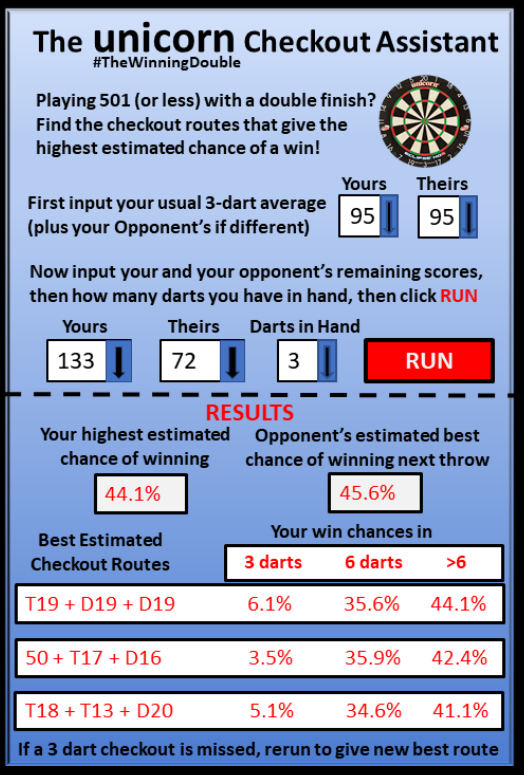
UNIBOFFIN BLOG – JUNE 2021

unicorn®
#TheWinningDouble

Revenge of the CheckOut App

It's been a while since my last blog, a fair bit spent in lockdown at home, and although I appreciated I was luckier than many in being able to do so in relative safety and comfort, that didn't stop me getting just a tiny bit bored. Bored enough, in fact, for an old darts project that had been hanging, like a mathematical Sword of Damocles, over my if-I-don't-look-at-it-it-might-go-away head, to launch a revenge attack.

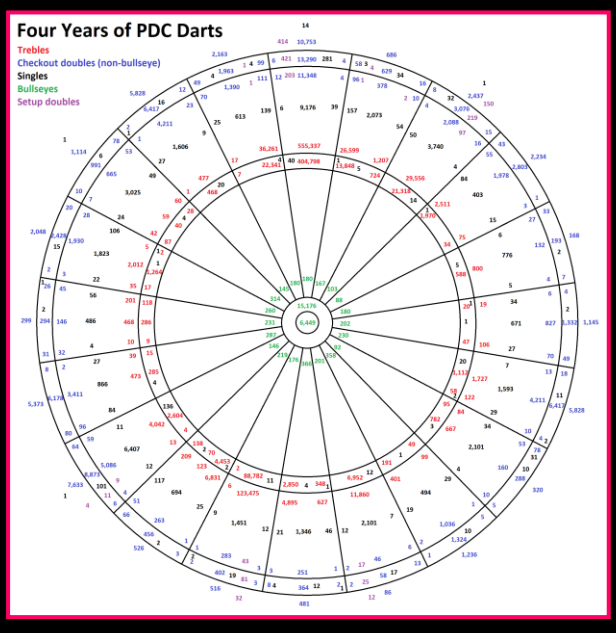
To explain, in 2017 when the PlayWithTheBest website took over the old Unicorn Darts one, the blogs posted on that disappeared down the back of a cyber-sofa. The last of mine was entitled "The Checkout App is in the Post" and it discussed, at frankly horrendous length (OK, still guilty!) why I wasn't about to produce a Checkout app in which "the User would input their and perhaps their opponent's standard… …together with both their scores, and the app would then output estimated probabilities for the best theoretical routes to a win".



On the right is a quick mock-up of what such an app might look like (don't worry too much about the cosmetics or percentages shown, it is just a quick mock-up - I'm too old a dog to learn the new trick of dashing off a quick actual app; an old-fashioned program maybe!).

Of course, one problem with such an app is that it would have to be generic and thus ignore a player's personal preferences for favourite doubles, etc. However, as I said in my blog back in 2017, I didn't see that as a show-stopper because "a player would at least get an idea of the statistical disadvantage they were under when, say, preferring a scoring route that led to double 18 rather than to double 16".

The main reason I actually gave for not producing the app was a lack of data to calibrate the statistical distributions that it would need, the standard go-to of a "normal" distribution not adequately reflecting the occasional wayward darts (known as "outliers" in statistics) that even the best players throw, or the effect of "marker" darts and their converse, widely switched aimpoints. Sounded a good excuse to me!



Since 2017, however, a statistical hero has appeared on the darts scene in the shape of Chris Kempf – Ochepedia, as he is known. On the left, for example, is a visualisation Chris produced for every dart thrown in PDC stage events between 2017 and 2021. Now that's what I call a heroic effort! (and many thanks to Chris for letting me use it).

The huge amount of data on scoring, rejected darts, and other aspects of play that, thanks to Chris, is now available for PDC players meant that, twiddling my thumbs in lockdown, I no longer had a good reason for my previous laz…, I mean logical, decision not to do some actual work to check whether I could produce a valid Checkout app.

UNIBOFFIN BLOG – JUNE 2021

unicorn®
#TheWinningDouble

The first stage in that work was to find some statistical distributions that reflect PDC player accuracy. On the left is a screenshot from a program I wrote to help with this. It's of a type known as "stochastic" or "Monte Carlo" and what it does is conceptually "throw" up to 100,000 darts at the treble, double, or single of any number, plus the bull, on the (HD2!) board. Each hit point is then a random sample from a chosen set of distributions. A graphic of a run at single 20 is inset and, by comparing the stats from this type of run with the equivalent from Ochepedia's data, the distribution's validity can be checked.

Once distributions had been validated, the effects of marker darts, switched aimpoints, and even rejected darts (much more likely with following darts) could be modelled. One result from this analysis was that, on average across players, there didn't seem to be as much variation in accuracy around the board as might be expected (at the bull was slightly better - ironic if 25 is actually wanted!). There was also not too much evidence for an overall left bias (I have a theory right-handers may tend to have one and versa-versa).

Armed with this overall model for the chances of a PDC player hitting, with their first, second, or third dart, a given target or its surrounding beds, I then had an initial stab at a Checkout program to calculate the odds of finishing from up to 350 in up to 6 darts. A key complication here is "surrounding beds", it's fairly simple to calculate the chance of a player checking out by hitting what they're aiming at, but initial misses may still allow a route. For a simple example, that's why pros mostly go for bull first when checking out 132 despite 50, T14, D20 being harder to hit than T20, D18, D18. Missing 50 into 25 still leaves T19, 50 whereas missing T20 leaves only remote chances, such as an accidental D20, to leave a two-dart finish.

So how has my "initial stab" Checkout program turned out? Well, bugs still need fixing and refinements are needed, perhaps including non-middle-of-the-bed targets (for example aiming at the join of 8 and 16 when on 48, or the outside wire when on D1 with three in hand). More work is also needed to extend it to non-PDC standard players. That said, the program has produced interesting results. When "playing" itself at 501 over a million "throws", it had 32,494 games, averaged 90.41, and found that the "player" going first won 62.51% of the time. These figures are realistic, but some other results are more questionable.

One of those concerns the "Deller" checkout of T20, T18, D12 from 138 I discussed in that 2017 blog. That's certainly the route that most standard Checkout tables would list, but what does my program suggest? Well, not that! It reckons T20, T20, D9 is the average PDC player's best bet for finishing in either 3 or 6 darts, with T18, T18, D15 getting second prize for 3 and T19, T19, D12 second prize for 6.

Can that be right? Do standard Checkout tables not always take enough account of factors my program allows for, such as the accuracy disadvantages of switching aimpoints being perhaps greater than those of ending on an odd double? The program is not yet fit enough for purpose to assert that, but even the possibility may suggest making it so, with the aim of perhaps improving those tables or even producing that all-singing-all-dancing app, could be a worthwhile venture.

So, should you fancy getting your hands on such an app, do let me know – enough interest might even justify all the elbow grease I'd need to give that Sword of Damocles a polish!