MATH 198/CS 199 Project Proposal

David M. Stone

10/21/16

1 Abstract

The goal of this project is to learn about Python, OpenGL, three-dimensional visualization, and hash functions through the development of a 3D version of the classic game Scrabble. Two to four players will compete from the same machine on a cubic extrapolation of the classic board layout. Players will need skills of vocabulary, strategy, and anagramming, though the game will take care of checking spelling and counting points. Scrabble has been a board game staple, and a three-dimensional variant will provide new challenges and opportunities for an avid player.

2 Background

Scrabble is a two-dimensional board game in which players form words and place them on the 15x15 board grid. The letters which form the word must be connected linearly, and the letters must be chosen from the set of tiles already on the board and tiles in the player's rack. There are 100 tiles, each bearing a letter, the distribution of which was calculated by creator Alfred Mosher Butts through analysis of letter frequency in prevalent publications (e.g. The New York Times). Each letter has a point value, and the sum of the points of each letter used is the score for the turn. In crossword style, each word (2-15 letters) formed must be permissible, as defined by a preset dictionary. A player's turn consists of: choosing a play, placing tiles, finding the score, and then refilling the rack up to seven tiles. A player may, instead of making a play, trade in any number of tiles from the rack back into the bag and draw new tiles.

Special Rules: Of the hundred tiles, two are blank (devoid of letter or point); these may be used as any letter, but once put on the board, represent that letter for the remainder of the game, and count for no points. Bonus point spaces are dispersed across the board, and are valued multiplicatively. Finally, if a player successfully uses all seven of his/her letters from the rack, that is considered a Bingo and is worth an additional 50 points.

3 RTICA

The three-dimensional board will be a visualized array, and when a player selects the location where he/she would like to place the tile, that array element will be filled. The view of the board will initially be orthographic, with the availability to spin it through the arrow keys. The special value locations will be marked, either with subtle letters or opaque shading, neither of which should interfere with gameplay. The player's current rack, the overall score, and a Submit button will be displayed on screen as well. Several algorithms will be created to facilitate gameplay:
1. Dictionary - will be a hash function to check if the desired play is acceptable by comparing all words made to a preset dictionary
2. Tiles - will emulate a typical card-dealing algorithm, randomly refilling racks from the remaining letters
3. Score Tracker - will keep track of total points for each player, and determine winner at the end of the game

4 Timeline

10/21: Create Proposal
10/28: Have board array and tile textures ready for mentor review
11/9: Class presentation – including a proof-of-concept with a basic play
11/16: Have the dictionary algorithm hashed
11/23: Handle special rules and situations
11/30: Polish specific areas such as blank tiles, bonuses, determining scores and winners, and other situations that may arise; prepare functionality for final presentation; time permitting, begin AI opponent