Commentary
Volume 9:1, 2022

Journal of Fluid Mechanics: Open Access

ISSN: 2476-2296 Open Access

Harmonic Oscillator in Mechanical Engineering

Joze Duhovnik*

Department of Mechanics, University of Ljubljana, Slovenia

Description

The quantum harmonic oscillator is a quantum mechanical counterpart to the classical harmonic oscillator. One of the most significant model systems in quantum mechanics is the arbitrary smooth potential, which can usually be represented as a harmonic potential in the neighbourhood of a stable equilibrium point. It's also one of the few quantum-mechanical systems for which a precise, analytical solution exists. In terms of physics, this indicates that a classical oscillator can never be located beyond its turning points, and its energy is solely determined by the distance between the turning points and the equilibrium position [1].

A classical oscillator's energy fluctuates continuously. The lowest possible energy for a classical oscillator is 0, which corresponds to an object at rest in its equilibrium position. A classical oscillator in its zero-energy state has no oscillations and no motion (a classical particle at the bottom of the potential well in. When an object oscillates, it spends the majority of its time near the turning points, regardless of how large or tiny its energy is. Periodic motion is exemplified by the harmonic oscillator. The atoms in a crystal are temporarily displaced from their regular positions in the structure due to the effects of the temperature [2].

Thermal energy absorption As a result, inter-atmoc forces obeying Hooke's Law act on the atmosphere. Artoms displaced each atom vibrates about its normal under the influence of such restorative forces location, which is the ideal structure's right position. As a result, each atom's vibrations are those of a basic harmonic oscillator are comparable. The spring's restoring force is plainly electromagnetic. The rules of electromagnetism (Maxwell's laws) and the Lorentz force law would have to be utilised to establish the spring's restoring force in order to obtain a fundamental model. No one knows how to construct a model like this. Instead, a constitutive law, which is designed to be a good approximation of reality, could be used to represent the force. Hooke's law is the most common force law: the restoring force is proportionate to the displacement and directed toward the mass's equilibrium position [3].

Although we begin with a mechanical example such as a weight on a spring, a pendulum with a small swing, or other mechanical devices, we are actually studying a differential equation. This equation appears frequently in physics and other sciences, and it is a component of so many events that it is well worth our time to investigate further. The oscillations of a mass on a spring, the oscillations of charge flowing back and forth in an electrical circuit, the vibrations of a tuning fork that generates sound waves, and the comparable vibrations of the human body are all examples of phenomena involving this equation [4].

The probability density of the ground state is concentrated at the origin, implying that the particle spends most of its time at the bottom of the potential well, as one would anticipate for a low-energy state. The probability density peaks at the classical "turning points," where the state's energy corresponds with the potential energy, as the energy increases. This is compatible with the classical harmonic oscillator, in which the particle spends more time (and hence is more likely to be found) near the slowest turning points. As a result, the correspondence principle is satisfied. Furthermore, coherent states, which are nondispersive wave packets with low uncertainty, oscillate similarly to classical objects [5].

Conflict of Interest

None.

References

1. Zhang, Hao, Wei Liu, Honghui Ding and Feng Zheng. "Multi-harmonic oscillation and stability analysis of double-input buck/buck-boost inverter." *IET Power Electro* 14 (2021): 38-50.
2. Zhao, Liyun, Jinchen Ji, Hongbo Bo and L.V. Jianfeng. "Weighted coordinated motion for coupled harmonic oscillators with heterogeneous interactions of cooperation and competition." *Int J Sys Sci* 52 (2021): 1026-1041.
3. Huijie, Shi, Gao Ming, Hu Enxin and Yan Dongfu, et al. "Analysis of the influence of oscillator stiffness parameters on vibration transmission characteristics of Drude model acoustic metamaterial with series double harmonic oscillators." In: *J Physics:* Conference Series, IOP Publishing, (2021).
4. Goswami, Amit, Sushila Rathore, Jagdev Singh and Devendra Kumar. "Analytical study of fractional nonlinear Schrödinger equation with harmonic oscillator." *Discrete Contin Dynam Sys S*14 (2021): 3589.
5. Salas, Alvaro H, S.A. El-Tantawy and Noufe H. Aljahdaly. "An exact solution to the quadratic damping strong nonlinearity Duffing oscillator." *Mathem Prob Eng* (2021).

***Address for Correspondence:** Joze Duhovnik, Department of Mechanics, University of Ljubljana, Slovenia; E-mail: joz.duhovnik@lec.si*

Received: 04 January, 2022; Manuscript No. fmoa-22-64856; **Editor Assigned:** 05 January, 2022; PreQC No. P-64856; **Reviewed:** 13 January, 2022; QC No. Q-64856; **Revised:** 18 January, 2022, Manuscript No. R-64856; **Published:** 25 January, 2022, DOI: 10.37421/2476-2296.2022.9.210

How to cite this article: Duhovnik, Joze. “Harmonic Oscillator in Mechanical Engineering.” *Fluid Mech Open Acc* 9 (2022): 210.