APPLYING OBJECT-ORIENTED TECHNOLOGY AND COMPUTATIONAL INTELLIGENCE TO CONSTRUCT AN OPTIMIZING QUALITY CONTROLLER FOR SEM

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ABSTRACT

This research presents a run-to-run(R2R) multiple input-multiple output controller for semiconductor manufacturing processes. The controller, termed Computational Intelligence Quality Controller (CIQC), can act as a controller for give models. Recursive estimation techniques are utilized for the on-line estimation of the parameters of a MIMO model of the Hammerstein type. Real-Valued Genetic Algorithm (RVGA) is used to obtain the optimal solution for the next run. The genetic operations, inspired by Darwin''s theory about evolution, include selection, reproduction, crossover, and mutation. An Unified Modeling Language (UML) is applied in this research for the system analysis and design of the R2R controller. The software implementation of the CIQC uses the MATLAB because it owns a lot of useful toolboxes and can provide a simple and friendly user interface. For testing purposes, Chemical Mechanical Planarization(CMP) processes were simulated based on real equipment models provided by SEMATECH. It is shown that under the presence of noise and drift disturbances of different magnitudes, the CIQC allows to keep adequate control of the responses even if the input-output transfer function is severely nonlinear, and can offer better performance than the Optimizing Adaptive Quality Controller(OAQC).

Keywords : Run-to-Run Controller ; UML ; Real-Valued Genetic Algorithm ; Chemical Mechanical Planarization

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