

The b -adic Diaphony as a Tool to Study Pseudo-randomness of Nets

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We consider b -adic diaphony as a tool to measure the uniform distribution of sequences, as well as to investigate pseudo-random properties of sequences. The study of pseudo-random properties of uniformly distributed nets is extremely important for Monte Carlo and quasi-Monte Carlo integration. It is known that the error of the quasi-Monte Carlo integration depends on the distribution of the points of the net. On the other hand, the b -adic diaphony gives information about the point distribution of the net.

Several particular constructions of sequences $(x_n), n = 0, 1, \dots$ are considered. The b -adic diaphony of the two dimensional nets $\{y_n = (x_n, x_{n+1}), n = 0, 1, \dots, M - 1\}$ is calculated numerically. The numerical results show that if the two dimensional net $\{y_n\}$ is uniformly distributed and the sequence $(x_n), n = 0, 1, \dots$ has good pseudo-random properties, then the value of the b -adic diaphony decreases with the increase the number of the points. The analysis of the results shows a direct relation between pseudo-randomness of the points of the constructed sequences and nets and the b -adic diaphony as well as the discrepancy.