ISSN: 0975-833X

Available online at http://www.journalcra.com

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

International Journal of Current Research
Vol. 13, Issue, 08, pp.18402-18403, August, 2021

DOI: https://doi.org/10.24941/ijcr.42041.08.2021

RESEARCH ARTICLE

EQUATION OF MOTION

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ARTICLE INFO

ArticleHistory:
Received 27th May, 2021
Received in revised form
30th June, 2021
Accepted 25th July, 2021
Published online 30th August, 2021

Key Words:

Motion.

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ABSTRACT

This paper describes an equation of motion that should also be considered during analysis of mechanical motion

Citation: Nripesh Trivedi. "Equation of motion", *2021. International Journal of Current Research, 13, (08), 18402-18403.*

INTRODUCTION

Equation of motion: Equations governing displacement, velocity and acceleration are given by –

Displacement - dx (1)

Velocity - $\frac{dx}{dt}$ (2)

Acceleration - $\frac{d^2x}{dt}$ (3)

Another equation to be considered is given below –

Motion - $\frac{ds}{dt}$ (4)

where s denotes the direction of motion (equation of motion)

It becomes easy to analyse mechanical motion if we use this equation of motion as the first equation and consider equations of displacement, velocity and acceleration later. To consider this equation, we differentiate motions into two types of motions. First, linear in direction change and second quadratic in direction change with respect to time. An example of this equation (linear) (equation of motion) is found in [1] where it is mentioned that ball stops to change the direction of displacement. Another example (quadratic) is circular motion. The motion as described in [1] could be identically compared to the motion of ball when it is straight thrown up in the air. We are interested in the topmost point where the ball stops to change the direction of displacement. According to equation (4), the direction of displacement or direction of motion changes linearly with respect to time. Thus, the motion is with constant velocity and zero acceleration at topmost point. (linear directional change on first differentiation with respect to time gives a constant velocity, the second differentiation in direction with respect to time gives zero acceleration). This is by considering the equations of displacement, velocity and acceleration as per the directional differentiation with respect to time. The circular motion is given by quadratic change in direction of motion according to equation

A (acceleration) - $\frac{mv^2}{r}$

Quadratic directional change on first differentiation with respect to time gives a linear directional velocity, the second differentiation in direction with respect to time gives constant acceleration. This is by considering the equations of displacement, velocity and acceleration as per the

directional differentiation with respect to time. Thus motion with acceleration (or constant acceleration).

REFERENCES

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