a tile, it is placed face-up in the middle, towards the side of the table closest to that player. Each time the player has a chance to "pong", "chi", or "gang" from another player's discarded tile, a box pops up asking the player if they would like to. If a player does choose one of these, the tiles that make up the "pong"/"chi"/"gang" are displayed face-up. The tiles to pick up from is represented by a small stack of tiles, face-down, in the middle of the table. There is also a score next to each player, which is calculated by determining which tiles were in the winning hand, and keeps track of the round (east, south, west, north), along with the position (which player is the dealer of that round). Each time a tile is picked up or discarded, there are sound effects. There is also an option of choosing the speed of the AI's.

I plan on making my project in a very similar fashion. Mouse clicks from the player will designate the flow of the game. The difference will be that my Mahjong AI will be a simpler version. The structure of the game will remain the same but I will not be implementing the "gang" option. Additionally, the graphics in my game will not have the shuffling imitation. The score will also not be calculated by the specific rules of Mahjong, but will be sufficient to show who is winning each round. There will also be no sound effects.
(https://www.youtube.com/watch?v=G9XfKM-w070)

Another 15112 student also did a Mahjong AI, using Pygame. Her game's graphics are similar but much simpler. The player's tiles are displayed but the tiles during a "pong"/"chi" are not displayed. There doesn't seem to be an option to "gang". Pressing the spacebar is how the player progresses through the game and clicking on the tile will discard that tile on their turn. Once a player wins, there is a game over message and it displays the hand of tiles of the winning player.

My project's graphics will be implemented using Tkinter. The general graphic format will be very similar such that the rest of the players will be represented as green tiles and the

player will have their cards shown on the canvas. The center of the screen will have a square representing the tiles that can be drawn, and inside that will be where the discarded cards are shown. There will also be no display of the cards being "pong"/"chi". Additionally, mouse presses and spacebar presses will be the way the player will advance through the game.

Structural Plan:

Files:

- home screen/help screen
    - home screen: press to play + press for instructions
    - help screen: instructions/rules + press to go back to home screen
- creating/drawing tiles
    - object Tiles
    - object Wan inherits from Tiles
    - object Tong inherits from Tiles
    - object Bamboo inherits from Tiles
    - object Word inherits from Tiles
- implementing AI (might have 1 file per CP)
    - function for each AI player
    - helper functions for picking discarded tile, discarding tiles, marking tiles as incomplete or complete sets
- playing/running the game
    - drawing graphics
    - setting up player's tiles

Algorithmic Plan for implementing AI players:

A complete set: 1 pair + 4 groups of 3 (consecutives or repeats)

1. Mark all completed sets in hand
    a. note if pair is not formed
2. For all incomplete sets:
    a. Mark all incomplete sets that are missing 1 tile (data.missing1 = True)
    b. Determine if tile thrown out by previous player can be used:
        i. can it fill a 'pong'/'chi'
        ii. can you win
    c. If tile cannot be used, draw new tile and determine to keep or throw:
        i. if new tile is not a word:
            1. throw words first that do not form a pair or a set of 3
            2. keep if:
                a. it completes any missing1 incomplete sets
                b. it makes any single tiles into a missing1 incomplete

ii. if new tile is a word:
    1. keep if makes pair with single tile
    2. keep if makes set of 3

Timeline Plan:
Monday: finish importing/resizing images for tiles
Tuesday: write AI backtracking functions as if I was player
Wednesday: convert Tuesday's code to AI
Thursday: make home screen
Friday: make sure everything is running/add extra things if there is time

Version Control Plan:
I am trying to learn how to fully use Github. In the meantime, I will be backing up my code by uploading it onto Google Drive.