- In the alternating optimization algorithm, we have

$$\mathbf{u}^{(k+1)} = (\mathbf{u}_1^{(k+1)}, \mathbf{u}_2^{(k+1)}) = (c_1(\mathbf{u}_2^{(k)}), c_2(c_1(\mathbf{u}_2^{(k)})))$$

  for $k \geq 0$.

- Define

$$\Delta f(\mathbf{u}) = f(c_1(\mathbf{u}_2), c_2(c_1(\mathbf{u}_2))) - f(\mathbf{u}_1, \mathbf{u}_2).$$

- Then

$$\begin{aligned} f^{(k+1)} - f^{(k)} &= f(\mathbf{u}^{(k+1)}) - f(\mathbf{u}^{(k)}) \\ &= f(c_1(\mathbf{u}_2^{(k)}), c_2(c_1(\mathbf{u}_2^{(k)}))) - f(\mathbf{u}_1^{(k)}, \mathbf{u}_2^{(k)}) \\ &= \Delta f(\mathbf{u}^{(k)}). \end{aligned}$$