CMP102 Software Design
Unit 2 Report

Benefits of Object Orientation

The main benefit I found while developing this project using Object-Oriented Programming is the improved organisation of the code in comparison with Procedural Programming. Keeping the code of each Class in a separate file helped me navigate through my project and kept me focused on one Class at a time instead of trying to implement all functions at the same time.

Therefore, using Object-Oriented Programming instead of Procedural Programming also aids in the development of the code itself, since it is easier to divide a big project into smaller portions (Classes) and work on these portions individually and in the end put them together into a big and complete program.

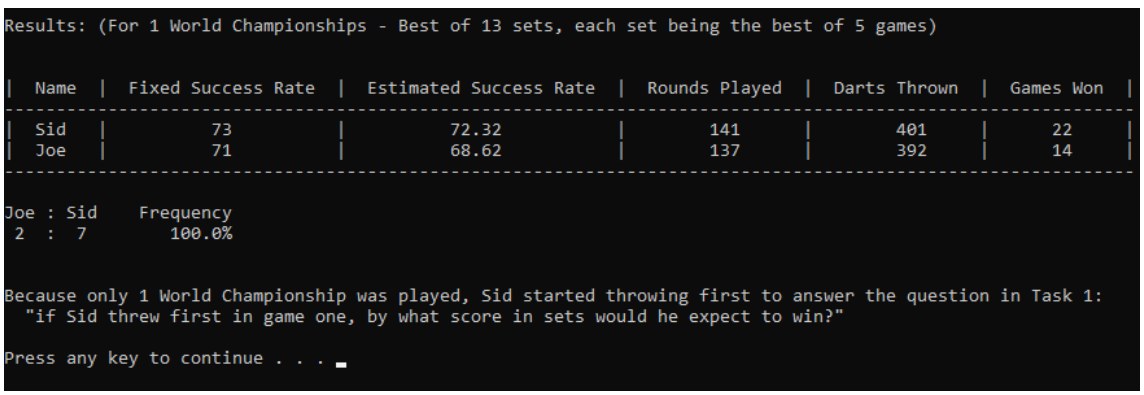
Task 1: Simple Solution

For this task, I started by using the code written for Week 6, where the players played a single game of darts 501. In this game, it was only possible to throw at bullseye or single.

Then, I implemented the other throw functions (throwDouble() and throwTreble()) and two other game modes: Multiple 501 Games and World Championships. The former consisted of multiple Single 501 Games, i.e. Single 501 Games played X number of times. The latter, the players played a X number of times a final of the World Championship, i.e. a match of the best of 13 sets, each being the best of 5 Single 501 Games.

At the same time that the Multiple 501 Games mode was implemented, I implemented the Enhanced Strategy for Task 2, so there is no output for the World Championships mode using the simple strategy.

The output of 1 World Championship final is (Joe: 71% // Sid: 73%):



The output for 1.000.000 World Championship finals is (Joe: 70% // Sid: 30%):

```
Results: (For 1000000 World Championships - Best of 13 sets, each set being the best of 5 games)

|  Name  |  Fixed Success Rate  |  Estimated Success Rate  |  Rounds Played  |  Darts Thrown  |  Games Won  |
-------------------------------------------------------------------------------------------------------------
|  Sid   |          30          |          30.03           |   92022122      |  273791694     |  679568     |
|  Joe   |          70          |          70.06           |  102237198      |  272597462     |21002792     |
-------------------------------------------------------------------------------------------------------------

Joe : Sid    Frequency
 7  :  0        99.8%
 7  :  1        0.2%
 7  :  2        0.0%

Press any key to continue . . .
```

Task 2: Enhanced Strategy

As previously stated, the Enhanced Strategy was implemented at an early stage of this game, so it is not possible to compare the performance of the players in the World Championship final using the Simple Strategy or the Enhanced Strategy.

The Enhanced Strategy was implemented using a map container to store the best strategy for every single possible score of a 501 game. Then, whenever a player needed to decide where to throw a dart, a function would search the map container for the best strategy for that score, eg: Score = 143 => Strategy = “T20 T17 D16”.

This correlation score/strategy was adapted from an online ‘calculator’ that outputs the best strategy depending on the input given (the score). The ‘calculator’ can be found at https://www.vcalc.com/wiki/MichaelBartmess/Darts+-+501+-+Next+Throw.

Task 3: Interactive Game

For this task I implemented a new Class named Interactive that derives from the Class Game.

This Class creates an interactive World Championship final between the user and the chosen player (Joe or Sid). At the start of the match, both players throw ‘nearest the bull’ to decide who goes first. Then, after each game the players alternate in throwing first.

There are three difficulty modes in this game:

Easy – Success Rate = 80%

Medium – Success Rate = same as opponent

Hard – Success Rate = 60%

The user can choose if they want hints throughout the match or not. If they choose to enable hints, their success rate decreases 10%.

Next, the players play the final of the World Championship (best of 13 sets, each being the best of 5 501 dart games).

After the game is finished, the result of the game is showed.