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Ph.D. DISSERTATION DEFENSE

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Title:	A Parallel Linear Active Set Method and A Generalization of Distance Domination
Chairperson:	Dr. Serban Sabau, Department of Electrical and Computer Engineering, School of Engineering & Science
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ABSTRACT

We engineered two processes. In the first, given a linear-inequality-constrained convex minimization problem in a Hilbert space, we develop a novel binary test that examines sets of constraints and passes only active-constraint sets. The test employs a black-box, linear-equality-constrained convex minimization method but can often fast fail, without calling the black-box method, by considering information from previous applications of the test on subsets of the current constraint set. In both cases the test generates the optimal point over the subject inequalities. Iterative and largely parallel applications of the test over growing subsets of inequality constraints yields a minimization algorithm. We include an adaptation of the algorithm for a non-convex polyhedron in Euclidean space. Outside of calling the black-box method, complexity is not a function of accuracy. The algorithm does not require the feasible space to have a non-empty interior, or even be nonempty. As a function of the number of inequalities, with a polynomial number of processors, the multi-threaded complexity of the algorithm is constant.

In the second, expanding on the graph theoretic ideas of k-component order connectivity and distance-l domination, we present a quadratic-complexity algorithm that finds a tree's minimum failure-set cardinality so that clusters of nodes further than l from failed nodes do not exceed a cardinality threshold. Applications of solutions to the expanded problems include choosing service center locations so that no large neighborhoods are excluded from service, while reducing the redundancy inherent in distance domination problems.