The Al-Hamed Equation in Mechanical Motion: An Improvement of Newton's Second Law

Author and Researcher: SALEH ALI SALEH AL HAMED

Independent Researcher

Email: saleh.ye3@gmail.com | Phone: +967775572377

Abstract

This research presents a new equation, the Al-Hamed equation, which incorporates friction force to improve the accuracy of Newton's second law of motion. A practical example is analyzed, and results are compared with those obtained using Newton's second law.

Introduction

Newton's second law of motion is fundamental in physics, describing the relationship between force, mass, and acceleration. However, this law does not explicitly account for the force of friction, which significantly affects motion. This research introduces the Al-Hamed equation, which includes friction to provide a more accurate model of motion.

Theory

Newton's Second Law of Motion

The classical form of Newton's second law is given by:

$$F = ma$$

Force of Friction

Frictional force is given by:

$$Fr = \mu N$$

where μ is the coefficient of friction, and N is the normal force.

Al-Hamed Equation

To include friction, the Al-Hamed equation modifies Newton's second law as follows:

$$Fs = (F - Fr) = ma$$

Application and Analysis

Consider an object with a mass of 10 kg subjected to an applied force of 50 N on a smooth surface. The friction force between the object and the surface is 10 N.

Using Newton's Second Law of Motion

$F = ma$

$50\ N = 10\ kg \times a$

$a = 5\ m/s^2$

Using Al-Hamed Equation

$Fs = (F - Fr) = ma$

$Fs = (50\ N - 10\ N) = 10\ kg \times a$

$Fs = 40\ N$

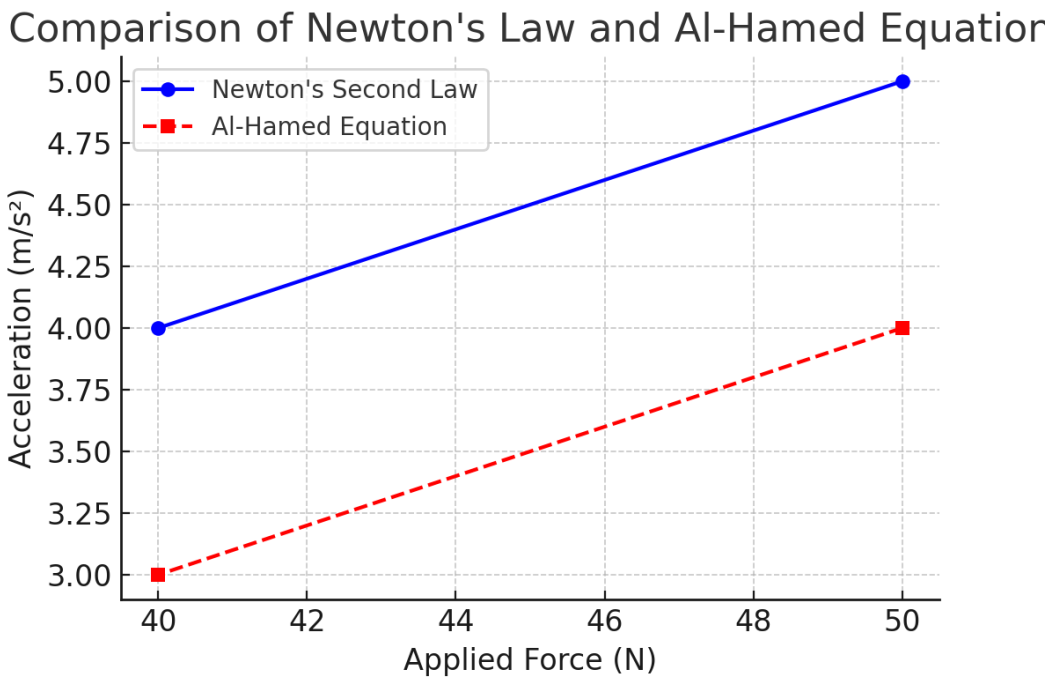
$a = 4\ m/s^2$

Results Table

Force (N)	Friction Force (N)	Acceleration (m/s^2)
50	10	5
40	10	4

Graphical Representation

The following graph compares acceleration computed using Newton's second law and the Al-Hamed equation:



Analysis and Statistics

From the table and graph, we observe that the acceleration computed using Newton's second law is 5 m/s^2, while using the Al-Hamed equation, it is 4 m/s^2. This demonstrates that including the friction force leads to a more accurate representation of motion.

Conclusion

The Al-Hamed equation improves upon Newton's second law by incorporating the force of friction, leading to a more realistic description of mechanical motion. This equation has applications in physics, engineering, robotics, and space sciences.

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