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Robust Resource Management Control for CO2 Emission and Reduction of Greenhouse Effect: Stochastic Game Approach

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ABSTRACT

With the increasingly severe global warming, investments in clean technology, reforestation and political action have been studied to reduce CO_2 emission. In this study, a nonlinear stochastic model is proposed to describe the dynamics of CO_2 emission with control inputs: clean technology, reforestation and carbon tax, under stochastic uncertainties. For the efficient resources management, a robust tracking control is designed to force resources tracking a desired reference output. The worst-case effect of stochastic parametric fluctuations, external disturbances and uncertain initial conditions on the tracking performance is considered and minimized from the dynamic game theory perspective. This stochastic game problem, in which one player (stochastic uncertainty) maximizes the tracking error and another player (control input) minimizes the tracking error, could be equivalent to a robust minimax tracking problem. To avoid solving the HJI, a fuzzy model is proposed to approximate the nonlinear CO_2 emission model. Then the nonlinear stochastic game problem could be easily solved by fuzzy stochastic game approach via LMI technique.

KEYWORDS

CO_2 Emission System, Dynamic Game Theory, Greenhouse Effect, LMI, Resource Management Control, Robust Tracking Control, T-S Fuzzy Model

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