Space ship speed in space (oxyz)

Mohammad Mahbod

mohammad.mahbod44@gmailcom, Isfahan Medical Science University Technical Office, Isfahan Medical Science University

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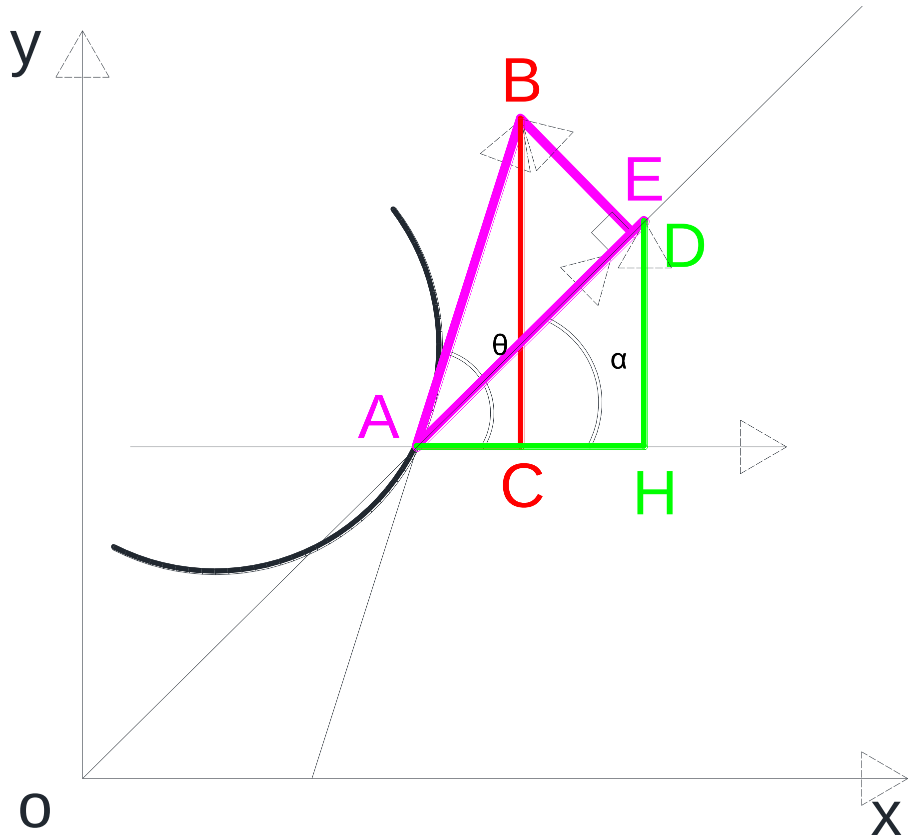
Application equations of the 1st order differential equations in space (oxyz), has been printed in Vol. 9 No. 9 Page 3072 Journal of Advances in Mathematics and www.P3M.ir

Now, if there is no differential equation or mathematical equation and we intend to calculate the course of a moving object which arbitrarily moves in space based on the spaceman's control and obtain relevant speed mathematical equation, we should act according to the following method. The moving object speed course at any moment is vector ($\overrightarrow{AB}$). In order to obtain the moving object speed equation, it will suffice us to have the image of speed vector ($\overrightarrow{AB}$) on the movement equation of the moving object ($\overline{OA}$). The obtained speed equation is the moving object speed equation, and the moving object speed equation (in plane oxy) is ($\overline{OA}$=$\sqrt{x^2+y^2}$).

Now having obtained the moving object speed equation on course ($\overline{OA}$), relation V_{AD} will follow. We are then required to get the moving object obtained movement equation on 2 axes of (ox) and (oy), that is, speed on axis (ox), Vx and speed on axis (oy) Vy.
Now, the above mentioned method can also be followed in plane (oxz), where Vz should only be considered instead of Vy. Having 3 parameters Vx, Vy and Vz, speed equation in space (oxyz)can now be obtained.



$V_{AC}=Vx$, $V_{AB}=\sqrt{{V_{AB}}^2+{V_{CD}}^2}$

$V_{CB}=Vy$

$V_{AH}=Vx$, $V_{AD}=\sqrt{{V_{AH}}^2+{V_{HD}}^2}$

$V_{HD}=Vy$

$$\overset{\triangle}{ABC} \Rightarrow \frac{V_{CB}}{V_{AC}}=\frac{V_y}{V_x}=\tan\theta$$
$$\overset{\triangle}{ADH} \Rightarrow \frac{\overline{HD}}{\overline{AH}}=\tan\alpha=\frac{y}{x}$$
$$\overset{\triangle}{ABE} \Rightarrow V_{AE}=V_{AB}.\cos(\alpha-\theta)$$

$$\cos(\alpha-\theta)=\cos\alpha.\cos\theta+\sin\alpha.\sin\theta$$
$$\cos\alpha=\frac{1}{\sqrt{1+\tan^2\alpha}}=\frac{1}{\sqrt{1+\frac{y^2}{x^2}}}=\frac{x}{\sqrt{x^2+y^2}}$$

$$\sin\alpha=\frac{\tan\alpha}{\sqrt{1+\tan^2\alpha}}=\frac{y/x}{\sqrt{1+\frac{y^2}{x^2}}}=\frac{y}{\sqrt{x^2+y^2}}$$

$$\cos\theta=\frac{1}{\sqrt{1+\tan^2\theta}}=\frac{1}{\sqrt{1+\frac{V^2y}{V^2x}}}=\frac{Vx}{\sqrt{V^2x+V^2y}}$$

$$\sin\theta=\frac{\tan\theta}{\sqrt{1+\tan^2\alpha}}=\frac{Vy/Vx}{\sqrt{1+\frac{V^2y}{V^2x}}}=\frac{Vy}{\sqrt{V^2x+V^2y}}$$

$$\cos(\alpha\text{-}\theta)=\frac{x}{\sqrt{x^2+y^2}}.\frac{Vx}{\sqrt{V^2x+V^2y}}+\frac{y}{\sqrt{x^2+y^2}}.\frac{Vy}{\sqrt{V^2x+V^2y}}=\frac{x.Vx+y.Vy}{\sqrt{x^2+y^2}.\sqrt{V^2x+V^2y}}\Rightarrow\begin{cases}V_{AB}=\sqrt{V^2x+V^2y}\\ V_{AE}=V_{AB}.\cos(\alpha-\theta)\end{cases}$$

$$V_{AE}=\sqrt{V^2x+V^2y}\,.\frac{x.Vx+y.Vy}{\sqrt{x^2+y^2}.\sqrt{V^2x+V^2y}}=\frac{x.Vx+y.Vy}{\sqrt{x^2+y^2}}$$

$$V_{AH}=V_x=V_{AE}\,.\cos\alpha=\frac{x.Vx+y.Vy}{\sqrt{x^2+y^2}}.\frac{x}{\sqrt{x^2+y^2}}=\frac{x(x.Vx+y.Vy)}{x^2+y^2}$$

$$V_{HD}=V_y=V_{AE}\,.\sin\alpha=\frac{x.Vx+y.Vy}{\sqrt{x^2+y^2}}.\frac{y}{\sqrt{x^2+y^2}}=\frac{y(x.Vx+y.Vy)}{x^2+y^2}$$

$$(oxy)\left\{\overline{OA}\left|\begin{matrix}x\\y\end{matrix}\right.\Rightarrow\overrightarrow{OA}\Rightarrow\overrightarrow{AE}\left|\begin{matrix}V_x=\frac{x(x.Vx+y.Vy)}{(x^2+y^2)}\\ V_y=\frac{y(x.Vx+y.Vy)}{(x^2+y^2)}\end{matrix}\right.\right\}$$

$$(oxz)\left\{\left|\begin{matrix}x\\z\end{matrix}\right.\Rightarrow\left|\begin{matrix}V_x=\frac{x(x.Vx+z.Vz)}{(x^2+z^2)}\\ V_z=\frac{z(x.Vx+z.Vz)}{(x^2+z^2)}\end{matrix}\right.\right\}$$

$$(oxyz)\Rightarrow V_T=\sqrt{V^2x+V^2y+V^2z}$$