



φ_G is enforced:

$$\varphi_D = \frac{\varphi_G + \varphi_c}{2} \rightarrow \varphi_G = 2\varphi_D - \varphi_c$$

Using an extended stencil,

$$\varphi_{n_i} = \frac{\frac{\varphi_c}{\|r_{n_i} - r_c\|} + \frac{\varphi_o}{\|r_{n_i} - r_{f_N}\|} + \frac{\varphi_o}{\|r_{n_i} - r_{f_c}\|} + \frac{\varphi_N}{\|r_{n_i} - r_N\|}}{\frac{\varphi_c}{\|r_{n_i} - r_c\|} + \frac{\varphi_o}{\|r_{n_i} - r_f\|} + \frac{\varphi_o}{\|r_{n_i} - r_f\|} + \frac{\varphi_N}{\|r_{n_i} - r_N\|}}$$

Then

$$(\nabla \varphi)_{f_c} = \sum_{k \in \{G, L, n_1, n_2\}} \varphi_k \vec{S}_k$$