Voronoi Language Games with Knightian Uncertainty

Zhaojun Xing*

Bielefeld University, Paris 1 University and Paris School of Economics

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Abstract

A Voronoi language game Jäger et al. (2011) is a sender-receiver game of common interest having infinite types, e.g the unit interval [0,1], but with finite signals, messages or words. The sender observes her private type and choose one of the finite signals that is sent to the receiver. The receiver interpreted it as some type. For any strict Nash equilibrium of the game, due to finite signals the sender partitions her type space into finite cells and the receiver guesses each signal as some type that is the center of mass of the cell that the signal denotes. The strict Nash equilibria of the game form the named Voronoi languages.

In this paper, we introduce Knightian uncertainty or multiple priors rather than a unique prior over the type space. We use two incomplete preferences, i.e. maximality (Bewley's way) and E-admissibility (Levi's way), to extend Nash equilibria to maximal Nash equilibria and E-admissible equilibria, respectively. An act or an option is maximal if there is no other act dominating this act under all distributions, and an act is E-admissible if there exists some distribution such that the act has the maximum expected value. Directly characterizing the maximal acts and the maximal Nash equilibria is not easy. Schervish et al. (2003) have proved the equivalence of the maximal rule and

*E-mail: zhaojun.xing(at)hotmail.com

the E-admissible rule within finite states. We wonder whether there is an equivalence even when the state space is infinite. Fortunately, we have demonstrated the equivalence between the two incomplete rules in the infinite case and applied the equivalence to characterizing strictly maximal Nash equilibria by strictly E-admissible equilibria. Then we show the equivalences among the following three concepts in our games: a strictly E-admissible equilibrium, a strict Nash equilibrium and a Voronoi language.

Besides, we discuss the efficiency or the minimal lost during information transfer and each efficient language is a Voronoi language. At last, we define the notion of vague Voronoi language, which is a collection of Voronoi languages that should satisfy some conditions: thickness, connectedness and maximality. In one-dimensional type space, we demonstrate that there exists no vague Voronoi languages when the prior of each player is a singleton. Hence, in our model Knightian uncertainty is a necessary condition to generate vague words, like the words (left, right), (short, tall), (red, orange), etc.