



Analytical expression in terms of the line integrals for a potential of the polyhedral bodies with linearly varying density

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The analytical expression for the gravitational potential of an arbitrary polyhedral body with the linearly varying density in terms of the line integrals is derived. The corresponding analytical expression for the attraction is known. The conversion of Newton's volume integral into the sum of line integrals for the polygon segments which form the edges of polyhedral body is done by applying the Gauss divergence theorem. The singular terms of the analytical expression are evaluated. The line integral approach can facilitate the linear density models created for more complex geometrical bodies. As consequence, the numerical efficiency increases comparing with the commonly used numerical and semi-analytical integration methods or alternatively the analytical rectangular prism approach.