Collaborative Research: CPS: Medium: On-Line Control and Soft-Sensing for Thermal Food Processing Based on a Reduced-Order Modeling Approach

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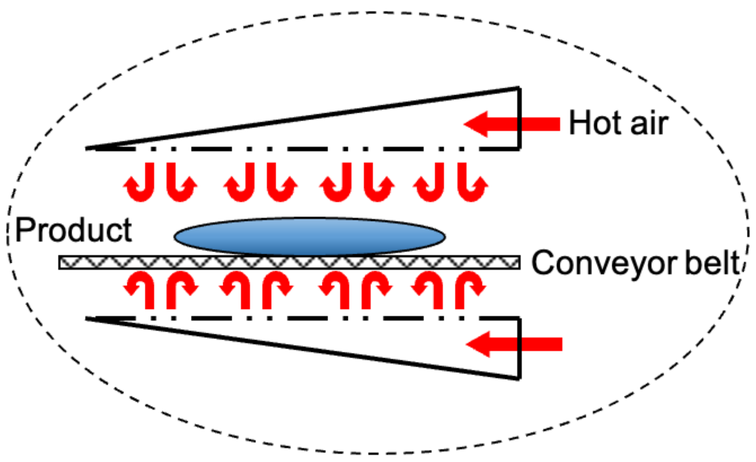

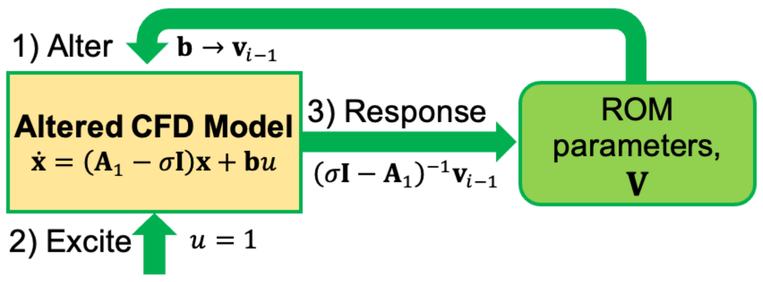

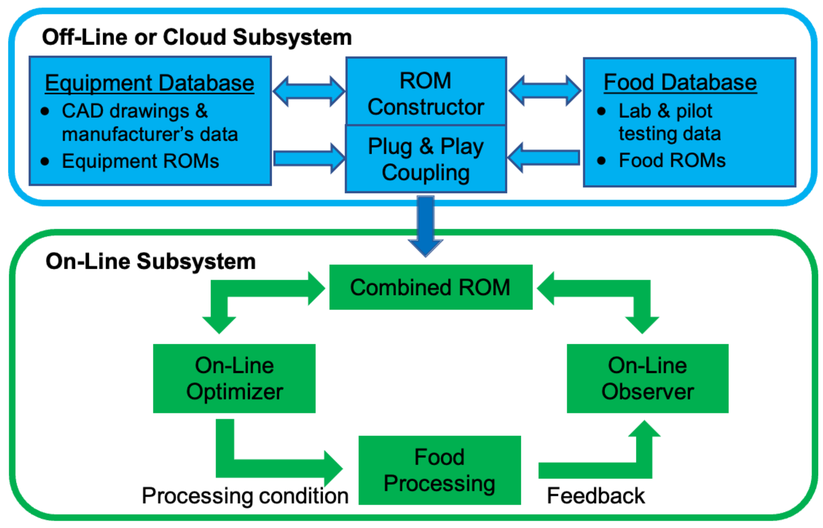

Challenge:

- A highly complex process with inevitable process variations such as product switchover and moisture changes
- A product switchover or a scale-up would render existing control and model parameters irrelevant.
- Direct feedback of product quality is unavailable in most industrial settings.

Solution:

- Quick assembly of pre-built model components, enabled by a physics-based approach
- Reduced-order modeling (ROM) of complex physics for computationally-efficient high-fidelity process simulations
- ROM-building based on a new concept of altering the digital twin of the process for improved identification
- Soft-sensing of immeasurable product quality

Scientific Impact:

- A more robust and industry-friendly ROM technique will facilitate ROM adoptions for a real-time CPS involving distributed-parameter system components.
- Will gain knowledge and experiences in quick model-assembly based on coupling of ROM components for real-time management of discrete process variations in a CPS.

Broader Impact:

- Improvement of yield and energy efficiency will ensure sustainable food supply chain and greener industry.
- Cross-disciplinary training in food processing, advanced computing, and controls
- Will update the curricula of CC, UG and graduate programs.
- Research opportunities for underrepresented groups
- Summer camps for high-school students from minorized groups

Award ID#: 2310590 and 2310591