Recent advances on the use of ① in optimization and regularization problems

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In recent years, several classical optimization problems have been tackled using the novel approach to infinite and infinitesimal numbers proposed by Sergeyev [1, 2, 3]. The use of ① has been beneficial both in defining new approaches in constrained optimization [4] (for example, new differentiable exact penalty methods) and unconstrained problems (for example, conjugate gradient methods for indefinite matrices, variable metric approach to nonsmooth optimization).

After a review of the most important results in this context the talk will concentrate on regularization problems with smoothed l_0 penalty. In order to avoid the difficulties due to the use of the l_0 norm, two different approaches have been proposed in literature. The first is to replace the l_0 norm with the l_1 or l_2 norm; the second technique uses a smooth function that will approximate the l_0 norm of a vector. This approach requires the use of a parameter δ that must converge to 0. This difficulty can be avoided by using the novel approach to infinite and infinitesimal numbers. The methods used can be extended to classification and regression problems.

References

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