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Short communication

A note on the paper 'Single machine scheduling problems with financial resource constraints: Some complexity results and properties' by E.R. Gafarov et al.

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ABSTRACT

This note emends an incorrectness in the NP-hardness proof of problem $1|NR, d_j = d, g_j = g|\sum T_j$ given in a paper by Gafarov et al. in Mathematical Social Sciences (see vol. 62, 2011, 7–13).

In the article E.R. Gafarov, A.A. Lazarev, F. Werner, Single machine scheduling problems with financial resource constraints: Some complexity results and properties, Mathematical Social Sciences, 62 (2011), 7–13, the following mistake is found in Section 3.2, where the authors consider the problem denoted as $1|NR, d_j = d, g_j = g|\sum T_j$ and claim that it is NP-hard. In the proof, a reduction from the Partition Problem was used which is not polynomial, since M exponentially depends on n.

However, it is not difficult to correct this proof. The main idea of using M^{n-i+1} was that the processing time of a job belongs to a pair with the smallest number being greater than the total sum of the processing times of all jobs from the pairs with larger numbers, e.g., for the job V_2: $p_2 \gg \sum_{i=2}^{n}(p_{2i-1} + p_{2i})$.

Instead of using $p_{2i} = M^{n-i+1}$, where $M = (n\sum b_j)^n$ (see the definition of the instance given in (3) on page 11), we can consider, e.g., $p_{2i} = 2n \cdot 2^{n-i+1}M$, where $M = (n\sum b_j)$. In this case, the reduction will be polynomial in the input length, if we suppose that all digits used are coded in a binary system with approximately 2^n zero–one symbols per digit.

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