Table 1: My caption

Input	Description	Type
qbar	Distributed load with N values	VectorVariable
N	Number of nodes	int

Beam

This model is valid for a discritized beam and calculates non-dimensional sheer stresses, moments, angles and deflections for a given distributed load. Assumes segment lengths are equal along the beam.

Required inputs are a non-dimensional distributed load that is a vector variable and the number of nodes

The non-dimensional equation derivation is shown below for wing bending application.

Using a standard Bernoulli-Euler discretized beam model with n nodes, the shear forces and moments can be computed from the distributed loads $q(y)$, with boundary conditions of zero shear forces and moments at the wing tips.

$$\mathcal{S}_i = \mathcal{S}_{i+1} - \frac{q_{i+1} + q_i}{2}\Delta y \tag{1}$$

$$M_i = M_{i+1} - \frac{\mathcal{S}_{i+1} + \mathcal{S}_i}{2}\Delta y \tag{2}$$

$$\mathcal{S}_n = 0 \tag{3}$$

$$M_n = 0 \tag{4}$$

Similarly, the angle deflection and deflection can be calculated with boundary conditions of zero angle and deflection and the wing root.

$$\Theta_i = \Theta_{i+1} + \frac{1}{2}\left(\frac{M_i}{EI_i} + \frac{M_{i-1}}{EI_{i-1}}\right)\Delta y \tag{5}$$

$$w_i = w_{i+1} + \frac{1}{2}(\Theta_i + \Theta_{i-1})\Delta y \tag{6}$$

$$\Theta_0 = 0 \tag{7}$$

$$w_0 = 0 \tag{8}$$

Equations~(1)-(8) are GP-compatible if expressed as

$$\mathcal{S}_{i+1} \geq \mathcal{S}_i + \frac{q_{i+1} + q_i}{2}\Delta y \tag{9}$$

$$\mathcal{M}_{i+1} \geq \mathcal{M}_i + \frac{\mathcal{S}_{i+1} + \mathcal{S}_i}{2}\Delta y \tag{10}$$

$$\Theta_i \geq \Theta_{i+1} + \frac{1}{2}\left(\frac{\mathcal{M}_i}{EI_i} + \frac{\mathcal{M}_{i-1}}{EI_{i-1}}\right)\Delta y \tag{11}$$

$$w_i \geq w_{i+1} + \frac{1}{2}(\Theta_i + \Theta_{i-1})\Delta y \tag{12}$$