Transformacja przyspieszenia (obrót wokół osi z)

$$\vec{r} = \vec{r}\,'$$

$$x\hat{i} + y\hat{j} = x'\hat{i}' + y'\hat{j}' \quad \Big/ \frac{d}{dt}$$

$$\frac{dx}{dt}\hat{i} + \frac{dy}{dt}\hat{j} = \frac{dx'}{dt}\hat{i}' + \frac{dy'}{dt}\hat{j}' + x'\frac{d\hat{i}'}{dt} + y'\frac{d\hat{j}'}{dt} \quad \Big/ \frac{d}{dt}$$

$$\vec{v} = \vec{v}\,' + x'(\vec{\omega}\times\hat{i}') + y(\vec{\omega}\times\hat{j}')$$

$$\underbrace{\vec{v} = \vec{v}\,' + \vec{\omega}\times\vec{r}\,'}$$

$\hat{i}' = \hat{i}\cos\omega t + \hat{j}\sin\omega t$ (obrót)

$$\frac{d\hat{i}'}{dt} = -\omega\sin\omega t\,\hat{i} + \omega\cos\omega t\,\hat{j}$$

$$\vec{\omega}\times\hat{i}' = (0,0,\omega)\times(\cos\omega t, \sin\omega t, 0)$$

$$= -\omega\sin\omega t\,\hat{i} + \omega\cos\omega t\,\hat{j} = \frac{d\hat{i}'}{dt}$$

$\hat{j}' = -\hat{i}\sin\omega t + \hat{j}\cos\omega t$ (analogicznie)

$$\frac{d^2x}{dt^2}\hat{i} + \frac{d^2y}{dt^2}\hat{j} = \frac{d^2x'}{dt^2}\hat{i}' + \frac{d^2y'}{dt^2}\hat{j}' + \frac{dx'}{dt}\frac{d\hat{i}'}{dt} + \frac{dy'}{dt}\frac{d\hat{j}'}{dt} + \frac{dx'}{dt}\frac{d\hat{i}'}{dt} + \frac{dy'}{dt}\frac{d\hat{j}'}{dt} + x'\frac{d^2\hat{i}'}{dt^2} + y'\frac{d^2\hat{j}'}{dt^2}$$

$$\vec{a} = \vec{a}\,' + 2\frac{dx'}{dt}\frac{d\hat{i}'}{dt} + 2\frac{dy'}{dt}\frac{d\hat{j}'}{dt} + x'\frac{d}{dt}(\vec{\omega}\times\hat{i}') + y'\frac{d}{dt}(\vec{\omega}\times\hat{j}')$$

$$\vec{a} = \vec{a}\,' + 2v_x'(\vec{\omega}\times\hat{i}') + 2v_y'(\vec{\omega}\times\hat{j}') + x'\left(\frac{d\vec{\omega}}{dt}\times\hat{i}\right) + x'\left(\vec{\omega}\times\frac{d\hat{i}'}{dt}\right) + y'\left(\frac{d\vec{\omega}}{dt}\times\hat{j}'\right) + y'\left(\vec{\omega}\times\frac{d\hat{j}'}{dt}\right)$$

$$\vec{a} = \vec{a}\,' + 2(\vec{\omega}\times\vec{v}\,') + \left(\frac{d\vec{\omega}}{dt}\times\vec{r}\,'\right) + x'(\vec{\omega}\times\vec{\omega}\times\hat{i}) + y'(\vec{\omega}\times\vec{\omega}\times\hat{j}')$$

$$\underbrace{\vec{a} = \vec{a}\,' + 2(\vec{\omega}\times\vec{v}\,') + (\vec{\varepsilon}\times\vec{r}\,') + (\vec{\omega}\times\vec{\omega}\times\vec{r}\,')} \longrightarrow \underbrace{\vec{a}\,' = \vec{a} + 2(\vec{v}\,'\times\vec{\omega}) - \vec{\varepsilon}\times\vec{r}\,' + \vec{\omega}\times(\vec{r}\,'\times\vec{\omega})}$$

Jeżeli $\vec{v} = \vec{v}\,' + \vec{\omega}\times\vec{r}\,' + \vec{u}$ ← prędkość unoszenia

to $\vec{a} = \vec{a}\,' + \vec{a}_c\,' + \vec{a}_s\,' + \vec{a}_d\,' + \underline{\vec{a}_u}$

$$\vec{\varepsilon}\times\vec{r}\,' = \vec{a}_s\,'$$

$$\vec{\omega}\times\vec{\omega}\times\vec{r}\,' = \vec{\omega}(\underbrace{\vec{\omega}\circ\vec{r}\,'}_{=0}) - \vec{r}\,'(\vec{\omega}\circ\vec{\omega}) = -\omega^2\vec{r}\,' = \vec{a}_d\,'$$

(w przypadku $\vec{\omega}\perp\vec{r}\,'$)