# Active-set based quadratic programming algorithm for solving inner optimization problems with inequalities in granular dynamics simulations

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## ABSTRACT

The minimization of convex quadratic function subject to inequality constraints is one of the most common optimization problem in computer-aided engineering applications [1]. In our contribution, we present our active-set based algorithm Modified Proportioning with Reduced Gradient Projection (MPRGP). This algorithm was successfully used to solve a linear elasticity contact problems with up to more than 40 million of nodal variables [2].

Our research in the solution of particle dynamics simulations has been motivated by the results achieved in [3]. Authors used the MPRGP algorithm to solve differential variational inequality (DVI) efficiently in spite of the fact that all theoretical results supporting the convergence of MPRGP were valid only for the strictly convex cost functions. Only recently, we successfully extended the theory and explained the convergence of the MPRGP for the problems with more general convex quadratic object function in [4].

At first, we shortly review the MPRGP algorithm. This method combines the conjugate gradient steps with the reduced gradient projection steps and adaptive precision control of the solution of the auxiliary problems. Special attention is paid in the discussion of the solvability of optimization problem.

The performance of the algorithm is demonstrated by the solution of a 3D particle dynamics problem and compared with other popular optimization methods.

## REFERENCES

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