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A correction to:

Parameterized Parallel Complexity

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In the fourth section of [1], we study a possible connection between the classical complexity class NC and the parameterized classes FPP and PNC. In particular, we claim the existence of a parameterized problem belonging to FPT such that all its slices are P-complete. By using such problem we can show that if NC $\neq$ P, then no FPT-hard problem (both considering FPP-reductions and PNC-reductions) can have all slices included in NC.

Unfortunately, a crucial proof in this section is wrong. We claimed that each slice of the parameterized Longest Path problem is P-complete by showing a classical logspace reduction from the Monotone Circuit Value problem. As pointed out by H. Fernau, K-J. Lange and R. Niedermeier [3], the claimed reduction does not hold, because the obtained graph could have additional unwanted paths due to the lacking of a "copy" operation beside the tradional logic operators.

Actually, parameterized tractable problems whose slices are P-complete really exist. Miyano [2] proved that almost all slices of the Lexicographically First Maximal k-Cycle-Free Edge-Induced Subgraph problem are P-complete. The instance of such problem consists of an undirected graph $G = (V, E)$ with a linear ordering on the edges and a designate edge $e \in E$; the question is whether e belongs to the lexicographically-first maximal edge-induced subgraph which does not contain a k-cycle (k being the parameter). Fernau, Lange and Niedermeier [3] showed that all "lexicographically first maximal Π_k edge-induced subgraph" problems characterized by a FPT-checkable graph property Π_k belong to FPT. Indeed, a simple greedy strategy can solve it.

However, we can also exhibit far simpler parameterized tractable problems whose slices are all P-complete. Let us consider for example the Weighted Circuit Value problem WCV: its instance consists of the description of a logical decision circuit C and of an input word w; the parameter k is the Hamming weight of w, and the question is whether C accepts w. Since the classical Circuit Value problem CV is polynomially solvable, the weighted parameterized

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version is in FPT. Moreover, each slice WCV_k is P-complete. Indeed, consider that for each binary word v it is possible to construct with a parallel algorithm and in constant time a simple circuit C_v which transforms the word $w = 1^k$ into v. The circuit obtained by the joining of C_v and C accepts w if and only if C accepts v.

References

[1] M. Cesati, M. Di Ianni. Parameterized Parallel Complexity. Technical Report ECCC 97-06, 1997. `http://www.eccc.uni-trier.de/eccc/`

[2] S. Miyano. The lexicographically first maximal subgraph problems: P-completeness and NC algorithms. In *Automata, Languages and Programming, 14th International Colloquium*, volume 267 of LNICS, pages 425–434, 1987

[3] H. Fernau, K-J. Lange, R. Niedermeier. A remark on Parameterized Parallel Complexity. Technical Report, 1997.
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