Zhukova I. N., Alieva S. M. (Adyghe State University, Republic of Adygea, Russia) — **The physical model «Maxwell-Rayleigh gun».**

A statistical distributions are actively used in physics to solve a wide range of problems. For example, in the course of molecular physics [1,2], the Maxwell–Boltzmann distribution of ideal gas molecules over velocity is considered in form

$$f(v) = \frac{v^2}{\sigma_0^3}\sqrt{\frac{2}{\pi}}\exp\Big(-\frac{v^2}{2\sigma_0^2}\Big),$$

where the parameter σ_0 is related to the standard deviation [2, p. 68]: $\sigma = \sqrt{\dfrac{\sum_i (x_i - \overline{x})^2}{n-1}}$.

As an example, a similar velocity distribution of molecules is found for a two-dimensional ideal gas and is called the two-dimensional Maxwell–Boltzmann distribution [3], which in mathematics is known as the Rayleigh distribution [2, p. 68]:

$$f(v) = \frac{v}{\sigma_0^2}\exp\Big(-\frac{v^2}{2\sigma_0^2}\Big), \ \ \sigma^2 = \sigma_0^2\Big(2 - \frac{\pi}{2}\Big).$$

In [1, 4], the following analogy is proposed between the velocity distribution of molecules and the distribution of shots when shooting at a target: shots hitting different columns of the target are distributed according to the Gauss distribution, and shots hitting different rings of the target are distributed according to the Rayleigh distribution.

This work is dedicated to verifying the validity of the proposed analogy. To do this, "shooting"was carried out with a dart vertically falling from one point onto a horizontal "target". The dart is affected only by gravity and air resistance, which do not change during the experiment. Therefore, the results of the deviation of the dart from the vertical line drawn from the "starting"point using a plumb line can be considered as random events.

Several series of described "shootings"of 80 "shots"were conducted, the results of which were averaged. The standard deviation was within certain limits and depended on the specified initial height of the dart. The distributions were identified using the Pearson's consensus criterion. As a result, we found that the distribution of shots over the rings into which the target is divided is in agreement with the Rayleigh distribution, and the distribution of shots over the columns into which the target is divided is in agreement with the Gauss distribution.

The conducted experiment can serve as both a Rayleigh and Gauss "gun"for obtaining data distributed according to the specified statistical distributions.

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