

Accepted Manuscript

On the Complexity of the Partner Units Decision Problem

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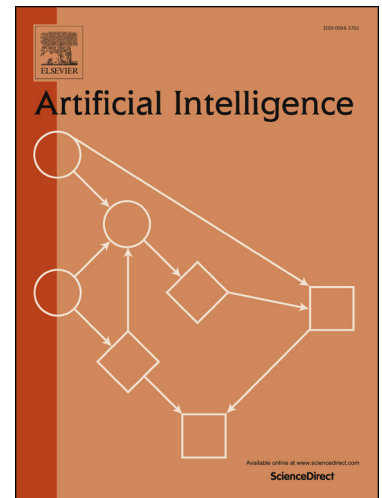
PII: S0004-3702(17)30040-1
DOI: <http://dx.doi.org/10.1016/j.artint.2017.04.002>
Reference: ARTINT 3009

To appear in: *Artificial Intelligence*

Received date: 18 January 2016
Revised date: 24 February 2017
Accepted date: 4 April 2017

Please cite this article in press as: E.C. Teppan, On the Complexity of the Partner Units Decision Problem, *Artif. Intell.* (2017), <http://dx.doi.org/10.1016/j.artint.2017.04.002>

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On the Complexity of the Partner Units Decision Problem

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Abstract

The partner units problem is an acknowledged hard benchmark problem for the logic programming community with various industrial application fields like CCTV surveillance or railway safety systems. Whereas many complexity results exist for the optimization version of the problem, complexity for the decision variant, which from a practical point of view is more important, is widely unknown. In this article we show that the partner units decision problem is NP-complete in general and also for various subproblems of industrial importance.

Keywords: Partner Units Problem, Computational complexity, NP-completeness

1. Introduction

The partner units problem (PUP, Falkner et al. (2011); Drescher (2012)) is a classical configuration problem where elements have to be connected such that all user requirements and technical constraints are satisfied (see Mittal and Frayman (1989)). Solving such real world configuration problems is one of the major challenges in industrial production domains and also one of the biggest success stories of artificial intelligence of the last decade. Given the results of the of the biennially happening answer set programming competitions¹ the PUP has been shown to be an exceptionally hard real world configuration problem.

Whilst having many application areas such as CCTV surveillance (see Aschinger et al. (2011a)), the PUP originates in the domain of railway safety

¹<http://aspcomp2015.dibris.unige.it/>

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