

Accepted Manuscript

Conic relaxations of the unit commitment problem

Salar Fattahi, Morteza Ashraphijuo, Javad Lavaei, Alper Atamtürk

PII: S0360-5442(17)31066-6

DOI: [10.1016/j.energy.2017.06.072](https://doi.org/10.1016/j.energy.2017.06.072)

Reference: EGY 11080

To appear in: *Energy*

Received Date: 30 October 2016

Revised Date: 18 May 2017

Accepted Date: 12 June 2017

Please cite this article as: Fattahi S, Ashraphijuo M, Lavaei J, Atamtürk A, Conic relaxations of the unit commitment problem, *Energy* (2017), doi: 10.1016/j.energy.2017.06.072.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Conic Relaxations of the Unit Commitment Problem

Salar Fattahi, Morteza Ashraphijuo, Javad Lavaei, Alper Atamtürk¹

University of California, Berkeley

Abstract

The unit commitment (UC) problem aims to find an optimal schedule of generating units subject to demand and operating constraints for an electricity grid. The majority of existing algorithms for the UC problem rely on solving a series of convex relaxations by means of branch-and-bound and cutting-planning methods. The objective of this paper is to obtain a convex model of polynomial size for practical instances of the UC problem. To this end, we develop a convex conic relaxation of the UC problem, referred to as a strengthened semidefinite program (SDP) relaxation. This approach is based on first deriving certain valid quadratic constraints and then relaxing them to linear matrix inequalities. These valid inequalities are obtained by the multiplication of the linear constraints of the UC problem, such as the flow constraints of two different lines. The performance of the proposed convex relaxation is evaluated on several hard instances of the UC problem. For most of the instances, globally optimal integer solutions are obtained by solving a single convex problem. For the cases where the strengthened SDP does not give rise to a global integer solution, we incorporate other valid inequalities. The major benefit of the proposed method compared to the existing techniques is threefold: (i) the proposed formulation is a single convex model with polynomial size and, hence, its global minimum can be found efficiently using well-established first- and second-

¹The authors are with the Department of Industrial Engineering and Operations Research, University of California, Berkeley (e-mail: fattahi@berkeley.edu, ashraphijuo@berkeley.edu, lavaei@berkeley.edu, atamturk@berkeley.edu). This work was supported by DARPA YFA, ONR YIP Award, AFOSR YIP Award, NSF CAREER Award 1351279 and NSF EECS Award 1406865. A. Atamtürk was supported, in part, by grant FA9550-10-1-0168 from the Office of the Assistant Secretary of Defense for Research and Engineering.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات