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On using Gaussian functions with varied parameters for approximation of functions of one variable on a finite segment. (Russian. English summary) Zbl 1388.41009

Summary: We study the opportunities of approximation of a piecewise continuous function on a finite segment by a linear combination of µ Gaussian functions, with the object of their usage for control approximation in lumped problems of optimal control. Recall that a Gaussian function (quadratic exponent) is one defined as follows
\[ \varphi(x) = \frac{1}{\sigma \sqrt{2\pi}} \exp\left(-\frac{(x-m)^2}{2\sigma^2}\right) . \]
Unlike investigations carried out by another authors, we consider the case where the parameters of a Gaussian function (with the coefficients of a linear combination) are varied and selected, in particular, by minimization of the difference between a function being approximated and its approximation, or (in the case of an optimal control problem) by minimization of the cost functional. Such an approach gives the opportunity to approximate optimal control problems with lumped parameters by finite dimensional problems of mathematical programming of comparatively small dimension (as opposed to piecewise constant or piecewise linear approximation on a fixed mesh with small width which is usually used). We present also some results of numerical experiments which substantiate efficiency of the approach under study.

MSC: 41A30 Approximation by other special function classes

Keywords: control parametrization technique; lumped problem of optimal control; approximation by quadratic exponents; Gaussian function

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