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Random Versus Pseudorandom Physics

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ABSTRACT

Physical processes can be compared to a lottery. This article compares natural physical events to artificial ones created by man's intervention. Manmade physical processes like a lottery cannot be perfectly random. Pure random behavior can only occur in nature without manmade intervention. Said another way all manmade lotteries have a nonrandom bias. The best that can happen is to contrive a lottery that converges on pure random behavior. This article explains why manual intervention invariably results in pseudorandom bias. In this article the label pseudorandom applies to any process occurring in nature that requires man's intervention. The article asserts that Repulsion Gravity can be viewed as the element in nature that causes true randomness. Physical processes like Brownian Motion represent pure random behavior. This article compares random to pseudorandom behavior.

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Introduction

The author's interest in various forms of gambling precipitated a desire to compare the nature of pure random to pseudorandom behavior. To that objective the author of this article developed a way to take advantage of the pseudorandom nature of all lotteries. He developed a unique software that allows one to measure and take advantage of the bias in all manmade lotteries. The software goes under the name BESTLOT and is marketed in the author's EBAY electronic store. Copies of the software have been sold throughout the world. The author is sure that it is the only software ever created that gives an advantage to the lottery player. The BESTLOT software is explained in reference [1]. Also, in [3] Einstein's research on random behavior of Brownian Motion is summarized. The main goal of this article is to compare the nature of random versus manmade pseudorandom behavior. The theorem given next is easily proven and is hardly more than an observation.

Definition: A probabilistic event space is Pseudorandom if and only if there is no way to form a sequence of the events to converge to zero.

Definition: A probabilistic event space is random if it is not Pseudorandom.

Clearly an event space that allows convergence of events to zero is random. The definitions are obvious enough to omit proving they are well-defined. The Pseudo-Random Theorem proves the definitions are well-defined, too.

Pseudo-Random Theorem

Manual intervention into any physical process with a finite number M of probabilistic outcomes cannot allow a random unbroken sequence of the nth outcome occurring to infinity for any member of the event space from n=1 to M.

Pf. Suppose we have an event space of M possible outcomes as in a conventional lottery commonly offered in every state in the USA. There is a finite number of M possible outcomes for any drawing. We can identify each outcome with a probability p_n for n=1,2…M. Each outcome can be chosen infinitely over time but the probability p_n does not change over time. I. e. it is an independent consistent probability that is not affected by its previous occurrences. The probability p_n is the bias that occurs for the nth outcome. Over time none of the members of the event space can have an unbroken sequence of occurrence approaching infinity. For if this were possible then none of the remaining outcomes could occur infinitely contradicting the assumption that all can occur infinitely over time. This proves that the nth outcome from n=1 to M cannot occur as an infinite unbroken sequence of the nth outcome. This observation proves that none of the finite number of outcomes can ever occur as an infinite unbroken sequence to infinity. Every outcome of the outcome space retains its probability p_n regardless of the number of draws of the lottery but never in an unbroken sequence to infinity. Q.E.D.

Corollary 1: All lotteries with a finite number of outcomes have bias p_n for each of its members in its event space.

Corollary 2: It is possible to gain an advantage in winning any lottery because of the bias that must occur for every one of the possible finite possible choices in every lottery.

The software BESTLOT created by the author gives an advantage to winning a lottery. And the advantage can be shown statistically. The Pseudorandom Theorem clearly shows it is possible to have a finite sequence of M hits of the nth outcome with probability p_n^M approaching zero but never can attain zero. Therefore, a positive probabilistic bias exists over an infinite horizon in any finite lottery.

We next address the randomness of natural processes with no intervention by man. This is the random character of the way the universe works probabilistically. Natural physical behavior does not conform to equations. It seems to have a mind of its own. Still, it is possible to describe physical nature to a degree conforming to manmade equations. No amount of equation-building can describe a natural process better than itself. Man attempting to control nature by describing it with equations is doomed often to wrongful conclusions. A poignant example of this error in thinking is in the age-old belief that gravity is an attraction force because it looks that way. According to mythology when an apple fell from a tree Newton concluded that gravity must be like a magnetic force. Sir Arthur Eddington's experiment clearly shows that gravity is a repulsion force unlike the Newtonian myth [2].

Essence of Random Behavior

Consider the essence of what can make perfect random. Often known probability distributions give methods of measuring likely outcomes. But most of the known distributions can only peripherally describe real physical randomness. Had we replaced a finite set of outcomes each with a probability of being selected in a continuum of outcomes it would not make sense to assign a probability to individual single point entries in a continuum of outcomes. A continuum of point outcomes could not satisfy the requirement that the sum of all probabilities of the continuum adds to 1.00. In fact, it is impossible to assign a positive probability to each of an infinite continuum of outcomes. Such an attempt to do so would always result in an infinite sum were it possible to do such a manual infinite addition. Eventually such an attempted addition, if possible, would be a number bigger than one. So, mathematicians had to invent another method for dealing with infinite (and transfinite) possible outcomes frequently occurring in nature. The theory of integration is the mathematical invention that gives the correct way to add infinite outcomes from a continuum of possible outcomes. I. e. assigning a positive valued probability to a point in a continuum makes no sense. The Calculus theory of integration is the tool that solves the mystery of how to add infinite continuous point sets in a continuum. In essence, entries in a continuum can be measured probabilistically as a continuous connected subset of points within the continuum by Calculus Integration.

From the Pseudorandom Theorem we conclude that positive probability measure of points in a finite event space can make sense but not to points from a continuum. We observe from the Pseudorandom Theorem that perfect random can never apply to a finite event space. By contrast, Brownian Motion occurs as a random continuum process of collisions of atoms in a fluid. Such random collisions of atoms in a fluid are at the heart of what causes Brownian Motion in a mixture of atoms in solution. If any soluble substance is put in a fluid the molecules diffuse randomly throughout the fluid with collisions of molecules occurring randomly resulting in what is called Brownian Motion. Einstein's Brownian Movement is explained in both reference [3] and [4]. Einstein theorized that the collection of Brownian particles can be viewed as having a probability density function of Brownian particles at point x at time t as a continuous differentiable probability density function ρ(x,t) starting at time t equal zero. He further theorized that the diffusion equation for Brownian particles can be given as the partial derivative of ρ(x,t) with respect to x and t with D occurring in the equation as a constant known as mass diffusivity satisfying the partial differential equation

i. $\partial\rho/\partial t = D\partial^2\rho/\partial x^2$.

The solution to the partial differentiable equation begins as a Dirac delta function where all the particles are located at the origin at time t=0 and for increasing time become an asymptotic uniform distribution in the form

ii. $\rho(x,t) = 1/(4\pi Dt)^{1/2}\, e^{-x2/4Dt}$

This equation ii. allowed Einstein to calculate moments directly. The first moment vanishes. This is what we would expect if the Brownian movement is perfectly random. Therefore, it seems logical that Einstein's analysis of Brownian motion makes sense. Brownian Motion essentially means a particle can be anywhere at any time colliding with other particles randomly with its average position (x,t) given as the expected value zero calculated by the integral from minus infinity to positive infinity with integrand xp(x,t). I.e., a particle is equally likely to move in any direction and its opposite direction resulting in zero displacement in its expected value of movement. And that is the essence of Brownian Motion.

Another way to view the behavior known as Brownian Motion is to realize that repulsion gravity acts with gravity repulsion force on all particles unbiasedly causing arbitrary random collisions of particles within a closed container of liquid having multiple molecules [2]. Because of the continuous repulsion force of gravity in all directions equally it is obvious that Brownian motion molecular collisions occur in totally unpredictable random paths for all particles in the solution. This is the essence of Brownian Motion as a product of universal repulsion gravity [1]. The expected value of the first moment computed using the probability density function ii confirms that Brownian Motion has zero first moment at all points (x,t) in a continuum as formulated in Einstein's theory of Brownian motion [3].

Pseudorandom Behavior of all Lotteries

We next return to pseudorandom behavior of a lottery. Tests have been done employing the lottery programs known as BESTLOT designed by the author. The lottery programs all employ an intricate proprietary algorithm copyrighted, programmed and tested by the author of this article. BESTLOT was designed based on data from the Michigan state 3,4,5, and 6 ball lotteries [3].

Lottery 101: Most lotteries employ some electro-mechanical means for picking the winning set of numbers. Lottery designers attempt to devise a scheme that gives as close to random of draws as possible. In theory every possible outcome of a draw should have equal probability of occurring. Unfortunately for lottery designers the task is impossible to do according to the Pseudorandom Theorem. However, we observe that a lottery can be designed to converge as close as possible to perfect random with large finite sequences of outcomes in a finite event space. Sample sizing in a lottery should be done optimally to give advantage to the lottery player. If the sample is too large often it is found unnecessary to make picks based on a sample growing too large. Experimenting with sample sizes is the best way to decide how many outcomes give optimal advantage.

The BESTLOT algorithm created by the author in the early 1980s allows one to take advantage of the inevitable non-random lottery bias. The algorithm can be used in ways besides lotteries, too. Any probabilistic situation such as picking stocks could result in more skillful picking stocks with the most likely profit to the investor. Suffice it to say any situation with multiple possible choices that can allow picking the best outcome could use the BESTLOT algorithm advantageously with perhaps minor changes to the BESTLOT software.

Bias Factors: All designers of lotteries try to use a method that comes as close to random selection as possible. Everyone following lottery methods should be familiar with the lightweight numbered balls blowing around in a windy chamber where some seem to randomly fall through a tunnel opening. When the right number of balls falls into the selection tray a winning draw is finalized. The process seems to look totally random. But the Pseudorandom Theorem says otherwise. Simply put, lottery draws are never random. It is preferred to refer to any manmade process that tries to create random behavior as pseudorandom.

No true random behavior can occur by any device having manual intervention. So, what are factors that cause non-randomness? With standard lotteries there are several possible factors. The variable weight of the numbers painted on each ball could be a factor. Generally, it is impossible to make each ball with the same exact weight and shape. Making a collection of perfect balls can be made close to exactitude but impossible for all having the same size and shape. Setting up the draw requires choosing how to enter the balls into the windy chamber. No doubt a bias can be caused by the order the balls are entered. Possibly the first and the last balls and the ones in between could introduce subtle hard-to-detect bias. Man made lotteries simply cannot be perfectly random according to the Pseudorandom Theorem. Many manmade factors impact outcomes in a lottery with a finite event space of outcomes. Nature has no such problem in introducing true randomness. We live in a highly probabilistic universe. In essence, nature has a brain of its own.

BESTLOT Procedural Design: The BESTLOT algorithm constructed by the author is quite intricate and required many hours of careful programming and debugging. The algorithm was originally coded using what was the most popular programming language at that time over forty years ago known as PL1. Languages like PL1 in themselves are algorithms that are customarily referred to as compiler programs. A compiler is a monster algorithm that translates computer programmed instructions into the digital operation of the computer for doing applications (commonly referred to as Apps). Besides PL1 the author programmed the lottery programs in another popular computer language known as the C language. On comparing the two languages it was found that the PL1 was more efficient.

What does BESTLOT do: BESTLOT works on actual lottery data. The computer software was designed to handle up to 200 of the last draws of any lottery. Though it would be quite easy to increase to any number of draws with very minor modifications of the coding. Early on experiments with the program showed that larger numbers of past draws considered tended to make outcomes converge to random behavior losing advantage to the player. It was found that the optimal advantage gained using the inherent bias diminished to the point that there was no reason to use more data after an optimal point. Experimenting with the algorithm for the Michigan Lottery found that the optimal advantage gained in playing any of the lotteries was well under100 past draws.

How does BESTLOT proceed: BESTLOT proceeds by finding the most frequently occurring ball numbers or using a selected starting ball number. BESTLOT next finds the most frequently occurring ball numbers that occur with the starting point lottery number(s). The process proceeds recursively until all numbers have been compared to the ones listed before them in the recursive chain of runs while exhausting all possible ball numbers. Michigan's LOTTO47 lottery uses 47 balls. So, the algorithm terminates after 47 balls are exhausted and included in the recursive chain of outcomes. At each iteration of the software the balls are tallied for frequency. If the user of the software asks the program to start the ball rolling with the balls occurring the most frequently then the BESTLOT automatically finds the balls with the highest frequency. There could be more than one ball in the first of the recursive iterations. And the progressive iterations behave the same way with often two or more ball numbers in the same iteration. If selection is random then every ball number would be assigned identical frequency. It is easy to see that this cannot happen as a reflection of the power of the Pseudorandom Theorem. Oddly the author has had on rare occasions a lottery ball not occurring even once or twice when others occur over 20 times. This situation when it happens surely demonstrates the impossibility of a lottery being perfectly random and challenges lottery builders. And no doubt the lottery designers try to even out the outcomes. Lotteries mission is to prevent folks from finding a way to beat their system. The author is aware of claims that some players of a lottery have found a way to beat the lottery builders. One of the buyers of BESTLOT happened to own a lottery store. He asked the author to not market his software because it was too good and would simply make less profits for those who sell lottery tickets. Some states give a bonus to a lottery store that sells a big winner. The author believes the buyer of his lottery store profited from selling lottery tickets based on BESTLOT.

Lottery Efficiency Tests: For the purpose of verifying the efficiency of BESTLOT Dr. Brierly did a test of the Michigan Four Ball lottery. Using a recent set of outcomes for the Four Ball lottery the author tabulated successful outcomes against a true data set of outcomes. Three months of past winning draws were tested to see how many winners could be had compared to the amount of bet money. It was found that three months of comparisons of draws resulted in three winners of the 5000 dollars offered for picking a winning draw. Buying 150 tickets per day using the Four Ball lottery program resulted in winning 15000 dollars at a cost of betting 13500 dollars. The experiment had been performed several times in past years with a similar result.

To get an idea of how effective the author's Four Ball lottery program works we need to calculate the total number of possible outcomes in a four-ball lottery. The computation is easily found to be 10x10x10x10 or 10,000. The lottery commission in Michigan offers 5000 dollars to any number of players hitting the four-ball outcome. Obviously, the lottery commission knows that the FourBall lottery is guaranteed to make a huge profit despite paying half of the number of the 10,000 likely outcomes.

Testing the Michigan six-ball lottery was done using a different technique. To accomplish that goal a fresh number of past 80 outcomes were inputted in the data file of outcomes. The six-ball lottery software was applied yielding the chain of iterations of the lottery outcomes. A search of the lottery files determined how many iterations each of the winning numbers in the draw would require. Once that is done then all one does is compare how many number combination draws are needed to choose a guaranteed winning ticket. The total number of possible outcomes for a 47 ball lottery is a standard calculation for a 6-ball lottery. It is simply computed as $47!/(41! \text{ X } 6!)=10,737,573$ possible outcomes.

A Strategy that all but Guarantees to win Big Payoffs Regularly is now explained: BESTLOT makes it possible to all but guarantee winning huge jackpots on a regular statistical basis using past draws. The player would have to test a selection of 6 ball picks to make the most likely successful bet. To that goal, BESTLOT output gives the number of balls that occur before any and all of the 6 picked balls shows up for the first time in the data of past draws. The best strategy to win would be to play all possible combinations of ball numbers that occur in the one that requires the maximum number of draws. However, since you do not know that until the lottery picks a winner one would have to do a statistical study to find the optimal number of tickets to buy. As you can see from the following experiment one of the test results shows only 1200 tickets were necessary to win. One could do the experiment on known winning tickets and arrive at an optimal number to buy to all but guaranteeing an eventual large winning payoff.

Test Results for 5 Recent Draws of Michigan Lotto47 Winning Draws

The winning draw 9-16-17-22-28-36 shows ball 36 is the ball of this draw that requires 31 choices of balls to be certain that all remaining balls are in the winning draw. It is easy to compute that 31!/(25!x6!)=736,281 would be the likely amount of lottery tickets required to win the jackpot. Obviously, this winning draw would be a great bet if the pot has grown to a much larger payoff than the bet. At times the Michigan LOTTO47 generates a jackpot of over 10 million. But there is still an unlikely chance that the jackpot would have to be shared with others. So, if the pot builds up to 10 million it is possible one could only win five million if the jackpot is shared with one other lucky player. Most winners do not have to share the pot due to the large number of possibilities of the lottery tickets bought by the losers.

Here are the results of three more attempts to buy a large jackpot built up by other players. The calculation to assess the potential profit is the same as in the case just explained.

Lottery Pick	Required Bet to Have Most Likelihood Win of Jackpot
1-2-11-26-34-41	$ 1,200
6-7-21-33-36-41	$593,779
21-31-38-39-41	$1,947,792

The author could list many more winning outcomes that could be used to win most any six-ball Michigan lottery. Often it occurs that a very small bet like the second one listed can be won for a very small number of 1200 tickets. Since the Michigan six ball lottery has had up to more than 10 million dollars accumulated with no one winning clearly there is a great possibility to buying the lottery prize [4, 5].

To the author's knowledge at least one syndicate has used the strategy to buy a huge jackpot somewhere in Texas. Likely the syndicate did not have the author's software to make an ideal statistically likely winning bet. And the syndicate doing the project could not make all 10,737,573 manually but were lucky to win the jackpot with the very large number of tickets they purchased. You can guess that applying the author's strategy outlined would surely win many huge jackpots over time. But few bettors have the capital to buy thousands of tickets. Moreover, in most states like Michigan each bet must be individually listed as a ticket or punched in on the computer entry method for lottery picks available in the Michigan lottery. Imagine how overwhelming that task could be! You can bet the author Dr. J. Brierly will never buy a lottery jackpot in Michigan.

Conclusion

This article surely compares the pseudorandom methods to the random methods of nature. Dr. Brierly offers his software cheaply in his EBAY electronic store. But he does not have the desire or capacity to sell many of the software packages that are still available in his EBAY electronic store. This paper is not meant to be an advertisement for software sales. Its main purpose is to clarify nature's random processes compared to man's pseudorandom processes. This research article supports confirming the Einstein theory of Brownian Motion and compares the way random and pseudorandom processes relate to each other. The article also captures the essence of how repulsion gravity is at the heart of random Brownian Motion. And in the final analysis the comparison of random to pseudorandom processes gives the overall picture of how our universe works probabilistically.

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