Humble-Nishiyama Randomness Game - A New Variation on Penney’s Coin Game

Steve Humble FIMA and Yutaka Nishiyama

This paper offers a variation on Penney’s Game using a pack of ordinary playing cards. The Humble-Nishiyama Randomness Game follows the same format as using Red and Black cards, instead of Heads and Tails. The card game’s finite structure creates a much greater chance of the 2nd player winning, you can use probability theory. Cases such as RRR vs BRR show a higher probability of RRR occurring than HTT in the game TTT vs HTT. Yet for most games the probability calculations become too difficult to manage.

The idea that the 2nd player’s chance of winning with cards is greater than with coins can be seen by looking at the recursive technique which was used to explain the coin game mentioned previously.

Looking at certain cases you can form equations such as these:
Assuming that there is a larger quantity of Black cards left in the pack and looking at RRR vs RRB gives:
\[ X_{RR} = (\text{Prob less than } 0.5 \times \text{Prob greater than } 0.5 \times \text{Prob less than } 0.5 \times \text{Prob greater than } 0.5) \times X_R \]
A higher quantity of Red cards left in the pack gives:
\[ X_{RR} = (\text{Prob greater than } 0.5 \times \text{Prob less than } 0.5 \times \text{Prob greater than } 0.5 \times \text{Prob less than } 0.5) \times X_R \]

Another way to validate the computer simulation is to assume for simplicity in the game RRR vs RRB, that the probability of RRR is at most 1/3 and RRB is at least 2/3.

Let P(RRR,R), the probability that RRB wins the most tricks after n matches in a game, be:
\[ P(RRR,R) = \frac{n}{2} \]

P(RRR,5) = \[ C_5^3 \times (\frac{1}{3})^3 \times (\frac{2}{3})^2 = 0.741 \]

P(RRR,5) = \[ C_5^2 \times (\frac{1}{3})^2 \times (\frac{2}{3})^3 = 0.279 \]

P(RRR,5) = \[ C_5^3 \times (\frac{1}{3})^3 \times (\frac{2}{3})^2 = 0.827 \]

and so on, showing how in the finite game the 2nd player holds a significant advantage.

In the short run, chance may seem to be voluntary and unfair. Considering the misconceptions, inconsistencies, paradoxes and counter intuitive aspects of probability, it is not a surprise that as a civilization it has taken us a long time to develop some methods to deal with this. In antiquity, chance mechanisms, such as coins, dice and cards were used for decision making and there was a strong belief in the fact that God or Gods controlled the outcome. Even today, people see chance outcomes as fate or destiny, “that which was meant to be”.

Maurice Kendall points out that, man is in his childhood and is still afraid of the dark. Few prospects are darker than the future subject to blind chance! [12,2]

REFERENCES
12. Deborah Bennett, Randomness. Published by Harvard University Press 1999

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Steve Humble (aka Dr Maths) works for The National Centre for Excellence in the Teaching of Mathematics in the North East of England (www.nctm.org.uk). He believes that the fundamentals of mathematics can be taught via practical experiments.

For more information on Dr Maths go to www ima.org.uk/Education/DrMaths/Dr Maths.htm

Yutaka Nishiyama is a professor at the Osaka University of Economics, Japan, where he teaches mathematics and information. He is proud to be known as the “benevolent professor.”

He is interested in the mathematics of daily life and has written eight books about the subject. The most recent, The Mystery of Five in Nature, investigates amongst other things, why many flowers have five petals.

Email: nishiyama@okaz.ac.jp