Simulation of dice rolls

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Abstract

In this work numerical simulation are used for verifying the law of large numbers [1] and the central limit theorem.

Contents

Chapter 1

Mathematical Introduction

This is simple text. Multiple spaces are treated as only one.

A single empty line means nothing.

Two or more empty lines means newline.

graphs define scopes.

1.1 Definitions

Definition 1. *A N-**faced die** is the set $\{n \in \mathbb{N}$ with $n \leq N\}$.*

Please, typeset units with siunitx: $1.5 \times 10^4\,\mathrm{m\,s^{-1}}$.

1.2 Theorems

Theorem 1. *The **expected value** of a N-faced die is:*

$$\mathrm{Exp}[N] = \frac{\sum_{i=1}^{N} i}{N} \tag{1.1}$$

Proof. Assuming that each face has the same probability the expected value is obtained with an arithmetic mean, which is exactly (1.1). □

Theorem 2 (The law of large numbers)**.** *The average value of N die rolls goes to the expected value if $N \to \infty$.*

Proof. The proof is left as useful exercise to the reader. □

Theorem 3 (The central limit theorem)**.** *If $d1$, $d2$ are two dice N-rolls, and s is the sum of the results of $d1$ and $d2$, then s is a Gaussian if $N \to \infty$.*

Proof. Trivial. $\square$

Chapter 2

Results

2.1 The law of large numbers

The law of large numbers is verified:

LaTeXhas a powerful packages for drawing plots.

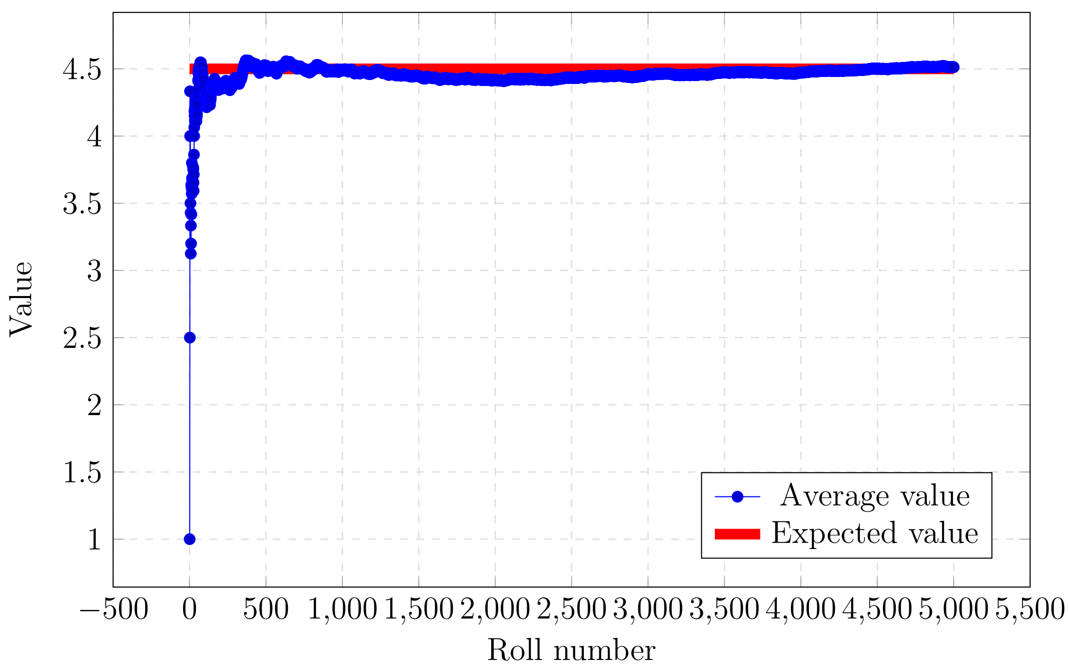

Figure 2.1: The law of large numbers

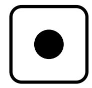

Figure 2.2: A simple die

2.2 The central limit theorem

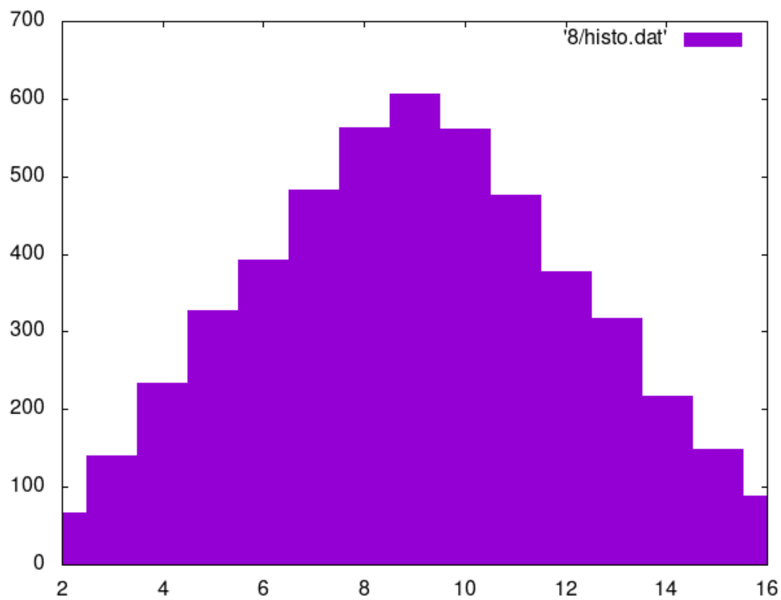

Figure 2.3: The central limit theorem

Table 2.1: Some data

Roll number	Value
1	4
2	8
3	2
...	...

Bibliography

[1] Feller, W. *The Strong Law of Large Numbers*. 10.7 in An Introduction to Probability Theory and Its Applications, Vol. 1, 3rd ed. New York: Wiley, pp. 243-245, 1968.