Requirements Documentation

1. Introduction

1.1. Scope of the Product

Proposed Project Summary

For the semester project, team 1 proposes to develop a version of the popular dice game Farkle. Our proposed version will be a standalone application utilizing a graphic user interface. The first iteration of development will yield a one player version of the game, and two player support will be added in a second iteration with the second player being a live person using the same computer as the first player. If time permits, a third iteration will yield a two player version that can be played against a computer opponent with probability determining the play of the computer opponent.

Traditional Rules of Farkle

Farkle is a game typically played with six dice and more than one player. The traditional rules dictate that each player takes turns rolling the dice in succession, with each turn producing a score. The score produced from the players current turn is added to that players previous score accumulation. The goal is to be the first player to reach 10,000 points. The scoring is generated as follows:

1. At the beginning of the turn, the player rolls all 6 dice.
2. Scoring for each roll is as follows: Each 1 = 100 points, each 5 = 50 points, (3) 1s = 1000 points, (3) 2s = 200 points, (3) 3s = 300 points, (3) 4s = 400 points, (3) 5s = 500 points, (3) 6s = 600 points, a straight = 1500 points, and more than three of a kind doubles the value for each additional match (e.g. (5) 3s = 300 x 2 x 2 = 1200 points).
3. Dice resulting in a score are chosen and removed by the player (the player must pick up at least one scoring die, but does not need to pick up all scoring die), and the player decides if they want to roll with the remaining dice or pass to the next player.
4. At least one die must be set aside after each roll.
5. A "farkle" occurs when a roll results in no points. All points accrued during that turn are forfeit, and play is passed to the next player.
6. If the player has scored all six dice, he or she can roll again with all six dice.
7. Once a player has reached the winning point total, each successive player has one last chance to score enough points to surpass the leader.

Proposed Changes to the Traditional Rules for this Version of the Game

Traditionally, Farkle is a multiplayer game with the first player to a given point total being named the winner of the game. The primary play for our proposed version will center on a single player. Two player options will be available in the final release, but we anticipate most players will opt for single player gameplay making it the primary focus of this application. To differentiate single player play from multiplayer play, the single player version will limit the number of turns given to the

player to ten with the primary goal being to maximize the total points for each game. In a sense, the player will be playing against himself or herself trying to beat a previous high score.

Programming Language

The application will be written in Java using JDK version 7.

Platform and Software Requirements

The application will be developed and tested on the Microsoft Windows 7 platform with the Java Runtime Environment 1.7+ installed.

1.2. Definitions, Acronyms, and Abbreviations
- JRE – Java Runtime Environment version 7 or newer
- JDK – Java Development Kit version 7

1.3. References
- The Farkle game rules were adapted from the Farkle Wikipedia page located at: http://en.wikipedia.org/wiki/Farkle
- Single player game play was adapted from the single player game version of the Farkle application found on Facebook at the following location: https://www.facebook.com/farkleonline
- The scoring summary image used in this application was adapted from the scoring summary image used in the Farkle application found on Facebook at the following location: https://www.facebook.com/farkleonline
- The application launcher was created using Visual Studio along with the InstallShield plugin from Flexera Software.
- Version control was implemented using Google Code.
- The application was packaged into a .exe file using Maven.

2. General Description

2.1. Product Perspective

The software is being built to allow the end user to play the popular dice game, Farkle, even if that user does not have a set of dice, or another player to play against. This software will simplify playing this game, and speed up overall gameplay. Without the need for actual dice, and with the addition of automatic scoring, this version of the game can be played multiple times in the time it takes to play one game in the traditional manner.

2.2. Product Functions

This game will allow the end user to play Farkle in multiple modes. The user can elect to play a single player version of the game that departs from the traditional rules by limiting the number of turns that player can take to a total of ten. The goal of this single player mode is to accumulate as many points as possible within the limited number of turns, trying to beat previous high scores. The user can also elect to play a two player version of the game that follows the traditional rules of Farkle, by

proclaiming the winner to be the first to 10,000 points. This two player mode can be played against another user, or against the computer.

2.3. User Characteristics

The anticipated end user is a basic user of the Windows operating system. The user is installing and using this application to take a break from his or her normal activities. This application will provide a few minutes of mindless enjoyment, or a means of procrastination, for the typical university student or professional employee. The application must be easy to install with limited requirements to properly serve this anticipated user.

2.4. General Constraints

As a standalone application, this software does not have many constraints. It is not designed for, nor does it work over, a network connection. Multiplayer mode is limited to two players, and if the user elects to play against another live user, both players must take turns at the same computer.

2.5. Assumptions and Dependencies

This software requires that the end user has the Java Runtime Environment (JRE) version 7 or newer installed. Though it may run on other operating systems with JRE installed, it was developed and optimized for Windows 7. A minimum display resolution of 1200 x 800 pixels is required.

3. Specific Requirements

1.0.0   Graphic User Interface

1.1.0   Select Game Mode Option Box – Upon opening the application, the user is greeted with an option box that includes all configuration options for gameplay. These options include "1 Player Mode", "2 Player Mode", "Human Opponent" (if two player mode is selected), "Computer Opponent" (if two player mode is selected), and text fields to enter the associated player names. Also included is a "Start" button and a "Close" button (both of which are always enabled). This option dialog box should pop up over the main GUI set to a solid green color (section 1.2.0).

1.1.1   If the user selects the "Close" button at any time, the application closes.

1.1.2   The "1 Player Mode" is highlighted by default when the application is first opened, and a blank text field for player one's name is displayed.

1.1.2.a If the user selects the "Start" button with "1 Player Mode" highlighted and the "Player One Name" field empty, the one player GUI (section 1.3.0) opens with the name "Jacob" assigned to player one.

1.1.2.b If the user selects the "Start" button with "1 Player Mode" highlighted and a name supplied in the "Player One Name" text field, the one player GUI (section 1.3.0) opens with the provided name assigned to player one.

1.1.3   If the user highlights the "2 Player Mode" option, the "1 Player Mode" option is deselected, and two more options appear ("Human Opponent" and "Computer Opponent"). The "Human Opponent" option is highlighted by default.

1.1.4   When the "Human Opponent" option is highlighted, two text fields are displayed, labeled "Player One Name", and "Player Two Name".

    1.1.4.a   If "Two Player Mode" is highlighted, "Human Opponent" is highlighted, the "Player One Name" field is empty, the "Player Two Name" field is empty, and the user selects the "Start" button, the two player mode GUI (section 1.4.0) is opened, and the names "Jacob" and "Brant" are assigned to player 1 and player 2, respectively.

    1.1.4.b   If "Two Player Mode" is highlighted, "Human Opponent" is highlighted, the "Player One Name" field is empty, the "Player Two Name" field contains a name, and the user selects the "Start" button, the two player mode GUI (section 1.4.0) is opened, the name "Jacob" is assigned to player 1, and the supplied name is assigned to player 2.

    1.1.4.c   If "Two Player Mode" is highlighted, "Human Opponent" is highlighted, the "Player One Name" field contains a name, the "Player Two Name" field is empty, and the user selects the "Start" button, the two player mode GUI (section 1.4.0) is opened, the name "Brant" is assigned to player 2, and the supplied name is assigned to player 1.

    1.1.4.d   If "Two Player Mode" is highlighted, "Human Opponent" is highlighted, the "Player One Name" field contains a name, the "Player Two Name" field contains a name, and the user selects the "Start" button, the two player mode GUI (section 1.4.0) is opened, and the supplied names are assigned to player 1 and player 2 accordingly.

1.1.5   When the "Computer Opponent" option is highlighted, the text fields for "Player One Name" and "Player Two Name" are displayed, but the "Player Two Name" field is disabled, and "Computer" is supplied for the "Player Two Name".

    1.1.5.a   If "Two Player Mode" is highlighted, "Computer Opponent" is highlighted, the "Player One Name" field is empty, and the user selects the "Start" button, the two player mode GUI (section 1.4.0) is opened, the name "Jacob" is assigned to player 1, and "Computer" is assigned to player 2.

    1.1.5.b   If "Two Player Mode" is highlighted, "Computer Opponent" is highlighted, the "Player One Name" field contains a name, and the user selects the "Start" button, the two player mode GUI (section

1.4.0) is opened, the supplied name is assigned to player 1, and "Computer" is assigned to player 2.

1.2.0   Items common to the user interface for both modes

1.2.1   The center of the screen shall display the six dice used during gameplay. These dice shall display the name of the game, "Farkle", until the user selects the roll button for the first time.

1.2.2   The total turn score shall be displayed above the dice in the center of the screen, and the score for the selected dice of the current roll shall be displayed directly below the turn score in the center of the screen. This score shall be updated as each die is selected.

1.2.3   Rules for the scoring combinations shall be displayed on the right side of the screen.

1.2.4   A "Roll Dice" button shall be displayed below the dice in the middle of the screen.

1.2.5   A "Bank Score" button shall be displayed below the dice in the middle of the screen, and shall initially be disabled.

1.2.6   After each roll, dice that have previously been selected, scored, and locked shall be shaded to indicate they will not be available on the next roll, and the turn accumulated score shall be updated.

1.2.7   If any roll results in 0 points, the word "Farkle" is prominently displayed, and 0 points is displayed in the accumulated turn score above the dice. The dice retain their current values that resulted in the Farkle. After the Farkle message is displayed, the dice still retain the values that resulted in the Farkle, but all dice are unlocked and play passes to the next player (in two player mode), or to the next turn (in one player mode).

1.2.8   A "Select All" button shall be displayed below the dice in the middle of the screen, and shall be initially disabled.

1.2.9   During a current roll, current dice selected by the user shall be indicated with a yellow border around each selected die, and the score for the currently selected dice shall be updated above the dice.

1.2.10 A menu shall be displayed at the top of the main GUI with one main option, "File", and five sub options: "Hint", "New Game", "Restart Game", "Reset High Score", and "Quit".

1.2.10.a If the user selects the "New Game" option, the select game mode option box (section 1.1.0) is displayed.

1.2.10.b If the user selects the "Restart Game" option, the current game with all current configurations (player mode, player names, and player types) is restarted.

1.2.10.c If the user selects the "Quit" option, the application is closed.

1.2.10.d If the user selects the "Hint" option, the dice combination for the highest possible score for the current roll is displayed.

1.2.10.e The "Hint" option shall only be available after a player has rolled, and before that player has selected any dice.

1.2.10.f If the user selects the "Reset High Score" option, the high score is reset to 0.

1.2.10.g The "New Game" option and the "Reset Game" option shall be disabled while the computer is taking its turn.

1.3.0   One player mode graphic user interface

1.3.1   The title of the window shall display: "Farkle – Single Player Mode".

1.3.2   The overall point total for the current game shall be displayed on the upper left hand corner of the screen, just below the player's name.

1.3.3   The left side of the screen shall have an area to display the point total for each of the ten turns taken in single player mode.

1.3.4   The current turn shall be indicated by highlighting that turn on the left side of the screen. This turn shall be highlighted as soon as the previous turn ends (which occurs after the player selects the "Bank Score" button, or after the Farkle message animation completes), and before the player selects the "Roll Dice" button for the current turn.

1.3.5   The current highest achieved score shall be displayed on the lower left hand corner of the screen. This score shall initially be set to 0 points.

1.3.6   The top of the left hand side of the screen shall display "Player: ", along with the provided name of the player.

1.4.0   Two player mode graphic user interface.

1.4.1   The title of the window shall display, "Farkle – Two Player Mode".

1.4.2   The left side of the screen shall have an area to display the overall accumulated point total for each player. This takes the place of the area displaying the point total for each turn in the one player mode graphic user interface.

1.4.2.a Each player shall be indicated in the following manner: "Player: " along with the provided player's name, or "Computer" if a "Computer Opponent" has been selected, followed by the running point total for the current game for that player.

1.4.3   The player whose turn it is shall be indicated by highlighting that player's current turn on the left side of the screen. The turn shall be highlighted after the previous player's roll ends and before the player selects the "Roll Dice" button for the first time for the current turn.

1.4.4   The first player to meet the minimum total point threshold required to win the game (equal to 10,000 points) shall be highlighted in a different color to indicate each subsequent player has one more turn to try and beat that player's score.

1.4.5   The turn totals for each player shall be displayed in a scroll pane below that player's name and game score. This scroll pane shall initially display 5 turns, adding additional turns after they are taken. The scrolling ability shall be enabled at the beginning of the 11th turn.

1.4.6   After a player has surpassed the 10,000 point threshold, a message dialog box is displayed indicating the other player has one last turn to try and beat that player's total score.

1.5.0   Conclusion of game option box
    1.5.1   At the conclusion of the game, an option box shall be displayed with the player's overall score for the completed game (in one player mode), or the winner of the current game (in two player mode). This option box shall include three options: "Play Again?", "Main Menu", and "Quit".
        1.5.1.a   If the user selects the "Play Again?" button, the game will be restarted with all of the same configuration options of the previous game (player mode, player's names, and player types).
        1.5.1.b   If the user selects the "Main Menu" button, the select game mode option box will be displayed (see section 1.1.0).
        1.5.1.c   If the user selects the "Quit" button, the application will immediately close.
        1.5.1.d   If the user selects the close button in the upper portion of the conclusion of game option box, the application will immediately close.

2.0.0   <u>Game Modes</u>
    2.1.0   When one player mode is selected, the one player mode graphic user interface (section 1.3.0) is displayed with the name "Farkle" displayed on the dice, the "Bank Score" button disabled, the "Select All" button disabled, and turn number one highlighted. The user will have ten turns to try and get as many points as possible.
        2.1.1   Each turn is taken according to the requirements of section 4.0.0.
        2.1.2   The game ends at the conclusion of the tenth turn, and the player's score is compared to the current high score.
        2.1.3   If the player's score is greater than the current high score, a congratulatory message is displayed, and the player's score replaces the previous high score.
        2.1.4   The conclusion of game option box (section 1.5.0) is displayed at the completion of the tenth turn.
    2.2.0   When two player mode against a live person is selected, the two player mode graphic user interface (section 1.4.0) is displayed with the name "Farkle" displayed on the dice, the "Bank Score" button disabled, the "Select All" button disabled, and player one highlighted indicating it is his or her turn.
        2.2.1   Each turn is taken according to the requirements of section 4.0.0. The current player for each turn is highlighted during that player's turn.
        2.2.2   The first player to surpass 10,000 total points at the end of a given turn is highlighted in a different color.
        2.2.3   The other player has one more turn to try and surpass the point total of the first player to surpass 10,000 points.
        2.2.4   The conclusion of game option box (section 1.5.0) is displayed after a player wins.
    2.3.0   When two player mode against the computer is selected, the two player mode graphic user interface (section 1.4.0) is displayed with the name "Farkle" displayed

on the dice, the "Bank Score" button disabled, the "Select All" button disabled, and player one highlighted indicating it is his turn.

2.3.1   Each turn is taken according to the requirements of section 4.0.0. The current player for each turn is highlighted during that players turn.

2.3.2   Decisions made during the computer player's turn are chosen in accordance with requirements section 5.0.0.

2.3.3   The first player to surpass 10,000 total points at the end of a given turn is highlighted in a different color.

2.3.4   The other player has one more turn to try and surpass the point total of the first player to surpass 10,000 points.

2.3.5   The conclusion of game option box (section 1.5.0) is displayed after a player wins.

3.0.0   Dice

3.1.0   Farkle is played with six standard 6 sided dice with each side numbered from 1 through 6 (inclusive).

3.2.0   Each die that is rolled shall be assigned a random value from 1 to 6 (inclusive) at the conclusion of the roll.

4.0.0   Player's Turn

4.1.0   At the beginning of the turn, the turn score is set to 0. The player selects the "Roll Dice" button, and all 6 dice are rolled in accordance with requirement 3.2.0. The "Select All" button is enabled after the initial roll takes place.

4.2.0   The resulting roll is analyzed according to requirement 6.0.0 to determine if the player farkled. A farkle occurs if the roll results in 0 points.

4.3.0   If the player did not farkle, he or she must select at least one scoring die. The score for the selected dice is calculated according to requirement 5.0.0, and is updated after each die selection. The score for the selected dice is displayed in accordance with section 1.2.9. If any of the selected dice does not contribute to the score, a selected dice score of 0 is displayed and the "Roll Dice" and "Bank Score" buttons are disabled.

4.4.0   When all of the selected dice contribute to the point total for the roll, the "Roll Dice" button is enabled, and the roll point total is added to the running point total for the current turn.

4.5.0   If the current turn score is greater than or equal to 300, the bank button is enabled.

4.6.0   If the player elects to roll again the selected dice are locked, the remaining dice are rolled, and the process returns to requirement 4.2.0.

4.7.0   If all six dice have been selected, and they all contribute to the turns point total, the player is issued a bonus roll indicated with a message in the current turn box. All selected and locked dice are deselected and unlocked, and the process returns to requirement 4.1.0.

4.8.0   If the player selects the bank button, the current turn point total is added to the player's game point total, and the turn is over.

4.9.0   If the player farkles on any roll during the current turn, that player loses all points accumulated during the current turn, the farkle message is displayed per requirement 1.2.7, and the turn is over.

4.10.0   When the turn is over all dice are unlocked while continuing to display their last value , the "Roll Dice" button is enabled, the "Bank Score" button is disabled, the "Select All" button is disabled, the current turn point total is set to 0, the current roll point total is set to 0, and play passes to the next player (two player mode) or the next turn (single player mode) by highlighting the appropriate player or turn on the left hand side of the screen.

5.0.0   Computer player

5.1.0   The computer player takes its turn in accordance with requirement 4.0.0, and the dice selection, as well as the decision to continue rolling the dice, are made in accordance with the following requirements.

5.2.0   After each roll, the computer player always selects the maximum scoring combination of dice.

5.3.0   If the current turn point total is less than the goal calculated in section 5.5.0, the computer always rolls again.

5.4.0   If the previous roll resulted in a bonus roll, the computer always rolls again.

5.5.0   The computer's goal is calculated after each roll. This goal is pseudo-randomly selected as 300 fifty percent of the time, 600 thirty percent of the time, and 1000 twenty percent of the time.

6.0.0   Scoring

6.1.0   Each 1 rolled is worth 100 points.

6.2.0   Each 5 rolled is worth 50 points.

6.3.0   Three 1's are worth 1000 points.

6.4.0   Three of a kind of any value other than 1 is worth 100 times the value of the die (e.g. three 4's is worth 400 points).

6.5.0   Four, five, or six of a kind is scored by doubling the three of a kind value for every additional matching die (e.g. five 3's would be scored as 300 X 2 X 2 = 1200).

6.6.0   Three distinct doubles (e.g. 1-1-2-2-3-3) is worth 750 points. This scoring rule does not include the condition of rolling four of a kind along with a pair (e.g. 2-2-2-2-3-3 is worth does not satisfy the three distinct doubles scoring rule).

6.7.0   A straight (e.g. 1-2-3-4-5-6), which can only be achieved when all 6 dice are rolled, is worth 1500 points.