Project Complexity DTC

Characterising equilibria in dynamical games. With applications to treaties related to reducing the effects of climate change.

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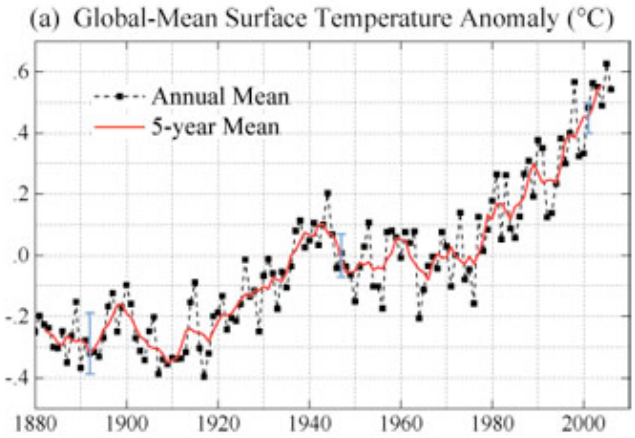
In this project we study the properties of game theoretic equlibria with the help of some concepts developed in evolutionary game theory. The basis of this project is a simple time-dependent game modelling the construction of treaties to reduce the CO2 contents in the atmosphere, as given in references [1] and [2]. As can be seen in the graphics, the average temperature of the world has a clearly visible increasing trend caused by the massive release of greenhouse gases (GHG) since the beginning of the industrial revolution.



The model to be established and analysed uses the dynamics of the relevant GHG as released by different countries and incorporate measures to reduce this emission. We like to study which measures (strategies) would guarantee a stable equalibria with as low emission rates as economically feasible. The equilibria should be characterised in a dynamical systems setting (like has been done in evolutionary game theory, see references [3] – [5]). To do so we will define different concepts, like Pareto optimality, and the Nash equilibria in the context of the simple model that will be studied.

References:

[1] Prajit K. Dutta and Roy Radner
A Strategic Analysis of Global Warming: Theory and Some Numbers

[2] Prajit K. Dutta and Roy Radner
Self-Enforcing Climate-Change Treaties
(both articles can be obtained as PDF by Markus)

[3] M. Benaim and M.W. Hirsch: *Mixed equilibria and dynamical systems arising from repeated games,* Games Econ. Behav. **29** (1999), 36-72 MR **2000m:91020**

[4] A.B. Ania, T. Tröger and A. Wambach: *An evolutionary analysis of insurance markets with adverse selection,* Games Econ. Behav. **40** (2002), 153-184.

[5] Josef Hofbauer; Karl Sigmund ,***Evolutionary game dynamics.*** Bull. Amer. Math. Soc. **40** (2003), 479-519.