



$$X = x_0 + w \cos t$$

$$y = y_0 + h \sin t$$

$$x_p = x \cos \varphi + y \sin \varphi$$

$$y_p = y \cos \varphi + x \sin \varphi$$

$$x_p = x_0 \cos \varphi + w \cos t \cos \varphi + y_0 \sin \varphi + h \sin t \sin \varphi$$

$$y_p = y_0 \cos \varphi + h \sin t \cos \varphi + x_0 \sin \varphi + w \cos t \sin \varphi$$

$$\begin{aligned} x_1 &= x_0 \cos \varphi + w \cos t_1 \cos \varphi + y_0 \sin \varphi + h \sin t_1 \sin \varphi \\ x_2 &= x_0 \cos \varphi + w \cos t_2 \cos \varphi + y_0 \sin \varphi + h \sin t_2 \sin \varphi \\ y_1 &= y_0 \cos \varphi + h \sin t_1 \cos \varphi + x_0 \sin \varphi + w \cos t_1 \sin \varphi \\ y_2 &= y_0 \cos \varphi + h \sin t_2 \cos \varphi + x_0 \sin \varphi + w \cos t_2 \sin \varphi \end{aligned}$$

$$\begin{aligned} x_1 - x_2 &= w \cos \varphi (\cos t_1 - \cos t_2) + h \sin \varphi (\sin t_1 - \sin t_2) \\ y_1 - y_2 &= h \cos \varphi (\sin t_1 - \sin t_2) + w \sin \varphi (\cos t_1 - \cos t_2) \end{aligned}$$

Z TRYGONOMETRII

$$\begin{aligned} \cos t_1 - \cos t_2 &= -2 \sin \frac{t_1 - t_2}{2} \cdot \sin \frac{t_1 + t_2}{2} \\ \sin t_1 - \sin t_2 &= 2 \sin \frac{t_1 - t_2}{2} \cdot \cos \frac{t_1 + t_2}{2} \end{aligned}$$

$$a = \frac{t_1 - t_2}{2}$$

NOWE  
ZMIENNE

$$b = \frac{t_1 + t_2}{2}$$

$$x_1 - x_2 = w \cos \varphi (-2 \sin a \sin b) + h \sin \varphi (2 \sin a \cos b)$$

$$y_1 - y_2 = h \cos \varphi (2 \sin a \cos b) + w \sin \varphi (-2 \sin a \sin b)$$

$$x_1 - x_2 = 2 \sin a (h \sin \varphi \cos b - w \cos \varphi \sin b)$$

$$y_1 - y_2 = 2 \sin a (h \cos \varphi \cos b - w \sin \varphi \sin b)$$

$$\frac{x_1 - x_2}{y_1 - y_2} = \frac{h \sin \varphi \cos b - w \cos \varphi \sin b}{h \cos \varphi \cos b - w \sin \varphi \sin b}$$

$$c = \frac{h \sin \varphi \cos b - w \cos \varphi \sin b}{h \cos \varphi \cos b - w \sin \varphi \sin b}$$

$$\begin{aligned} c(h \cos \varphi \cos b - w \sin \varphi \sin b) &= h \sin \varphi \cos b - w \cos \varphi \sin b \\ c h \cos \varphi \cos b - c w \sin \varphi \sin b &= h \sin \varphi \cos b + w \cos \varphi \sin b = 0 \\ h(c \cos \varphi - \sin \varphi) \cos b - w(c \sin \varphi - \cos \varphi) \sin b &= 0 \\ h(c \cos \varphi - \sin \varphi) \cos b &= w(c \sin \varphi - \cos \varphi) \sin b \end{aligned}$$

$$\frac{\sin b}{\cos b} = \tan b = \frac{h(c \cos \varphi - \sin \varphi)}{w(c \sin \varphi - \cos \varphi)}$$

$$\textcircled{1} \quad c = \frac{x_1 - x_2}{y_1 - y_2}$$

$$\textcircled{2} \quad b = \arctan \frac{h(c \cos \varphi - \sin \varphi)}{w(c \sin \varphi - \cos \varphi)}$$

$$\textcircled{3} \quad a = \arcsin \left( \frac{1}{2} \frac{x_1 - x_2}{h \sin \varphi \cos b - w \cos \varphi \sin b} \right)$$

$$\begin{aligned} a &= \frac{t_1 - t_2}{2} & -2a &= t_2 - t_1 \\ b &= \frac{t_1 + t_2}{2} & 2b &= t_2 + t_1 \\ & & t_2 &= b - a \end{aligned}$$

$$\begin{aligned} t_1 &= 2a + t_2 \\ t_1 &= 2b - t_2 \end{aligned}$$

$$\textcircled{4} \quad \begin{aligned} t_1 &= a + b \\ t_2 &= b - a \end{aligned}$$

FOR SWEEP = 1,  
JUST SWAP SIN WITH  
COS AND VICE VERSA

LARGE = 1, MIN(t<sub>1</sub>, t<sub>2</sub>) = ±2π,  
GDZIE MIN(t<sub>1</sub>, t<sub>2</sub>) = { t<sub>1</sub> DLA t<sub>1</sub> < t<sub>2</sub>  
t<sub>2</sub> DLA t<sub>2</sub> < t<sub>1</sub>

$$\begin{aligned} x_1 &= x_0 \cos \varphi + w \cos t_1 \cos \varphi + y_0 \sin \varphi + h \sin t_1 \sin \varphi / \cdot \cos \varphi \\ y_1 &= y_0 \cos \varphi + h \sin t_1 \cos \varphi + x_0 \sin \varphi + w \cos t_1 \sin \varphi / \cdot \sin \varphi \\ x_1 \cos \varphi &= x_0 \cos^2 \varphi + w \cos^2 \varphi \cos t_1 + y_0 \sin \varphi \cos \varphi + h \sin \varphi \cos \varphi \sin t_1 \\ y_1 \sin \varphi &= x_0 \sin^2 \varphi + w \sin^2 \varphi \cos t_1 + y_0 \sin \varphi \cos \varphi + h \sin \varphi \cos \varphi \sin t_1 \end{aligned}$$

$$x_1 \cos \varphi - y_1 \sin \varphi = x_0 (\cos^2 \varphi - \sin^2 \varphi) + w (\cos^2 \varphi \cos t_1 - \sin^2 \varphi \cos t_1) + h \sin \varphi \cos \varphi (\sin t_1 - \sin t_2)$$

$$\textcircled{5} \quad x_0 = \frac{x_1 \cos \varphi - y_1 \sin \varphi - w (\cos^2 \varphi \cos t_1 - \sin^2 \varphi \cos t_2) - h \sin \varphi \cos \varphi (\sin t_1 - \sin t_2)}{(\cos^2 \varphi - \sin^2 \varphi)}$$

$$\begin{aligned} x_1 &= x_0 \cos \varphi + w \cos t_1 \cos \varphi + y_0 \sin \varphi + h \sin t_1 \sin \varphi / \cdot \sin \varphi \\ y_1 &= y_0 \cos \varphi + h \sin t_2 \cos \varphi + x_0 \sin \varphi + w \cos t_2 \sin \varphi / \cdot \cos \varphi \\ x_1 \sin \varphi &= y_0 \sin^2 \varphi + h \sin^2 \varphi \sin t_1 + x_0 \sin \varphi \cos \varphi + w \sin \varphi \cos \varphi \cos t_1 \\ -y_1 \cos \varphi &= -y_0 \cos^2 \varphi - h \cos^2 \varphi \sin t_2 - x_0 \sin \varphi \cos \varphi + w \sin \varphi \cos \varphi \cos t_2 \\ x_1 \sin \varphi - y_1 \cos \varphi &= y_0 (\sin^2 \varphi - \cos^2 \varphi) + h (\sin^2 \varphi \sin t_1 - \cos^2 \varphi \sin t_2) + w \sin \varphi \cos \varphi (\cos t_1 - \cos t_2) \end{aligned}$$

$$\textcircled{6} \quad y_0 = \frac{x_1 \sin \varphi - y_1 \cos \varphi - h (\sin^2 \varphi \sin t_1 - \cos^2 \varphi \sin t_2) - w \sin \varphi \cos \varphi (\cos t_1 - \cos t_2)}{(\sin^2 \varphi - \cos^2 \varphi)}$$

$$\textcircled{1} \quad c = \frac{x_1 - x_2}{y_1 - y_2}$$

$$\textcircled{2} \quad b = \arctan \frac{h(c \cos \varphi - \sin \varphi)}{w(c \sin \varphi - \cos \varphi)}$$

$$\textcircled{3} \quad a = \arcsin \left( \frac{1}{2} \frac{x_1 - x_2}{h \sin \varphi \cos b - w \cos \varphi \sin b} \right)$$

$$\textcircled{4} \quad \begin{aligned} t_1 &= a + b \\ t_2 &= b - a \end{aligned}$$

$$\textcircled{5} \quad x_0 = \frac{x_1 \cos \varphi - y_1 \sin \varphi - w (\cos^2 \varphi \cos t_1 - \sin^2 \varphi \cos t_2) - h \sin \varphi \cos \varphi (\sin t_1 - \sin t_2)}{(\cos^2 \varphi - \sin^2 \varphi)}$$

$$\textcircled{6} \quad y_0 = \frac{x_1 \sin \varphi - y_1 \cos \varphi - h (\sin^2 \varphi \sin t_1 - \cos^2 \varphi \sin t_2) - w \sin \varphi \cos \varphi (\cos t_1 - \cos t_2)}{(\sin^2 \varphi - \cos^2 \varphi)}$$

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t<sub>2</sub> DLA t<sub>2</sub> < t<sub>1</sub>