Researchers at the University of South Florida have developed a new method of performing wavelet-modulated reinforcement learning-based run-by-run (RbR) control to manage output variability in a manufacturing process run.

In recent years, RbR control mechanisms have emerged as a useful tool for keeping complex semiconductor manufacturing processes on target during repeated short production runs. Many types of RbR controllers exist where the exponentially weighted moving average (EWMA) controller is widely used in the industry. However, EWMA controllers are known to have several limitations. For example, in the presence of multiscale disturbances and lack of accurate process models, the performance of EWMA controller deteriorates and often fails to control the process.

There is a need for an intelligent and efficient RbR process controller, especially for the control of processes with short production runs as is the case in the semiconductor manufacturing industry. Our inventors have proposed a controller that is capable of generating optimal control actions in the presence of multiple time-frequency disturbances and allows the use of realistic (often complex) process models without sacrificing robustness and speed of execution.

Performance measures such as reduction of variability in process output and control of compositions, minimization of initial bias, and ability to control processes with high autocorrelations are shown to be superior in comparison to the commercially available EWMA controllers.

**ADVANTAGES:**
- Intelligent and efficient
- Allows complex process models without sacrificing robustness and speed
- Ability to control processes with high autocorrelations
- Reduction of variability in process output and control recipe

**Intelligent and Efficient RbR Process Controller Specially for Short Production Runs**

**Structure of WRL-RbR Controller**

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