TECHNISCHE UNIVERSITÄT
IN DER KULTURHAUPTSTADT EUROPAS
CHEMNITZ

Fakultät für Mathematik
Chemnitzer Mathematisches Colloquium

E i n l a d u n g

In der Reihe „Chemnitzer Mathematisches Colloquium“ der Fakultät für Mathematik der TU Chemnitz spricht

Herr Prof. Dr. Ralf Wunderlich (BTU Cottbus)

über das Thema

Stochastic Optimal Control of Heating Systems with a Geothermal Energy Storage.

Der Vortrag findet am

Donnerstag, dem 24. Oktober 2024, um 16:00 Uhr, im Raum 2/B202

statt.

Ich möchte Sie hiermit recht herzlich zu dieser Veranstaltung einladen. Das Kolloquium wird von Herrn Prof. Dr. Alois Pichler geleitet.

Abstract:
We consider the cost-optimal management of a residential heating system equipped with several heat production and consumption units. The manager is exposed to uncertainties about randomly fluctuating renewable heat production and environmental conditions driving the heat demand and supply. As a special feature the manager has access to a geothermal storage which allows for intertemporal transfer of thermal energy. This leads to a challenging mathematical optimization problem. The optimization problem is treated as a continuous-time stochastic optimal control problem for a controlled state process whose dynamics is described by a system of ordinary differential equations (ODEs), stochastic differential equations (SDEs) and a partial differential equation (PDE). We first apply semi-discretization to the PDE and use model order reduction techniques to reduce the dimension of the associated system of ODEs. Our numerical experiments for the model reduction with the balanced truncation method show that the space-time dynamics of the temperature in the geothermal storage can be described by only a few controlled ODEs. Finally, time-discretization leads to a Markov decision process for which we apply numerical methods to determine a cost-optimal control and the associated value function.

Prof. Dr. Daniel Potts
Dekan

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