A FUZZY-NEURAL APPROACH FOR REMAINING CYCLE TIME ESTIMATION IN A SEMICONDUCTOR MANUFACTURING FACTORY–A SIMULATION STUDY

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ABSTRACT. *A fuzzy-neural approach is proposed in this study for estimating the remaining cycle time of each job in a semiconductor manufacturing factory, which was seldom investigated in the past studies but is a critical task for semiconductor manufacturing industry. The proposed methodology applies the FCM-FBPN approach with multiple buckets to estimate both the cycle time and the step cycle time of a job, and then derives the remaining cycle time with the proportional adjustment approach. To evaluate the effectiveness of the proposed methodology, production simulation is used to generate some test data. According to the experimental results, the estimation accuracy of the proposed methodology was significantly better than those of many existing approaches.*
Keywords: Fuzzy-neural, Remaining cycle time, Step cycle time, Simulation, Semiconductor manufacturing

1. **Introduction.** The remaining cycle time of a job that is being fabricated in a semiconductor manufacturing factory is the time still required to complete the job (see Figure 1). If the job is just released into the semiconductor manufacturing factory, then the remaining cycle time of the job is its cycle time. In other words, the remaining cycle time is an important attribute (or performance measure) for the work-in-progress (WIP) in the semiconductor manufacturing factory. This study is devoted to estimate the remaining cycle time for each job in a semiconductor manufacturing factory. The motives include

(1) Importance of customer relationship management: Estimating the remaining cycle time is a critical task to the semiconductor manufacturing factory because it has to respond to customers' queries about the progress of their orders in the factory, and to make sure that the jobs can be completed in time and the orders can be delivered to the customers on time. Otherwise, some efforts should be made to accelerate the progress of the jobs.

(2) Importance of scheduling/sequencing purposes: Some scheduling rules in a semiconductor factory are based on the remaining cycle times of jobs. For example, the two stochastic scheduling rules proposed by Lu *et al.* [1]-the fluctuation smoothing policy for variance of cycle time (FSVCT) and the fluctuation smoothing policy for meaning cycle time (FSMCT). In such scheduling rules the remaining cycle times of