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Abstract

Continuity or discreteness?

Are the space and time continuous or discrete?

The aim of research was investigating phenomenon of space and time continuity and discreteness hypotheses. The actuality of this task is intertwined with problems of science since ancient times as a paradox.

Modern physics is based on the hypothesis of space and time continuum of the universe. Which hypothesis is more trustful and closer to reality we need a physical experiment. To do this, the well-known phenomenon of free fall from a state of rest was considered. Within the continuity hypothesis, we get the equation of motion. According to the discreteness hypothesis, I got the different equation of motion. Which equation reflects the reality can be answered by the experiment.

Atwood machine was used for this reason. Atwood machine was modified for the purpose of the experiment. Both equations for applying it and checking on the device was deduced to dynamics of Atwood machine accordingly. The experiment was conducted for different load masses and equation dependencies were checked for different heights and times of falling system. Graphs were made and the equation was analyzed for each load mass of falling system. The relative error of measurements was calculated. According the free-falling concept, the acceleration of system needs to stay constant for any height of fall system and any masses in conditions of falling altitude considered in experiment of Atwood machine. As experiment showed discreteness hypothesis is in relevancy with measurements.

The comparison of continuity and discreteness hypotheses of space and time is discussed. For this, the magnitude of the acceleration of free fall was deduced from the hypotheses of continuity and discreteness, and was measured experimentally using the Atwood machine. The comparison showed that the hypothesis of discreteness reflects reality more accurately and relevantly than the hypothesis of continuity.