How Isaac Newton could help you beat the casino at roulette

August 24 2016, by Graham Kendall

Credit: Yuki Shimazu, CC BY-SA

Imagine walking into a casino with a computer strapped to your chest. Solenoid electromagnets thump against your body telling you where to place your bet on the roulette table. Suddenly, you start getting electric shocks. You rush to the toilet to undertake emergency repairs, hoping that the casino staff do not realise what is happening.

In the late seventies, graduate student Doyne Farmer and colleagues did just that – with purpose-built computers that could predict where a roulette ball would land. The project, described in the book The Newtonian Casino (published as The Eudaemonic Pie in the US), was, however, difficult and fraught with technical problems. The team never really found a reliable way of doing it. But decades later, is it any closer to becoming a reality?

In a game of roulette, the croupier spins a wheel in one direction and a ball in the other direction. Players then place bets on where the ball will land by choosing either a single number, a range of numbers, the colours red or black or odd or even numbers.

Our understanding of the physics behind the movement of the ball and wheel is pretty solid – governed by Newton's laws of motion. As the ball slows, gravity takes hold and it falls into one of the numbered compartments. It is predictable when the ball will leave the rim. However once it does, the route it takes to a numbered slot is less so. This is because the ball bounces around as it strikes various obstacles.

Every roulette wheel is slightly different. Atmospheric conditions continually change and the wheel itself has features that encourage randomness – such as the size of the frets between the numbers and the diamond-shaped obstacles that intercept the ball as it falls down to the wheel. This means that you cannot predict the exact number where the ball will land. But you only need to know which area of the wheel the ball will land and you can gain a massive advantage over the casino – more than 40%. This is a huge swing from the 5.26% margin that US casinos have over players – often referred to as the house edge. In Europe it is only 2.7%, as the wheel has only one zero (a US wheel has two zeroes).

Shoe computer. The Eudaemonic Pie display at the Heinz Nixdorf Museum. Credit: https://en.wikipedia.org/wiki/J._Doyne_Farmer, CC BY-SA

Sweaty experiments

When Farmer and his team entered the casino for the first time, two people were wearing computers. One had a computer built into his shoes, with the task of inputting data by tapping switches under the toes. This computer performed two main functions. One was to adjust parameters for each wheel before a game, such as the rate at which the ball and wheel slowed down, and the velocity of the ball when it fell off the track. They also had to determine whether the wheel exhibited any tilt.

The second job was during live play. The player with the shoe computer tapped the toe switches each time a certain point (typically the double zero) on the wheel passed by and also when the ball passed by. Using this information, the program could calculate the speed of both the wheel and the ball – thus knowing when the ball would start to fall. Knowing the relative positions of the ball and the wheel meant that a prediction could be made about where the ball would finally land. The computer then had to transmit the prediction to the person wearing the second computer. This was achieved by weak radio signals.

The second computer, strapped to someone else, received the radio signals and conveyed this information to the player by the solenoid electromagnets that thumped that player's stomach. A code had been developed which relayed the predicted number, with the player placing bets on that number and several numbers either side to account for the randomness. In order that the casinos could not easily see what they were doing, the team altered their betting patterns slightly. For example, not betting on all the consecutive numbers.

However this never gave them the 40% advantage observed in the lab – mainly due to technological problems such as short circuits caused by sweating, wires becoming loose and lost radio connections.

It took several years for the team (which now comprised about 20 people who'd worked on the project in varying degrees) to develop an improved computer system. Both computers were now in custom-built shoes. This could protect the operator from being electrocuted but would also make it harder for the casino to detect. The other innovation was that the computers were set in resin blocks, with only the toe-operated switches and the solenoids that now drummed against the feet, being visible. This was to try and combat the problems such as loose wires and sweating.

They then entered Binion's casino in Las Vegas ready for an all-out assault. Once the parameters had been set, the first prediction was to bet in the third octant – which included the numbers 1, 13, 24 and 36. The ball landed in 13 and the team got paid off at 35-1. The years of work looked promising, but the solenoids eventually started to act randomly, so the accurate predictions from one computer were not being transmitted to the other. The team suspected it was due to the electronic noise present in casinos. Eventually they had no choice but to abandon the idea.

Would it work today?

The main issue in the late seventies and early eighties was that the team had to build their own computers from scratch, literally – they had to design the computer, buy all the components and get busy with a soldering iron. These days, the computers are readily available, as the following video shows.

Technology has evolved. These days, all the required processing power could be fitted into a single unit. You could imagine a system based on a mobile phone where the camera videos the ball and the wheel and image processing software extracts the relevant data so that the prediction software can calculate the final position of the ball.

But certain challenges still remain. If several people are involved, which is the best way to avoid detection, how can you work as a team and pass data? Perhaps the use of free wifi in many casinos could be a solution? Another problem is how to best hide the fact that you are trying to use an electronic device to predict where the ball will land, when you need to input data and receive the prediction. Here, suitably connected glasses may be one get around, used in tandem with toe-operated switches.

The hardest challenge, however, is the casino itself. They are certainly unlikely to simply let you have a camera pointed at the roulette wheel, especially if you are winning. If they did, they would be likely to ask you to leave and as it is often illegal to use such devices. But with a little creativity it may not be long before scientists prove they are able to outsmart casinos.

This article was originally published on The Conversation*. Read the* original article.

Source: The Conversation

Citation: How Isaac Newton could help you beat the casino at roulette (2016, August 24) retrieved 26 April 2024 from https://phys.org/news/2016-08-isaac-newton-casino-roulette.html