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# An algorithm for data analysis via polyhedral optimization

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## Abstract

© 2017 IEEE. We propose the novel data analysis algorithm which allows to identify exactly the position of a given point as exterior, interior, or boundary relatively to an intersection of the finite number of pattern sets. Due to the special structure of the problem under study, this algorithm can be realized not only by sequential, but also by parallel computing on the basis of appropriate model decomposition.

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## References

[1] V.F. Demyanov, Mathematical Diagnostics, Advances in Convex Analysis and Global Optimization: Honoring the Memory of C. Caratheodory (1873-1950), 54, 11, 2013.

[2] Nonlinear optimization and Applications, G. Pillo and F. Giannessi, Eds. Springer Science & Business Media, 2013.

[3] A. Bagirov, N. Karmitsa and M. M. Mäkelä, "Introduction to Nonsmooth Optimization: theory, practice and software," Springer, 2014.

[4] Z.R. Gabidullina, "A Theorem on Separability of a Convex Polyhedron from Zero point Of the Space and Its Applications in Optimization," Russian Mathematics (Iz.VUZ), vol. 50, no. 12, pp. 18-23, 2006.

[5] Z.R. Gabidullina, "A Theorem on Strict Separability of Convex Polyhedra and Its Applications in Optimization," J. Optimization Theory and Applicat., vol. 148, no. 3, pp. 550-570, 2011.

[6] Z.R. Gabidullina, "A Linear Separability Criterion for Sets of Euclidean Space," J. Optimization Theory and Applicat., vol. 158, no. 1, pp. 145-171, 2013.

[7] Z.R. Gabidullina, "Necessary and Sufficient Conditions for Emptiness of the Cones of Generalized Support Vectors," Optimization Lett., vol. 9, no. 4, pp. 693-729, 2015.

[8] Z.R. Gabidullina, "The Problem of Projecting the Origin of Euclidean Space onto the Convex Polyhedron," arXiv preprint, arXiv:1605.05351, 2016.

[9] Z.R. Gabidullina, "Solving of variational inequalities by reducing to the linear complementarity problem," IOP Conf. Ser.: Materials Sci. and Eng., vol. 158, no. 1, art. no. 012033, 2016.

[10] Z.R. Gabidullina, "The Minkowski difference of sets with the constraint structure," in VIII Moscow Int. Conf. on Operations Research (ORM2016), Moscow, Russia, 2016, vol. 1, pp. 30-33.

[11] K. Hormann and A. Agathos, "The point in polygon problem for arbitrary polygons," Computational Geometry, vol. 20, no. 3, pp. 131-144, 2001.

[12] F.R. Feito and J.C. Torres, "Inclusion test for general polyhedra," Computers&Graphics, vol. 21, no. 1, pp. 23-30, 1997.

[13] Y.E. Kalay, "Determining the spatial containment of a point in general polyhedra," Computer Graphics and Image Processing, vol. 19, no. 4, pp. 303-334, 1982.

[14] A. Said and D. Parker, "Design and analysis of a new point-inpolyhedron algorithm," in 1st Int. conf. on geocomputation, University of Leeds, United Kingdom, 1996, pp. 17-19.

[15] H.H. Bauschke and J.M. Borwein, "On Projection Algorithms for Solving Convex Feasibility Problems," SIAM review, vol. 38, no. 3, pp. 367-426, 1996.

[16] Y. Censor, "Computational Acceleration of Projection Algorithms for the Linear Best Approximation Problem," Linear Algebra and its Applicat., vol. 416, no. 1, pp. 111-123, 2006.

[17] V.F. Dem'yanov and V.N. Malozemov, Introduction to Minimax. Dover Publications, 1990.

[18] E.G. Gilbert, D.W. Johnson and S.S. Keerthi, "A Fast Procedure for Computing the Distance Between Complex Objects in Three-dimensional Space," IEEE Robot. Automat. Mag. , vol. 4, no. 2, pp. 193-203, 1988.