

Master's Thesis

The Use of Smoothing Methods in
Multi-Leader-Follower Games

Guidance

Assistant Professor Ellen Hidemi FUKUDA

Daisuke TSUYUGUCHI

Department of Applied Mathematics and Physics

Graduate School of Informatics

Kyoto University



February 2016

Abstract

The multi-leader-follower game is an important model with possibilities of applications in many fields, such as economics and operations research. In this game, there are two kinds of players, called leaders and followers. A leader anticipates the followers' strategies and competes with other leaders in a non-cooperative Nash way. At the same time, for a given leaders' decisions, the followers choose their own optimal strategies by competing with each other. This game is an extension of the Stackelberg game, where only one leader is considered. However, except for special classes of problems, it is hard to say that it has been well studied. In this paper, we present a method for problems in which the followers have inequality constraints. With a smoothing method, we reformulate this problem into a sequence of parameterized smooth Nash equilibrium problems. We will show that by solving the sequence of Nash equilibrium problems, we can get a solution of the original multi-leader-follower game.