Lab 1

Daniel Molenhuis

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1 Random Numbers

We may all have an intuitive sense of what a random number is. We may think of choosing lottery numbers and the respective draws that occur. This is a repeated process without any deterministic pattern. Mathematically this can be a bit tricky to understand. See the code example.

Randomness: a lack of predictability
Random Number Generator: generation of a number sequence without any pattern.
Pseudorandom Number Generator: algorithm that describes properties of randomness. We begin with a state, using a seed producing the same sequence.

Example:
1/ Try random number generation using the GSL GNU scientific library:
https://www.gnu.org/software/gsl/ see rng.cpp
2/ Consider the RANDU problem: https://en.wikipedia.org/wiki/RANDU

2 Properties

Probability Density Function: a function whose definite integral over a given range gives the probability of occurrence within that range.
Cumulative Distribution Function: gives the probability that a random variable is less than or equal to the independent variable of the function.

3 QUESTIONS

1/ What base 10 number is defined by (sign, fraction, base, exponent) = (1,your-name,13,1)

[width=0.1cm]RANDU.JPG

Figure 1: RANDU output

2/ On paper, calculate the following as a base ten integer:
sign = 1
exponent = 10110101
fraction = 000000000000001000001011
3/ Determine the first 20 values of the Fibonacci sequence
4/ Write a function that generates the pseudorandom number generator known as RANDU. The range is [0,1], begin with a seed of 12345, with 10E+05 instances.