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Abstract:
The interest in ensuring optimal growth climate conditions is sustained by the increasing demand in greenhouse products, which in turn, leads to an increasing demand of high efficiency greenhouse control systems. The greenhouse climate control is complex due to the high nonlinear interaction between the biological subsystem and the physical subsystem, and due to strong coupling of the two main controlled variables: temperature and humidity. In this context, the paper presents an equivalent greenhouse climate model based on feedback-feedforward compensation technique responsible for linearization, decoupling and disturbance compensation of the greenhouse complex model. Based on this equivalent model reduced to integral plus dead time decoupled processes, a comparison study of associated PI/PID controllers employing different tuning techniques is performed by simulation.

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I. Introduction
The greenhouse facilities provide a closed, controllable environment allowing intensive culture of plants. The current environmental constraints, for micro and macro nutrients, CO₂ injection and fixed delivery timing, lead to the need of highly automation control of greenhouse environment, where the total costs can be estimated before and during the production time. It should also offers the possibility for crop steering, fungus and mold prevention, protection in case of diseases and optimization in terms of costs.

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Keywords
IEEE Keywords
Tuning, Green products, Humidity, Temperature control, Air pollution, Process control

INSPEC: Controlled Indexing
three-term control, climate mitigation, feedback, feedforward, greenhouses, humidity control, linearisation techniques, optimal control, PI control, temperature control

INSPEC: Non-Controlled Indexing

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PI controller, PID controller tuning, feedback-feedforward linearization, optimal growth climate condition sustainability, greenhouse product demand, greenhouse climate control systems, nonlinear interaction, biological subsystem, physical subsystem, temperature control variable, humidity control variable, feedback- feedforward compensation technique, disturbance compensation, greenhouse complex model, integral-plus-dead time decoupled processes

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