Approximation of deterministic mean field games with control-affine dynamics

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We study the numerical approximation of deterministic Mean Field Games where the dynamics of a typical agent is non-linear with respect to the state variable and affine with respect to the control variable. We focus our attention on the approximation of such mean field games by analogous problems in discrete time and finite state space. For these approximations, we show the existence and, under an additional monotonicity assumption, uniqueness of solutions. Our main result is the convergence of equilibria of the discrete mean field game problems towards equilibria of the continuous one. We provide some numerical results for two MFG problems. In the first one, the dynamics of a typical player is nonlinear with respect to the state and, in the second one, a typical player controls its acceleration.

We refer the reader to [GS23, GSZ23] for more details.

[GS23] Justina Gianatti and Francisco J. Silva. Approximation of deterministic mean field games with control-affine dynamics. *Foundations of Computational Mathematics*, 2023.

[GSZ23] Justina Gianatti, Francisco J. Silva, and Ahmad Zorkot. Approximation of deterministic mean field games under polynomial growth conditions on the data. *Journal of Dynamics and Games*, 2023.