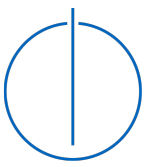
DEPARTMENT OF INFORMATICS

TECHNICAL UNIVERSITY MUNICH

Master Thesis

Collection of Proofs

Lukas Retschmeier



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On Parametrized Semitotal Dominating Set

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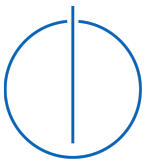

I confirm that this master thesis is my own work and I have documented all sources and material used.

Copenhagen, Lukas Retschmeier

Acknowledgments

Abstract

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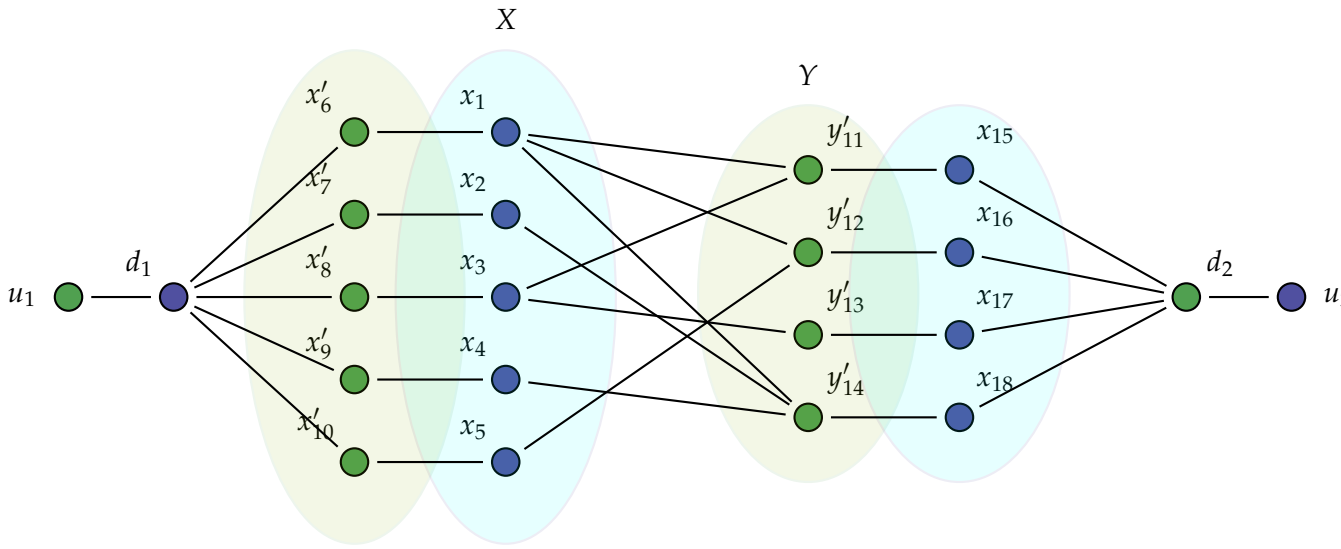

Theorem 1.0.1. *Semitotal Dominating Set is $\omega[2]$ hard for bipartite Graphs*

Proof. Given an bipartite Graph $G = (\{X \cup Y\}, E)$ where X and Y are Independent Sets, we construct a bipratite G′ the following way:

1. For each vertex $x_i \in X$ we add a new vertex x'_i and add a edge (x_i, x'_i) in between.
2. For each vertex $y_i \in Y$ we add a new vertex y'_i and add a edge (y_i, y'_i) in between.
3. We add two P_1's $(u_m, d_m), m \in [2]$ and connect (d_1, x'_i) and (d_2, y'_i) with all vertices from X (Y resp.)

Observation: The constructed graph is clearly bipartite: Setting $X' = X \cup \{y_i, u_1\}$ and $Y' = Y \cup \{x_i, u_2\}$

Corollary 1.0.1.1. *G′ has a Semitotal Dominating Set of size k iff G has a Dominating Set of size $k' = k + 1$*

As the G' can be constructed in O(m+n) and parameter k only increases about 1, this reduction is a FPT reduction.

As Dominating Set is already $w[2]$ hard for Chordal Graphs (CITE) so is Semitotal Dominating Set.

□

Theorem 1.0.2. *Semitotal Dominating Set is $\omega[2]$ hard for Chordal Graphs*

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