Advances in Environmental Biology, 8(9) Special 2014, Pages: 746-753

AENSI Journals

Advances in Environmental Biology

ISSN:1995-0756 EISSN: 1998-1066

Journal home page: http://www.aensiweb.com/aeb.html

Sustainable Dynamics

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ARTICLE INFO

Article history:
Received 2 April 2014
Received in revised form 13 May 2014
Accepted 28 June 2014
Available online 23 July 2014

Keywords:
sustainable dynamics, materials

ABSTRACT

Sustainable Dynamics: Dynamics is the science of motion generated by forces and sustainable means permanent or continuous. The concept of sustainable dynamics thus means incessant motion in relation to a moving object witch enjoys permanent motion, for example, the permanent motion of electrons round nuclei, the moon round the earth and/ or the earth round the sun. In this formula, the permanent motion of the moving object round the origin of coordinates in space is studied. Regarding the importance of masses motion in space, it is felt that, in order to design and optimize dynamic systems (dynamic mechanics) and all relevant subsets, a well-reasoned relation should be presented. Effort is made in this formula to prove the relations in question in the simplest possible way.

To Cite This Article: Sustainable Dynamics, Mohamad Mahbod, Mohammad Reza Mahbod, Amir Mohammad Mahbod, ***Adv. Environ. Biol., 8(9),*** *746-753, 2014*

INTRODUCTION

In relevant dynamic mechanics literature, the issue of motion related to a moving object is discussed and established. For instance, the trajection of a particle into space, the range of the moving object, force moving peak point, and the mass and acceleration of the moving object are dealt with and there are compiled and well-documented formulas.

This formula deals with the moving object permanent motion and as stated in the Abstract, the formula of the moving object permanent motion, ie, the same sustainable dynamics of the moving object, has been established. The formula in question is initially proved in the plane (X O Y) and is then generalized in other coordinates planes (X O Z) and (Y O Z). In the end, by having 3 images of the moving object in the above mentioned coordinates planes, the following general formula of the moving object in space can be obtained:

$$m.V_A.(\overline{OH})_A = m.V_B(\overline{OH})_B = m.V_c.(\overline{OH})_C = m.V_D.(\overline{OH})_D$$

Where m= mass of the moving object and

$\overline{(OH)}$A= vertical distance from point (O) to velocity vector V_A at point A.

In plane (X O Y), assume a moving object with mass m and velocity V(x,y)A. If this object permanently moves round the origin of coordinates, the following relation can be written.

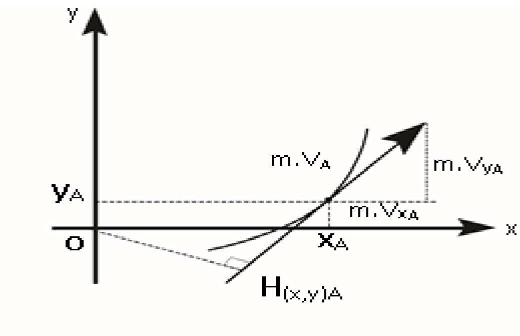

Fig. 1:

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$$A \left| \begin{matrix} m.V_{xA} \\ m.V_{yA} \end{matrix} \right.$$

The image of velocity $V(x)_A$ on the x axis
The image of velocity $V(y)_A$ on the y axis
Torque is derived from the amount of motion $m.V(x, y)_A$ relative to point O:

$$m.V_{(x,y)A}.\overline{OH}_{(x,y)A} = m.V_{xA}.y_A + m.V_{yA}.x_A \quad (1)$$

Both sides of which are divided by m to give:

$$V_{(x,y)A}.\overline{OH}_{(x,y)A} = V_{xA}.y_A + V_{yA}.x_A$$

If the moving object moves from point A and gets to point B, C or D or other points in its orbit,
Relation (1) will thus apply to points B, C, and D...
Relation (1) could thus be written as:

$$V_{(x,y)B}.\overline{OH}_{(x,y)B} = V_{xB}.y_B + V_{yB}.x_B \quad (2)$$

And it can be concluded that all relations are equal to each other at points A, B, and C, D....

$$V_{xA}.y_A + V_{yA}.x_A = V_{xB}.y_B + V_{yB}.x_B = V_{xC}.y_C + V_{yC}.x_C = V_{xD}.y_D + V_{yD}.x_D \quad (3)$$

Regarding the above mentioned relations, 2 points are mentionable:
1. The motion of a moving object round point O in an orbit depends on its velocity and distance from the origin of coordinates at that point (A,B,C,D,...)
2. The motion of the moving object round point O in an orbit does not depend on mass m.

Formulas 3 to 1 apply to coordinates plane (x,y) and these formulas in coordinates planes (X O Z) and (Y O Z) equal :
At point A in plane (X O Z)

$$V_{(x,z)A}.\overline{OH}_{(x,Z)A} = V_{xA}.z_A + V_{zA}.x_A \quad (4)$$

At point B in plane (X O Z)

$$V_{(x,z)B}.\overline{OH}_{(x,Z)B} = V_{xB}.z_B + V_{zB}.x_B \quad (5)$$

$$V_{xA}.z_A + V_{zA}.x_A = V_{xB}.z_B + V_{zB}.x_B = V_{xC}.z_C + V_{zC}.x_C = V_{xD}.z_D + V_{zD}.x_D \quad (6)$$

And in coordinates plane (Y O Z):

$$V_{(y,z)A}.\overline{OH}_{(y,z)A} = V_{yA}.z_A + V_{zA}.y_A \quad (7)$$

$$V_{(y,z)B}.\overline{OH}_{(y,z)B} = V_{yB}.z_B + V_{zB}.y_B \quad (8)$$

$$V_{yA}.z_A + V_{zA}.y_A = V_{yB}.z_B + V_{ZB}.y_B = V_{yC}.z_C + V_{ZC}.y_C = V_{yD}.z_D + V_{zD}.y_D \quad (9)$$

If moving object m enjoys permanent motion in space (O X Y Z) at velocity V round point O, Relation 10 will apply:

$$m.V_A.\overline{OH}_A = m.\sqrt{V_{(x,Z)A}^2 + V_{(x,y)A}^2 + V_{(y,z)A}^2}.\sqrt{\overline{OH}_{(x,z)A}^2 + \overline{OH}_{(x,y)A}^2 + \overline{OH}_{(y,z)A}^2} \quad (10)$$

$$m.\sqrt{V_{(x,Z)B}^2 + V_{(x,y)B}^2 + V_{(y,Z)B}^2}.\sqrt{\overline{OH}_{(x,Z)B}^2 + \overline{OH}_{(x,y)B}^2 + \overline{OH}_{(y,Z)B}^2}$$

V=velocity of the moving object in space

$$V = \sqrt{V^2_{(x,Z)A} + V^2_{(x,y)A} + V^2_{(y,z)A}}$$

OH=vertical distance from point O to the vector of velocity V

$$\overline{OH} = \sqrt{\overline{OH}^2_{(x,Z)A} + \overline{OH}^2_{(x,y)A} + \overline{OH}^2_{(y,z)A}}$$

The moving origin of coordinates:

The origin of coordinates is always fixed in basic sciences (math, physics, mechanics...) and relevant relations are proved based on the fixed origin of coordinates.

We will now deal with the relations and formulas existing in mathematics at the moving object origin of coordinates and because the origin of coordinates is moving and there is the parameter of velocity in the issue of the origin of coordinates, the relations, equations and formulas existing in the science of mathematics can be discussed in physics, mechanics and mathematics. Before the moving origin of coordinates is dealt with, the following 2 prerequisites should be studied:

1. The differential equation f (x,y,z,y',z',c')=0 is assumed in mathematics.

This differential equation should primarily be solved and the solved equation should be applied.

Regarding the parameter of velocity which was entered into mathematical relations and formulas, we can now directly apply the above mentioned differential equation before solving it.

In the above mentioned differential equation, one can write:

If the numerator and denominator of formulas 1 and 2 are divided by (dt), we will have:

$$z' = \frac{dz}{dx} \quad (1) \qquad y' = \frac{dy}{dx} \quad (2)$$

$$y' = \frac{dy/dt}{dx/dt}$$

$$z' = \frac{dz/dt}{dx/dt}$$

It can be observed in these relations that the fraction numerator and denominator are 2 parameters of velocity, id, and distance variations relative to time variations.

dx/dt = Vx : velocity on the x axis

dy/dt =Vy: velocity on the y axis

dz/dt=Vz: velocity on the Z axis

Regarding the velocity parameters,

$$y' = \frac{v_y}{v_x}$$

And

$$z' = \frac{v_z}{v_x}$$

can thus be substituted to directly apply the above mentioned differential equation

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$$F(x,y,z,y',Z',c) = F\left(x,y,z\,\frac{V_y}{V_X},\frac{V_Z}{V_X},C\right) \quad (3)$$

If we intend to use the above mentioned applied equation via CNC machines and remote control systems, the following velocity equation can be considered:

$$V = \sqrt{V_x^2 + V_y^2 + V_z^2} \qquad (4$$

V=velocity in space (o xyz)

0<v≤ 300000 km/sec

2. Algebraic equation F(x,y,z,c) is assumed. In order to apply this algebraic equation, its images should be primarily obtained in 3 planes of (o x y), (o x z) and (o y z). Then, y' should be obtained in plane (o x y) , z' in plane (o x z) and $\frac{z'}{y'}$ in plane (o y x) to be substituted for Z'=$\frac{Vz}{Vx}$ and $\frac{z'}{y'} = \frac{Vz}{Vy}$.

In order to apply the above mentioned algebraic equations, the image of the 3 planes should be initially obtained.

5) F(x,y,0,c)=0 , z=0 : image of the above mentioned equation in plane(o x y).
6) F(x,0,z,c)=0 , y=0: image of the above mentioned equation in plane (o x z).
7) F (0,y,z,c)=0 , x=0: image of the above mentioned equation in plane (o y z).

In Eq.(5) , if y is differentiated relative to x, $\frac{dy}{dx}$ will appear.

$$\frac{dy}{dx} = \frac{dy/_{dt}}{dx/_{dt}} = \frac{Vy}{Vx}$$

In Eq. (6), if z is differentiated relative to x, $\frac{dz}{dx}$will appear.

$$\frac{dz}{dx} = \frac{dz/_{dt}}{dx/_{dt}} = \frac{Vz}{Vx}$$

In Eq.(7) if z is differentiated relative to y, $\frac{dz}{dy}$ will appear.

$$\frac{dz}{dy} = \frac{dz/_{dt}}{dy/_{dt}} = \frac{Vz}{Vy}$$

By specifying the velocities in the coordinates planes, Eq. 4 can be considered.
By reviewing differential equations and algebraic equations, such equations can thus be applied.
Regarding the study of prerequisites 1 and 2 above, mathematical formulas which are presented in the form of differential equations, algebraic relations or any other forms can be mathematically, physically, mechanically,... studied, and regarding formula 4, relations, equations or problems terms can be applied.
The form of newly presented problems are mathematically, physically, mechanically,... is thus proposed.
An object moving on any mathematical curve and whose moving coordinates are shown in the form of intervals (x,y,z), that moving object velocity coordinates will be displayed as (Vx, Vy, Vz). The following example will illustrate the above mentioned formulas.
Now, if the above mentioned moving object is considered as the moving origin of coordinates to establish the moving coordinates systems S1 and S2, motion can be studied, ie, the motion of moving object S2 relative to coordinates system S1.
Example 1: Show the following differential equation in an applied form.

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$$x^2.y.dx + z.y^2dy + z^2.x.dz = 0$$

Solution: both sides of the relation are divided by (dt):

$$x^2.y.\frac{dx}{dt} + z.y^2.\frac{dy}{dt} + z^2.x.\frac{dz}{dt} = 0 \rightarrow \begin{cases} \frac{dx}{dt} = V_x \\ \frac{dy}{dt} = V_y \\ \frac{dz}{dt} = V_z \end{cases}$$

$$x^2.y.v_x + z.y^2.v_y + z^2.x.v_2 = 0$$

Now, regarding the above mentioned applied equation and the following relation:

$$V = \sqrt{V_x^2 + V_y^2 + V_z^2}$$

$$0 < V \leq 300l000\ {}^{km}/_{sec}$$

The above mentioned relations can be defined for CNC and remote control machines.

Example 2: Show the following 3D equation in the applied form and define it for CNC and remote control machines.

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

The images of the above mentioned equation should primarily be obtained in 3 planes (o x y), (o x z) and (o y z). Then, the equation relevant to any plane should be differentiated to obtain the velocities specific to that plane. By having 3 parameters of velocity and equations related to the planes , relevant relations can be defined for CNC and remote control machines.

Firstly, the image in plane (o x y), ie, z=0:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{0}{c^2} = 1 \rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

$$\frac{2.x.dx}{a^2} + \frac{2.y.dy}{b^2} = 0 \Rightarrow \frac{2.y.dy}{b^2} = \frac{-2.x.dx}{a^2}$$

$$\frac{dy}{dx} = \frac{-b^2.x}{a^2y} \Rightarrow \frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{V_y}{V_x} = \frac{-b^2.x}{a^2.y} \Longrightarrow V_y = \frac{-b^2.x}{a^2.y}.V_x$$

Now, the image in plane (o x z), ie, y =0:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1 \Rightarrow \frac{x^2}{a^2} + \frac{0}{b^2} + \frac{z^2}{c^2} = 1$$

Both sides are differentiated:

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$$\frac{2x.dx}{a^2}+\frac{2z.dz}{c^2}=0 \Rightarrow \frac{2x.dx}{a^2}=\frac{-2z.dz}{c^2} \Rightarrow \frac{dz}{dx}=\frac{-C^2.x}{a^2.z}$$

$$\frac{dz}{dx}=\frac{dz/_{dt}}{dx/_{dt}}=\frac{Vz}{Vx}=\frac{-c^2.x}{a^2.z} \Rightarrow V_z=\frac{-c^2.x}{a^2.z}.V_x$$

Now, the image in plane (o y z), ie , x =0

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1 \Rightarrow \frac{0}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$$

$$\frac{2.y.dy}{b^2}+\frac{2z.dz}{c^2}=0 \Rightarrow \frac{dy}{dz}=\frac{-b^2.z}{c^2.y}$$

$$\frac{Vy}{Vz}=\frac{-b^2.z}{c^2.y}$$

By having the above mentioned relations, one can write:

$$V=\sqrt{V_x^2+V_y^2+V_z^2}$$

$$V=\sqrt{V_x^2+(\frac{-b^2.x}{a^2.y}.V_x\ \ )^2+(\frac{-c^2.x}{a^2.z}.V_x\ \ )^2}$$

$$0<V\leq 300I000\,{}^{km}/_{sec}$$

The values of a,b and c should be numerically defined for CNC and remote control machines.
In Example 2, in order to specify the 3 parameters of velocity, it will suffice to obtain the equation image in 2 planes. In plane (o x y), 2 velocity parameters Vy and Vx and in plane (o x z), 2 parameters of Vz and Vx are specified. It is not thus required to determine any velocity parameter in plane (o y z), for 2 parameters of Vz and Vy have been determined in plane (o y z).
Moving origin of coordinates: In physics and mechanics, where the issue of velocity is considered, mass will be related to it. That is, a moving object which has a velocity, it will also have a mass, so that the amount of motion is defined as (m.v), ie, the product of the mass times the velocity of the moving object.
At the origin of coordinates (o x y), a moving object is moving on any curve with the mass of m1 and velocity of V1(Fig 1).

The values of (m1. V1) on the 2 axes of x and y

equal

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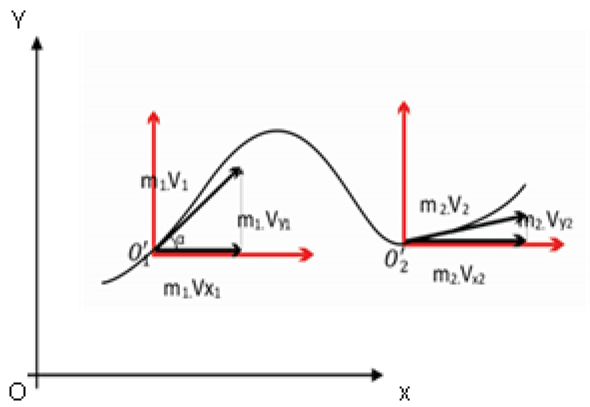

$$\tan \propto = y_1' = \frac{m_1 . V_{y1}}{m_1 . V_{x1}} = \frac{V_{y1}}{V_{x1}}$$

Velocity coordinates:

$$o_1' \left| \begin{matrix} m_1 . V_{x1} \\ m_1 \ . \ V_{y1} \end{matrix} \right.$$

Distance coordinates

$$o_1' \left| \begin{matrix} x_1 \\ y_1 \end{matrix} \right.$$

Now, the new coordinate's origin or the moving origin of coordinates can be named as point O'1 in system (S1). We intend now to study the moving object m2.V2 relative to m1.V1.

Point O'2 is the center of system (S2). Firstly, in order to obtain (y') in the new system (S2 relative to S1), one should write the following relation:

(The sign + or- depends on both the direction and counter-direction of the images motion).

$$y_{2,1}' = \frac{m_1 . V_{y1} - m_2 . V_{y2}}{m_1 . V_{X1} - m_2 . V_{X2}}$$

If 2 differential equations

$$\begin{cases} F(x1, y1, y'1, c1) = 0 \\ F(x2, y2, y'2, c2) = 0 \end{cases}$$

are assumed and intended to be applied, and then the motions of 2 moving objects are to be compared relative to each other at points O'1 and O'2 we will have:

$$o_2' \left| \begin{matrix} m2. Vx2 \\ m2. Vy2 \end{matrix} \right.$$

(velocity coordinates) X1,2)= abscissa or distance of moving object O'2 relative to the moving object O'1

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$\frac{X2}{Y2}$ /(Distance coordinates)

(Y1,2)=ordinate or distance of moving object O'2 relative to moving Object O'1

$$X_2 = X_{2,1} + X_1 = X_{2,1} + X_1 \Rightarrow X_{2,1} = X_2 - X_1$$

$$Y_2 = Y_{2,1} + Y_1 = Y_{2,1} + Y_1 \Rightarrow Y_{2,1} = Y_2 - Y_1$$

Having established the distance/velocity coordinates relations of 2 moving objects, we can now compare with each other the 2 differential equations written in system S2 or S1.

N.B.: Not any differential equation depends per se on the moving object mass for being applied. Yet, in order for 2 differential equations to be applied relative to each other, they depend on the masses of 2 moving objects, (m2) and (m1).

By enjoying 2 differential equations and relations y'2,1, X2,1, Y2,1 and V2,1,

$$y'_{2,1} = \frac{m_1 V_{1y} - m_2 V_{2y}}{m_1 V_{1X} - m_2 V_{2X}}$$

$$\begin{cases} (S_1) F(x_1, y_1, y'_1, c_1) = F\left(x_1, y_1, \frac{v_{y1}}{v_{x1}}, c_1\right) = 0 \\ (S_2) F(x_2, y_2, y'_2, c_2) = F\left(x_2, y_2, \frac{v_{y2}}{v_{x2}}, c_2\right) = 0 \end{cases}$$

$$0 < V_{2,1} < 300000\ ^{km}/_{sec}$$

The values of C2 and C1 can be numerically determined for CNC and remote control machines.

The above mentioned relations apply to plane (o x y) and if we intend to apply 2 moving objects in space relative to each other and compare them, we should specify the above mentioned relations in planes (o x z) and (o y z). Velocity in space should then be written according to the following relation:

$$m_{1,2} V_{2,1} = \sqrt{(m_1.V_{X1} - m_2.V_{X2})^2 + (m_1.V_{y1} - m_2.V_{y2})^2 + (m_1.V_{z1} - m_2.V_{z2})^2}$$

$$0 < V_{2,1} < 300000\ ^{km}/_{sec}$$

REFERENCES

This research has not use any article for its content.