

Construction of quadratic models for derivative-free trust-region algorithms: polynomial interpolation versus support vector regression.

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Resumo/Abstract:

We consider derivative-free trust-region algorithms based on sampling approaches for convex constrained problems and discuss two conditions on the quadratic models for ensuring their global convergence. The first condition requires the poisedness of the sample sets, as usual in this context, while the other one is related to the error between the model and the objective function at the sample points. Although the second condition trivially holds if the model is constructed by polynomial interpolation, since in this case the model coincides with the objective function at the sample set, we show that it also holds for models constructed by support vector regression. These two conditions imply that the error between the gradient of the trust-region model and the objective function is of the order of the radius that controls the diameter of the sample set. This allows proving the global convergence of a trust-region algorithm that uses two radii, the sample set radius and the trust-region radius. Numerical experiments are presented for minimizing functions with and without noise.