Control Design for Non-Linear Uncertain Systems via Coefficient Diagram Method: Application to Solar Thermal Cylindrical Parabolic Trough Concentrators

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Abstract: In this paper, we propose a new application of the coefficient diagram method (CDM) to design a robust controller of non-linear uncertain system, the control is applied to a distributed collector field of a solar power plant based on cylindrical parabolic trough concentrators. The non-linear uncertain system is represented by two PDEs of both the fluid and the metal. To design the control, a linearization of the non-linear system is made around an equilibrium point to have a transfer function, this point represents the simulation's steady state of the real system, then the controller is obtained using the form of Manabe for the CDM. Comparing the results of this method with those of the PID controller, it is shown that the CDM design is an easy and robust control for a non-linear system, that gives enhanced stability with good settling time with respect to the large rise time.

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