As can be seen above, the result from the Topology Optimization code is different for the ft = 1 and ft = 2. Ft is the switch between using either sensitivity-based filtering or density-based filtering.

Sensitivity Filtering

$$\widehat{\frac{\partial c}{\partial \rho_e}} = \frac{1}{\rho_e} \frac{1}{\sum_{i=1}^{N} \hat{H}_i} \sum_{i=1}^{N} \hat{H}_i \rho_i \frac{\partial c}{\partial \rho_i} \qquad \hat{H}_i = r_{min} - \mathrm{dist}(e,i) \qquad \{i \in N \mid \mathrm{dist}(e,i) \leq r_{min}\}$$

Sensitivity Filter involves calculating the weighted average of the term: $\hat{H}_i \rho_i \frac{\partial c}{\partial \rho_i}$

During ongoing iterations, even in Ft=1, the original design comes up to the same structure as ft=2, after which the filtering leads to the elimination of those structures at the end. The averaging, as can be observed through the equations, is supposed to eliminate structures whose thickness is less than twice the filter radius. This does not happen in the case of Ft = 2. After averaging, the code with Ft=1 produces the Xnew variable, which is directly used in the case of sensitivity filtering. This variable is converted to physical density using weighted averaged in case of Density filtering and then used further. This is the key difference because of which we get different solutions.