Hard random instances generator for the open shop scheduling problem

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The random instances generator takes the number of jobs n and the number of machines m as input and requires three parameters k, p and f. An instance is generated in two steps, the first step creates the $m \times n$ matrix P of processing times using the parameter k. The second step performs a number of perturbations p to the $m \times n$ matrix P in combination with a parameter f.

Parameters k, p and f are described by:

- k: integer number, such that the sum of each line of P is equal to k. The value $k \mod m$ is added to the diagonal of P.
- p: number of perturbations, such that for each perturbation, two task's processing times P_{ij} and P_{kl}, $i \neq k$ and $j \neq l$, are randomly selected for which is subtracted a fixed value calculated with the parameter f.
- f: a ratio used to calculate the fixed value *to be subtracted* from the maximum *substractable* processing time. The maximum removable processing time corresponds to the minimum of the two randomly selected tasks P_{ij} and P_{kl} (minus 1 to avoid creating tasks of length 0). A random value (between zero and the difference between *substractable* and *to be subtracted*) is also added to that fixed value.

The value subtracted from P_{ij} and P_{kl} is added to the P_{il} and P_{kj} to keep the sum of all rows equal to k. For numerous generated instances the parameters k, p and f are randomly generated as follows:

- k: random value between $n \times m$ and $n \times m \times 100$
- p: random value between $n \times m$ and $n \times m^2$
- f: random value between 0 and 1

References

[1] Guéret, C., & Prins, C. (1999). A new lower bound for the open-shop problem. Annals of Operations Research, 92, 165–183. https://doi.org/10.1023/A:1018930613891.