Notes on NEWUOA

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Algorithm 0.1

Input: $x_0 \in \mathbb{R}^n$, $\Delta_0 \in (0, +\infty)$, $m \in \{n+2, n+3, \ldots, (n+1)(n+2)/2\}$.

1. **Initialization**. Choose an $\mathcal{X}_0 \subset \mathbb{R}^n$ with $x_0 \in \mathcal{X}_0$ and $|\mathcal{X}_0| = m$. Set $Q_{-1} = 0$ and $k = 0$.
2. **Model construction**.

$$Q_k = \operatorname*{argmin}_{Q \in \mathcal{Q}} \{\|\nabla^2 Q - \nabla^2 Q_{k-1}\|_{\mathrm{F}} : Q(x) = f(x) \text{ for } x \in \mathcal{X}_k\}.$$

3. $x_k = \operatorname{argmin}\{Q_k(x) : \|x - x_k^*\| \leq \Delta_k\}$.

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