

An Intelligent Interactive Design System for Greener and Customer-Centred Ship Design

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Algorithm: The pseudo-code of Space-Shrinking Technique (SST)

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1: Input: Input Design space ( $\mathcal{X}$ ), Number of Designs ( $N$ ) and population size ( $s$ ).
2: Generate an initial design set  $\mathcal{N}_{op} \leftarrow GDT(\mathcal{X}, N, s)$ .
3: Display designs in  $\mathcal{N}_{op}$ .
4: Initialise  $T \leftarrow 0$ 
5: repeat
6:    $T \leftarrow T + 1$ 
7:   Select  $t^{th}$  design ( $\mathbf{x}_t$ ) from  $\mathcal{N}_{op}^{T-1}$  based on its performance and appearance (Note:  $\mathcal{N}_{op}^0 = \mathcal{N}_{op}$ ).
8:   Define  $N, s, \lambda^T$ 
9:   for  $k = 1$  to  $n$  do
10:     $\mathcal{X}^T \leftarrow \begin{cases} \hat{x}_{m,k}^l \leftarrow x_{m,k}^l + (\lambda^T \times \mathcal{R}_T^l) \\ \hat{x}_{m,k}^u \leftarrow x_{m,k}^u - (\lambda^T \times \mathcal{R}_T^u) \end{cases}$ 
11:    if  $\hat{x}_{m,k}^u > x_{m,k}^u$  ( $\hat{x}_{m,k}^l < x_{m,k}^l$ ) then
12:       $\hat{x}_{m,k}^u \leftarrow x_{m,k}^u$  ( $\hat{x}_{m,k}^l \leftarrow x_{m,k}^l$ )
13:    end if
14:     $x_{m,k}^l \leftarrow \hat{x}_{m,k}^l$  and  $x_{m,k}^u \leftarrow \hat{x}_{m,k}^u$ 
15:  end for
16:   $\mathcal{N}_{op}^T \leftarrow GDT(\mathcal{X}^T, N, s)$ 
17:  Display all designs of  $\mathcal{N}_{op}^T$ .
18: until The user obtains a satisfactory design(s)
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