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P1_6 The Average Golfer

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Abstract

A model of a golfer playing solely 'average' strokes has been developed. "Terrible" shots are neglected. Shot dispersion is also modelled. Each stroke for an 18-hole round by 1 million golfers was modelled. The resultant scores matched real scores for an 'average' golfer. Therefore, the "terrible" shots of reality must typically be balanced.

Introduction

A program was written to reproduce the shots of an average golfer and determine whether by hitting purely 'average' shots amounts to the sum of its parts and yields an average score.

Method

This section runs through the process of how the program models the golfer(s). Firstly, the holes are modelled as one of three types; par 3s, 4s and 5s. Appropriate lengths are chosen (150, 350, 500 yards). The 'course' is stored in a table of 18 holes with distance values. For this paper, the holes are simply modelled as perfectly straight with no penalty for not hitting centrally. There are no hazards included. Follow-up papers may model more complex hole arrangements.

In playing a hole, the initial positions of the ball and hole are established and an array is created to store the ball position after each shot. Next, a loop is established for while the ball is not on the green (within 11 yards). While active, the club choosing and shot playing functions are called and resulting positions stored in the next row of the position array. These are explained below.

The club choice function draws the standard distance for each club from a table. 14 clubs are available, with the putter having short, medium and long putt distances. In each case, the desired distance is found through another function which takes the current ball and hole positions. The difference between this and each club's standard distance is found. If this delta is closer than the previous best, that club is used. The distances for each club depend on a golfer's ability, thus the values are used for an average golfer [1].

Once the club is chosen, the play shot function takes over. Firstly calling another function to find the desired angle and direction of the shot, correcting for sign and quadrant errors before adding random error. For distance, this is taken from a normal distribution centred around the club's standard distance, then angular dispersion from a chi-squared distribution. This is because a normal distribution would be centred around the perfect shot, whereas in reality the most common position for an average golfer is not exactly on the centre-line. A random sign is then given to determine if the miss is left or right. The chi-squared distribution has 1 degree of freedom (1 variable needed) with a non-centrality parameter of 7.5°.This value is arbitrarily chosen, but is later shown to be a good approximation. Finally, the shot is played and the new position returned.

Once the shots required to reach the green have been taken, the ball positions are returned. A final function iterates this process over all holes. All positions are stored in an array with an extra dimension for the hole number with null values removed. The number of shots taken is found and an average putts value $\times 18$ added. This yields a round score.

Results and Conclusions

Figure 1 below illustrates the shots taken by the algorithm over a par 3 and a par 4 hole as modelled in the code.

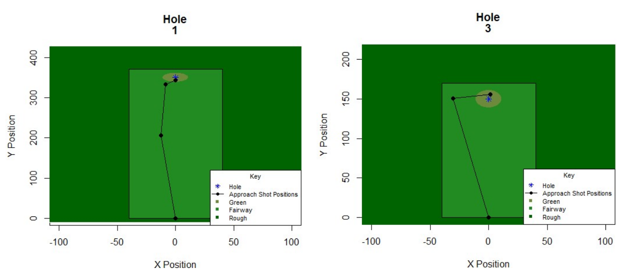

Figure 1: Shot traces on a par 4 (left) and 3 (right) hole

As referenced in the Method, the shot dispersion found using the chosen parameters behaves as expected and, as will be seen, leads to scores typical of an average golfer. Figure 2 shows the positions of tee shots hit independently by 5,000 'golfers'. The behaviour we see is as expected, a small number of 'terrible' shots far off line, some reasonable variation in distance and a most common position of the edges of a fairway ($\pm$ 40 m).

The model ran for 1 million golfers, each modelling all holes and their scores recorded. The distribution of these scores is shown in Figure 3.

The mean score was 88.88 with a standard deviation of 2.13. The best score was 79, no golfers broke par (72); the worst score was 100. These values fall as expected for an average golfer (handicap 16-20) [2].Thus, the results appear accurate to reality and so may represent a good model. An average putt value of 2 was chosen based on values found in literature [3] [4].

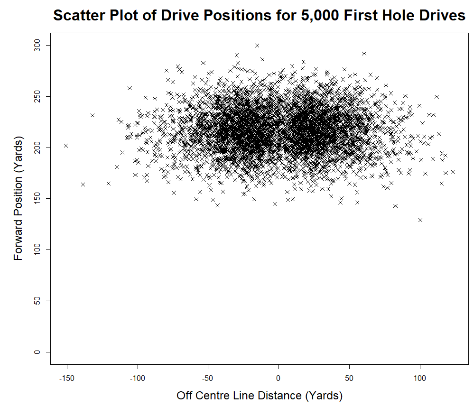

Figure 2: 5000 tee shots on the first modelled hole

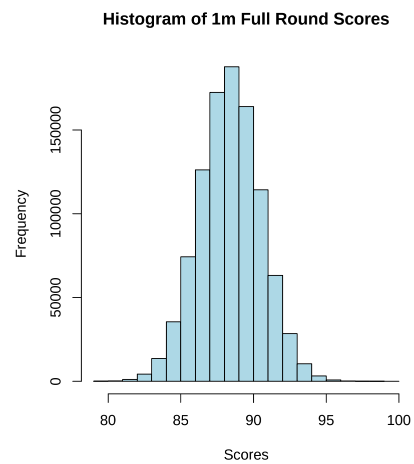

Figure 3: Score distribution of 1 million modelled golfers

References

[1] https://destination-golf.com/golf-club-distance-charts/ [Accessed 22/10/2021]

[2] https://www.golfspan.com/what-is-a-good-golf-handicap [Accessed 22/10/2021]

[3] M. Broadie, Assessing Golfer Performance Using Golfmetrics, Science and Golf V (2008).

[4] C.R.S. Fitzsimmons, Comparative performance analysis of the PGA tour and Ontario university golfers (2011).