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Collision Probability Analysis in a Parallel Machines Model When the Number of Jobs Is Constrained

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Abstract

When designing a production line, obtaining the maximum number of finished products in a given time is a fundamental requirement. To this end, the time interval for feeding materials into a line should be as short as possible. When time intervals are shortened, the probability of a collision occurring between materials increases. In a manufacturing process, such a collision might result in losses in many areas. For example, financial or time losses might be incurred if a manufacturing system shuts down. Moreover, a shutdown might also increase labor costs due to the recovery required. Therefore, when designing a manufacturing line, it can be very important to estimate the collision probability in the designed line.

Research already exists on collision probability in a manufacturing model, where an in-line machines model was assumed. This study assumes that the processing times of jobs follow an Erlang distribution, and then derives a closed form formula for collision probability in a parallel machines model, where the number of jobs is the number of machines plus one or two. Following on from this, we discuss whether collision probability in a parallel machines model could be described by a closed form expression for any number of jobs.

Keywords
parallel machines model, collision probability, Erlang distribution, closed form

Biography

Taiki Otsuka received a B.S. degree and an M.S. degree from Chuo University in 2003 and 2005, respectively. He joined NEC Nexsolutions, Ltd., and later became a stuff member of Z-kai, Inc. He is currently a technician in the Department of Industrial and Systems Engineering at Hosei University, Japan. His research includes algorithms and differential topology.

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