Alternating direction method of multiplier: a powerful tool for difficult optimization problems

Xin Liu

State Key Laboratory of Scientific and Engineering Computing
Institute of Computational Mathematics and Scientific/Engineering Computing
Academy of Mathematics and Systems Science
Chinese Academy of Sciences, China

Fifteenth Chinese-American Kavli Frontiers of Science Symposium

Arnold and Mabel Beckman Center, Irvine, CA

October 13, 2012

Alternating direction method of multiplier: a powerful tool for difficult optimization problems

Xiu Liu (liuxin@lsec.cc.ac.cn)
State Key Laboratory of Scientific and Engineering Computing
Academy of Mathematics and Systems Science
Chinese Academy of Sciences, China

Fifteenth Chinese-American Kavli Frontiers of Science Symposium
Irvine, California, U.S. October 13, 2012

"Divide" and "Conquer"
⇕ ⇕
"Split" and "Alternate"

$\Rightarrow$

Difficult optimization models

- nonlinearity, nonconvexity
- nondifferentiable term
- combinatorial objective or constraints

- Splitting brings easy subproblems;
- Augmented Lagrangian function penalizes the equality constraints
- Alternating solves the split targets in turn

$\circlearrowleft$

Three application instances

- phase retrieval
- portfolio optimization
- matrix factorization