TFY4235/FY8904 Computational Physics, Spring 2013

Problem Set 6

Problem 1.

Generate a sequence of 10 000 pairs of random numbers (r_{i-1}, r_i) using the "16807" generator and the generator build into the compiler you are using. Plot the pairs in the plane $x \in [0,1]$ og $y \in [0,1]$ for both generators. Then plot a similar number of random number pairs, but limited to the quadrant $x \in [0, 0.001]$ and $y \in [0, 0.001]$. Comment on the result.

Problem 2.

We will here attempt to determine whether extremely tall people are just statistical fluctuations that can be expected from the distribution the rest of us follow, or if they follow a different statistical distribution.

This is not such a daft question as it may seem at first. If one records the statistics of wealth, the very rich do *not* follow the statistics most people do. Wealth is distributed according to a Gaussian, but for large values, there is a fat tail, called the Pareto tail. The wealthy are much more numerous — in fact by orders of magnitude — than the Gaussian distribution would predict.

Is the same true for the height of people? Let us investigate this.

The tallest person alive in 2008 is Leonid Stadnik in the Ukraine. He measures 2.57 meters. The second tallest person is China's Bao Xishun who is 2.36 meters tall.

The height of people follows a Gaussian distribution. If we draw M batches of N numbers from a Gaussian, what is the average value of the *largest* number in each batch contaning N numbers? Find numerically the functional dependency of this average value on N. Use this to predict the height of the tallest American and tallest Norwegian. Are the results consistent with the assumption that the tallest people in the world got so by statistical fluctuations? Here is a list of the average heights of people around the world: `http://en.wikipedia.org/wiki/Human_height`.