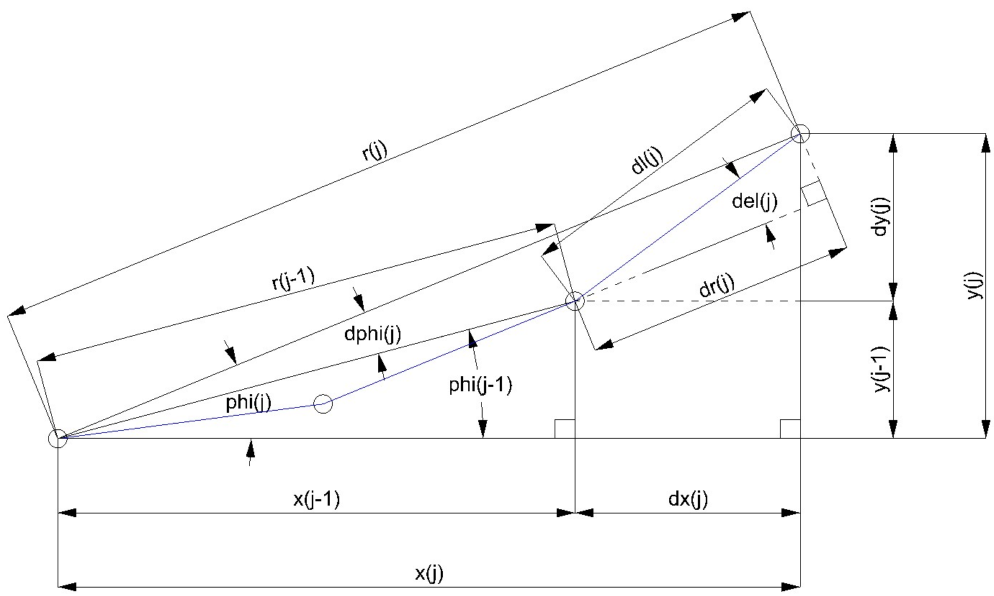
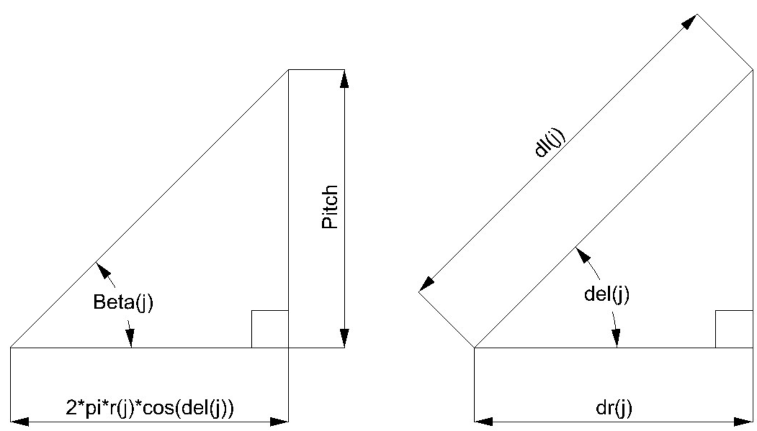
PROP_DESIGN Geometry





Inputs:

$r(jm)$ Radius at the tip

$\varphi(jm)$ Angle Phi at the tip

P Pitch (axial displacement of the propeller for one turn), same for every station

Calculations (shown in order performed):

$r(j) = r(j-1) + \frac{r(jm)}{(jm-1)}$ Radius at a given station

$\phi(j) = \phi(j-1) + \frac{\phi(jm)}{(jm-1)}$ Angle Phi at a given station

$x(j) = r(j)\cdot\cos(\varphi(j))$ Coordinate Transformation

$y(j) = r(j)\cdot\sin(\varphi(j))$ Coordinate Transformation

$dx(j) = x(j) - x(j-1)$

$dy(j) = y(j) - y(j-1)$

$d\varphi(j) = \varphi(j) - \varphi(j-1)$

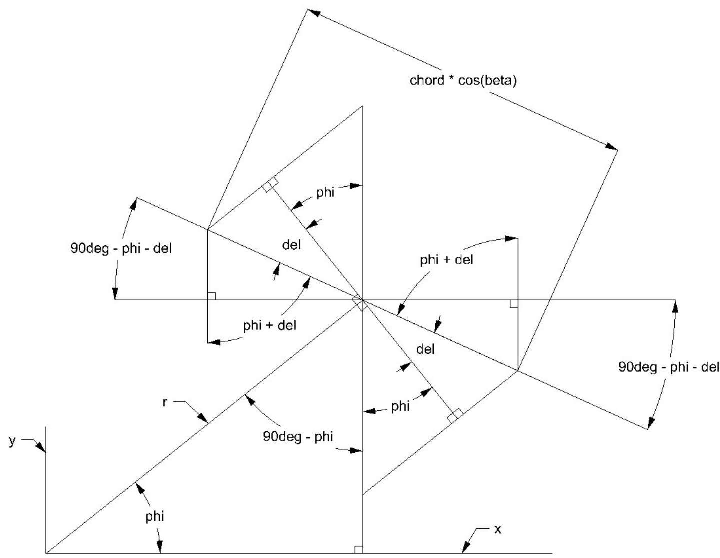
$dr(j) = r(j)\cdot\cos(d\varphi(j)) - r(j-1)$

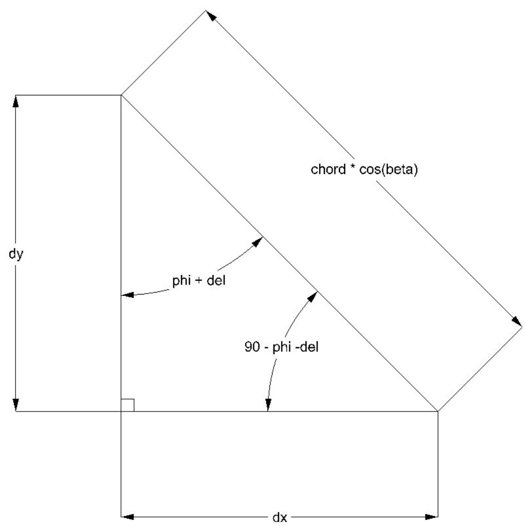
$dl(j) = \sqrt{dx(j)^2 + dy(j)^2}$

$\delta(j) = \operatorname{acos}\left(\frac{dr(j)}{dl(j)}\right)$ Sweep Angle at a given station

Note; $\delta(jm) \neq \varphi(jm)$ PROP_DESIGN can accept δ(jm) as an input and iterate on φ(jm)

$\beta(j) = \operatorname{atan}\left(\frac{P}{2\cdot\pi\cdot r(j)\cdot\cos(\delta(j))}\right)$ Geometric Angle of Attack at a given station





beta = β phi = φ delta = δ

$$dx = chord \cdot \cos(\beta) \cdot \sin(\varphi + \delta)$$

$$dy = chord \cdot \cos(\beta) \cdot \cos(\varphi + \delta)$$