

Minimizing machine assignment costs over Δ -approximate solutions of $P||C_{\max}$

Alexander Kononov^{1,2}, Mikhail Kovalyov³, and Bertrand M.T. Lin⁴

¹ Sobolev Institute of Mathematics,

4, Akad. Koptyug avenue, 630090, Novosibirsk, Russia.

² Novosibirsk State University, 2, Pirogova str., 630090, Novosibirsk, Russia

³ United Institute of Informatics Problems,

National Academy of Sciences of Belarus, Minsk, Belarus

⁴ Institute of Information Management, Department of Information and Finance Management, National Chiao Tung University, Hsinchu, Taiwan

alvenko@math.nsc.ru

kovalyov_my@newman.bas-net.by

bmtlin@mail.nctu.edu.tw

Bi-criteria lexicographical minimization problems with the makespan as the primary objective and the total machine assignment costs as the secondary objective have been recently introduced to the scheduling research, and polynomial time $(\Delta, 1)$ -approximation algorithms have been suggested for their solution [1]. We study a problem of minimizing the total machine assignment cost over the Δ -approximate solutions of the makespan minimization problem. We prove that this new problem is strongly NP-hard and pseudo-polynomially non-approximable in general. A polynomial time approximation algorithm with a guaranteed approximation ratio is presented for a special case where the ratio between the maximal and minimal costs associated with the machines is bounded. An $O(mn^{2k})$ time dynamic programming algorithm is presented for another special case in which the number k of distinct job processing times is fixed.

Acknowledgements

The research of the first author is supported by the Russian Science Foundation grant 15-11-10009.

References

1. K. Lee, J.Y.-T. Leung, Z.-h. Jia, W. Li, M.L. Pinedo, B.M.T. Lin, Fast approximation algorithms for bi-criteria scheduling with machine assignment costs, *European Journal of Operational Research* 238 (2014) 54-64.