Mathematics > Optimization and Control

Hamilton-Jacobi Equations and Two-Person Zero-Sum Differential Games with Unbounded Controls

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(Submitted on 6 Jul 2011 (v1), last revised 17 Feb 2012 (this version, v2))

A two-person zero-sum differential game with unbounded controls is considered. Under proper coercivity conditions, the upper and lower value functions are characterized as the unique viscosity solutions to the corresponding upper and lower Hamilton--Jacobi--Isaacs equations, respectively. Consequently, when the Isaacs' condition is satisfied, the upper and lower value functions coincide, leading to the existence of the value function. Due to the unboundedness of the controls, the corresponding upper and lower Hamiltonians grow super linearly in the gradient of the upper and lower value functions, respectively. A uniqueness theorem of viscosity solution to Hamilton--Jacobi equations involving such kind of Hamiltonian is proved, without relying on the convexity/concavity of the Hamiltonian. Also, it is shown that the assumed coercivity conditions guaranteeing the finiteness of the upper and lower value functions are sharp in some sense.

Comments:	34 pages
Subjects:	**Optimization and Control (math.OC)**; Systems and Control (cs.SY)
Cite as:	**arXiv:1107.1011 [math.OC]**
	(or **arXiv:1107.1011v2 [math.OC]** for this version)

Submission history

From: Jiongmin Yong [view email]
[v1] Wed, 6 Jul 2011 01:29:50 GMT (26kb)
[v2] Fri, 17 Feb 2012 14:25:31 GMT (27kb)

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