Optimality assesment

Start

Initialize design optimality vector

$$\mathbf{N}_E = \left[n_{E1}\, n_{E2} \cdots n_{E\beta} \right]^{\mathrm{T}} = \mathbf{0}$$

Sample a requirement arc from Ω_R

Solve

$$\min_{\{c,\mathbf{S}\}} \quad f(c,\mathbf{S},\mathbf{R}_w)$$

$$\text{subject to} \quad \mathbf{g}(c,\mathbf{S},\mathbf{R}_w) \le \mathbf{0}$$

Optimum decision arc

$$\mathbf{x}_S{}^*(\mathbf{R}_w) = \left\{ c^*, \mathbf{S}^* \right\}$$

Optimum design arc

$$\mathbf{x}^*(\mathbf{R}_w) = \left\{ c^*, \mathbf{D}^* \right\}$$

Augment set of parameteric optimal design arcs

$$S_E{}^* = \left\{ \mathbf{x}^*(\mathbf{R}_1), \mathbf{x}^*(\mathbf{R}_2), \cdots, \mathbf{x}^*(\mathbf{R}_w) \right\}$$

Award design arc in $\mathbf{N}_E$

$$n_{E\lambda} \leftarrow n_{E\lambda} + 1$$

All samples evaluated? — *no* → $w \leftarrow w+1$

yes

α design arcs with largest values $n_{R\lambda}$

Set of optimal design arcs

$$S_E = \{ \{c,\mathbf{D}\}_{E1}, \{c,\mathbf{D}\}_{E2}, \cdots, \{c,\mathbf{D}\}_{E\alpha} \}$$

Stop

Set of optimal design arcs with respect to excess

Robustness and flexibility assessment

Start

Initialize design robustness vector

$$\mathbf{N}_R = \left[n_{R1}\, n_{R2} \cdots n_{R\beta} \right]^{\mathrm{T}} = \mathbf{0}$$

Sample design arc from Ω_{cD}

Sample a requirement arc from Ω_R

Generate a decision arc

$$\{c,\mathbf{S}\}_\gamma$$

Check reliability constraint

$$\mathbf{g}(c,\mathbf{S},\mathbf{R}_w) \le \mathbf{0}?$$

no → all enumerations generated? $\gamma = \xi$? — *no* → $\gamma \leftarrow \gamma+1$

yes

yes

$\{c,\mathbf{D}\}_\lambda$ satisfies requirement $\mathbf{R}_w$

$\{c,\mathbf{D}\}_\lambda$ does not satisfy requirement $\mathbf{R}_w$

Award design arc

$$n_{R\lambda} \leftarrow n_{R\lambda} + 1$$

Do not award design arc

$$n_{R\lambda} \leftarrow n_{R\lambda} + 0$$

Update design robustness vector

$$\mathbf{N}_R = \left[n_{R1}\, n_{R2} \cdots n_{R\beta} \right]^{\mathrm{T}}$$

All samples evaluated? — *no* → $\lambda \leftarrow \lambda+1$

yes

Compute filtered outdegree

$$FO_\lambda = q - o$$

Augment design flexibility vector

$$\mathbf{N}_F = \left[FO_1\, FO_2 \cdots FO_\lambda \right]^{\mathrm{T}}$$

All samples evaluated? — *no* → $w \leftarrow w+1$

yes

Stop

α design arcs with largest values $n_{R\lambda}$

Set of robust design arcs

α design arcs with largest values FO_λ

Set of flexible design arcs