Application of Terminal Sliding Mode Control to the Stabilization of the Indoor Temperature in Buildings

Authors : Pawel Skruch, Marek Dlugosz

Abstract : The paper starts with a general model of the temperature dynamics in buildings. The modelling approach relies on thermodynamics, in particular heat transfer, principles. The model considers heat loses by conduction and ventilation and internal heat gains. The parameters of the model can be determined uniquely from the geometry of the building and from thermal properties of construction materials. The model is presented using state space notation and this form is used in the control design procedure. A sliding surface is defined by the system output and the desired trajectory. The control law is designed to force the trajectory of the system from any initial condition to the sliding surface in finite time. The trajectory of the system after reaching the sliding surface remains on it. A simulation example is included to verify the approach and to demonstrate the achievable performance improvement by the proposed solution in the temperature control in buildings.

Keywords : modelling, building, temperature dynamics, sliding-mode control, sliding surface

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