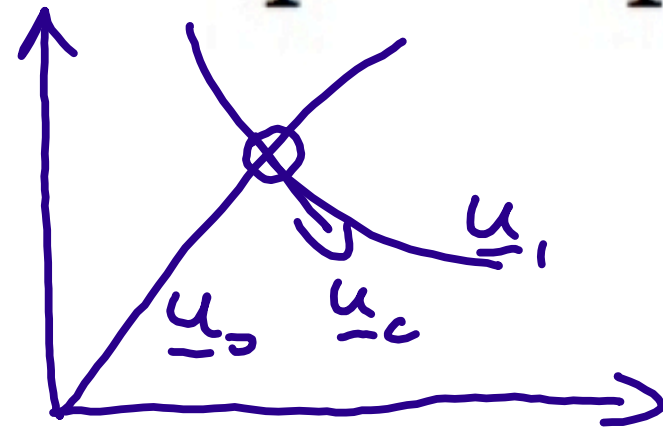


AE4536: Buckling of structures

Adjacent equilibrium

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The principle of adjacent equilibrium



$$\underline{u} = \underline{u}_0 + \underline{u}_1$$

↑ perturbation

General method

$$N' = 0 \rightarrow EA(u_0' + \frac{1}{2}w_0'^2)' = 0$$

$$EIw_0'''' - Nw_0'' = 0 \rightarrow EIw_0'''' - EA(u_0' + \frac{1}{2}w_0'^2)w_0'' = 0$$

$$\underline{u} = \underline{u}_0 + \underline{u}_1 \rightarrow \begin{matrix} u_0 + u_1 \\ w_0 + w_1 \end{matrix}$$

Adjacent equilibrium example

$$EA(u_0' + u_1' + \frac{1}{2}(w_0' + w_1')^2)' = 0$$

$$EA(u_0' + u_1' + \frac{1}{2}(w_0'^2 + 2w_0'w_1' + w_1'^2))' = 0$$

$$EA(u_0'' + u_1'') = 0 \rightarrow u_1'' = 0$$

$$N' = 0 \rightarrow N = -P$$

$$EA(u_0' + \frac{1}{2}w_0'^2) = -P$$

$$u_0' = -\frac{P}{EA}$$

$$EI(w_0'''' + w_1''') - EA(u_0' + u_1' + \frac{1}{2}(w_0'^2 + 2w_0'w_1' + w_1'^2))$$

$$(w_0'' + w_1'')$$

$$EIw_1'''' - \underbrace{EAu_0'}_{-P}w_1'' = 0 \rightarrow EIw_1'''' + Pw_1'' = 0$$