## ABSTRACT

# MARKOV CHAIN ANALYSIS OF A SINGLE-STAGE LOOP-TYPE AUTOMATED MANUFACTURING SYSTEM

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In this paper, a single-stage loop-type automated manufacturing system composed of several machines of the same type, a loop conveyor line and a loading-unloading station is taken into consideration, and the behavior of one machine in the system is modelled and analyzed.

The system is characterized by following features.

(1) A workpiece on a pallet is loaded into either empty machine once.
(2) The production time of a machine obeys arbitrary general distribution.
(3) The conveyor is divided into slots which may contain one pallet or none.
(4) A check point is placed in front of each machine to check the type of the slot arriving at the machine.

Focusing attention upon instants that the head of each slot arrives at the check point, physical states of the machine are modelled as a Markov chain. By using a flow graph modification, the explicit expression for the inter-inflow time distribution is derived. By calculating the mean inter-inflow time and the equilibrium state probabilities, several measures of investigating machine's behavior such as production rate, inflow rate and idle rate are then obtained. Some numerical examples are showed and discussed. Simulation results are also presented to validate the analytical results. Furthermore, by using the analytical results, the approximate production rate of the system composed of N machines is obtained.