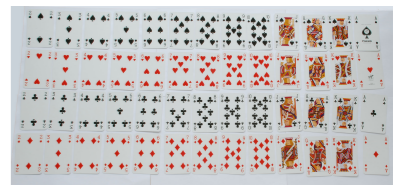


Multipurpose MIXMAX Random Numbers Generator

Georgios Savvidis

National Centre for Scientific Research "Demokritos"



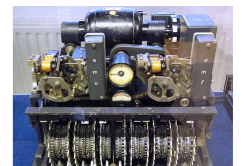
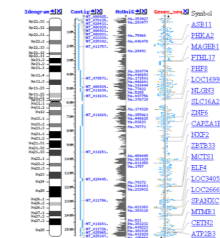
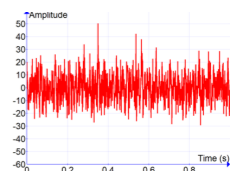
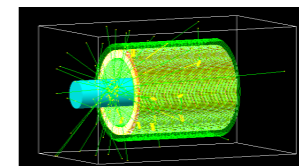
Random Number are used from ancient times:

1. Backgammon game - the random numbers generated by dice
2. Deck of playing cards - the cards are distributed randomly by hands.
3. Lottery Machine - used to generate lucky numbers.
4. Monte Carlo spinning roulette- to determine the winning number and colour.



Random Numbers Generator is in the heart of the modern Monte Carlo Method:

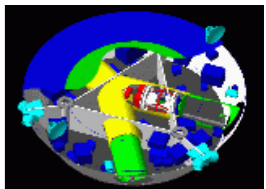
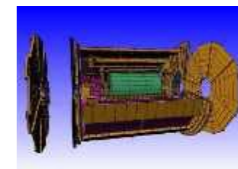
1. Used in Manhattan Project
2. To simulate propagation of high energy particle
3. Modelling radiation dosimetry
4. Estimating radiation transmission in medical applications
5. Advanced signal processing and filtering method
6. Computational physics and molecular chemistry
7. Designing detectors
8. Computational biology, computational pharmacology
9. Computational and Statistical Genetics
10. Communication, telecommunication, cryptography, including: electronic commerce,
11. chip-based payment cards, digital currencies, computer passwords and many others..



Development and Implementation of the MIXMAX Technology

Development of the MIXMAX Random Numbers Generator:

1. The MIXMAX Consortium has developed a cutting-edge theory of the MIXMAX generator.
2. The MIXMAX code in C and C++ was developed by Konstantin Savvidis.
3. The MIXMAX code generates 64-bit high quality random sequences.
4. It is one of the fastest generators on the market.
5. <http://www.inp.demokritos.gr/~savvidy/mixmax.php>



Implementation of the MIXMAX Technology:

1. The MIXMAX generator has been implemented into **Geant4** software at CERN. Its areas of application include high energy, nuclear and accelerator physics, as well as studies in medical and space science: <https://geant4.web.cern.ch>.
2. The MIXMAX generator has been implemented into **PYTHIA** software at Lund U http://home.thep.lu.se/~torbjorn/doxygen/MixMax_8h_source.html
3. The MIXMAX generator has been implemented into the **GSL - GNU Scientific Library** <https://www.gnu.org/software/gsl/>
4. The MIXMAX generator is implemented into the **ROOT** library at CERN:
5. <https://root.cern.ch/doc/master/classTRandom.html>
ROOT at NASA Space Radiation Analyses Group, Johnson Space Centre

