A Mechanical Random Number Generator

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Introduction

Truly random numbers are a very valuable and rare resource. Design, produce, and test a mechanical device for producing random numbers. Analyse to what extent the randomness produced is safe against tampering. So many ways were in use to generate random numbers until now .There were simple ways like throwing a dice or flipping a coin and some complex ways like lotto machine .Also there are many ways to generate random numbers in computer.

Random numbers are rare, useful and valuable resources and they are used for gambling, statistical sampling, computer simulation, cryptography, completely randomized design, and other areas where producing an unpredictable result is desirable. There are many ways to generate them like mechanical devices as roulette wheels, lotto machine, dice and so on; and the computer methods as defining a function like rand function in quick basic programing language and so on. But how random are they and how can we get sure that no one can cheat?

Experiments

To solve this problem two ideas were closer to reality. The first one was to make an icosahedron dice and the second was to prove that a disk gives us numbers randomly. So I have two ways to test the randomness of the numbers; first is the practical way which is to get a large amount of random numbers of the device and calculate the percentage of numbers, and the second is to theoretically prove that they are random. Actually both of them were used to prove that this dice is what the question asked to make. So I made my icosahedron by magnets and then I put numbers 1 to 20 on its faces. It weights nearly 1kg and its longest diameter is about 8cm and the edges are 4cm. For the first method (to get a large amount of numbers and calculate the percentage of every number), I diced for 640 times. As we got in the practical way its tolerance of randomness is about 2%. If we use the method of having the highest and the lowest percentage difference as our tolerance, that it should be less than 5%, if we want to assert that it gives us random. The second method is to calculate the average of tolerances of each number. By this way it will become 0.45% and if we want to assert that it's randomly, it should be less than a limit between 1% and 2% (according to how much random do we expect it to be); that the dice lives up to this too.

References

1-http://www.ams.org/samplings/featurecolum
/fcarc-five-polyhedra
2-http://www.cut-the
not.org/do_you_know/polyhedra.shtml