Canadian Journal of Linguistics/Revue canadienne de linguistique, 61(1): 107–116, 2016
doi: 10.1017/cnj.2016.5

Reviews
Comptes rendus

Robin Clark. 2012. *Meaningful Games: Exploring Language with Game Theory*. Cambridge: MIT Press. Pp. 376. $50.00 (hardcover).

Reviewed by Maxime C. Corbeil, *Université du Québec à Montréal*

In this book, Clark introduces game theory and its application to linguistic meaning. The central idea presented is that meaning arises from strategic choices made by rational players and that it can be modeled with game theory. Game theory itself is about rational decision making in a situation where the outcome depends on a choice made by one player (or agent). Its application to linguistics aids in the development of a formal mathematical approach to modeling linguistic behaviour.

Part 1 – The social side of meaning

The first part of the book is devoted to comparing game theory to the widely-accepted computational approach to linguistic meaning. In Chapter 1, "Platonic Heaven", Clark presents this approach, in which the mind is defined as a computational device containing all the rules necessary to manipulate concepts. In this standard view, there is a mapping between natural language and the language of thought, i.e., mentalese. In Chapter 2, "My Fall from Platonic Heaven", he states that concepts are rather constrained by their relation with the world since it is the social network "that gives my words and mental states content" (p. 31). Clark then spends Chapter 3, "Meaning and the Social Contract", arguing that meaning originates outside the mind because if one wants to be understood, one must first choose the best socially-accepted way of expressing oneself. For Clark, language is not only connected with human reasoning, but most importantly with the real world. The fact that game theory makes it possible to explicitly represent the choices made by a player and to model such a strategic social interaction makes it, according to the author, a perfect tool to use for the study of linguistic meaning.

Part 2 – Games and truth

In this second part of the book, Clark introduces the mechanics of game theory and works through many examples of its application to the study of linguistic meaning. In Chapter 4, "A Primer on Games", it is argued that communication is strategic from both the hearer's and the speaker's perspective as they both want to maximize their payoffs. A game between two players is defined as a series of choices, each having its own utility (a utility is like an arithmetic preference for different options), and for each of these choices players will typically choose the most favourable outcome for themselves. In other words, a player will make the highest-utility move at each point where s/he has a choice to make. It is worth noting that, though game theory does provide a formal framework, that formalism does not help to justify the different values for the utilities of a given decisional node.

Clark presents many examples of different kinds of games, but he notes that only games of partial information can provide good models of linguistic communication. In a partial information game, a player makes a choice without completely resolving a possible ambiguity (e.g., the two possible meanings of a word). Additionally, since communication also involves social conventions and cooperation, Clark suggests that coordination games are an excellent starting point to explore linguistic communication. Coordination games are a class of games where the choices made by a player will affect the outcome of the other player (e.g., Hobo Dinner Game on p. 90). In the well-known Prisoner's Dilemma, two suspects are held by the police and they cannot communicate with each other. The police offer them a deal with three possible outcomes: if they both remain silent, they both will serve one year in prison, if they betray each other, they both will serve two years in prison, and if one stays silent and the other one betrays him, the former will serve three years in prison and the latter will be free. This is a great example of a coordination game because a decision made by one player affects the outcome of the other player.

Chapter 5, "A Game Logic for Natural Language", is entirely devoted to developing a game logic for natural language. Clark uses game theory to assess the truth of a sentence with respect to a model via a zero-sum game of perfect information. A model is a part of the world against which the sentence is evaluated and zero-sum means the game has a clear winner and a clear loser. In this kind of game, the two players have opposite goals, one tries to find evidence for the sentence's validity (if he wins, the sentence is true), and the other one tries to find evidence against the sentence (if she wins, the sentence is false). To determine who wins, Clark defines a series of game rules that will then have to be combined with a model. Using this game theoretic approach, he is able to work out the truth value of atomic sentences for which a player need only look at the truth value in the model, but also work out the truth value of more complicated cases such as sentences containing negation, logical connectives, and even Aristotelian determiners (e.g., sentences like *Some monkey didn't chatter*). However, Clark notes that truth conditions are only one aspect of meaning, and even though the sorts of games described here are useful for thinking about truth conditions, they do not take into account the fact that successful communication may benefit both players. In other

https://doi.org/10.1017/cnj.2016.5 Published online by Cambridge University Press

words, linguistic communication rarely corresponds to a pure zero-sum game because the interests of the players often coincide and this means that both players can get positive payoffs.

Part 3 – Games and the world

Part 3 discusses the notion of common knowledge and presents a game-theoretic model that can take into account cooperative meaning. Even though true common knowledge is impossible to achieve (see Barwise and Moss 1996), in Chapter 6, "Common Knowledge", Clark contends that the players can still communicate by using an approximation of common knowledge, which prevents them from falling into the abyss of infinite regression (i.e., all the players know *p*, they all know that they know *p*, etc.). Because a player's memory and cognitive capacity are limited, s/he must approximate common knowledge using heuristics. Additionally, common knowledge needs to be coordinated between the players in order to avoid misunderstanding. This means that if a presupposition (such as the fact that I have a sister when I say *my sister*) is not already part of the common ground, then the players must jointly update their discourse. Chapter 7, "Lexical Games", covers lexical games with an exhaustive presentation of a game-theoretic model of word interpretation. In these games, the payoffs (or expected utility) come from a subjective probability that corresponds to the personal beliefs of the player. This probability depends upon the linguistic knowledge of the players, on their experience with the language, and on the particular context of utterance.

In Chapter 8, "Two Examples: Pronouns and Politeness", Clark discusses issues already raised by Clark and Parikh (2007) about the strategic decision making involved in the interpretation of discourse anaphors and shows that pronouns do not need a specific grammar component to be interpreted because their use is explained by rational behaviours and can thus be modeled using game theory. The rest of Chapter 8 is used to present the general steps involved in a game-theoretic analysis. The first step is to divide the problems into a series of choices made by the speaker and the hearer. The next and crucial step is determining the preferences of both players and converting them into payoffs/utilities. Once this is done, the game can be solved by assigning a payoff to every decisional node. It is not possible to freely assign a utility to a given outcome because the attribution of a utility to a given node is constrained by the preference of the player.

The last chapter of the book, "The Social Ecology of Meaning", is devoted to Clark's reconstruction of prototype theory in terms of coordination games. His main idea is that prototypes act like "conventionalized focal points" (p. 297) and this allows players to coordinate their behaviour around them. In other words, the semantic value of a prototype is acquired through social coordination and negotiation from both parties. The book then draws to an exciting conclusion as Clark describes how the conventionality of meaning could emerge from social coordination between players using a word to signal a given point in the semantic space.

https://doi.org/10.1017/cnj.2016.5 Published online by Cambridge University Press

Clark's approach builds on the view that linguistic meaning arises from social coordination rather than from mental representations, and, as motivation for his view, he does an excellent job of describing the social aspect of linguistic interaction, helping the reader to better understand how language works and the unequivocal link between a speaker/player and his/her place within the world. The book does not presuppose any knowledge of game theory or semantics. Since the goal of the book is to make game theory accessible to a wide variety of readers, the level of mathematical formalism is kept simple enough for a general audience to understand. For the more mathematically-inclined reader, the author includes many formal definitions in boxes throughout the text, and there is also a comprehensive list of suggested readings at the end of each chapter. In short, this is a well-written introduction to game theory and its application to natural language meaning that will be of interest to semanticists and pragmaticists, as well as communication scholars, particularly those interested in the relation between social interaction and meaning construction.

BIBLIOGRAPHY

Barwise, Jon, and Lawrence Moss. 1996. *Vicious circles: On the mathematics of non well-founded phenomena*. CSLI Lecture Notes No.60. Stanford, CA: CSLI Publications.

Clark, Robin, and Prashant Parikh. 2007. Game theory and discourse anaphora. *Journal of Language, Logic and Information* 16: 265–282.

Bryan Gick, **Ian Wilson**, and **Donald Derrick.** 2013. *Articulatory Phonetics*. West Sussex: Wiley-Blackwell. Pp. xxii + 250. CDN$56.95 (softcover).

Reviewed by Sarah D.F. Greer, *University of Calgary*

Articulatory Phonetics is a first-edition textbook by Gick, Wilson, and Derrick. The book is divided into two parts: Part I tackles basic anatomy and how thought becomes sound, while Part II delves into how specific types of sounds are articulated. Each chapter begins with an abstract and ends with exercises such as short-answer questions and/or practical assignments. Also included at the end of each chapter is a section titled *sufficient jargon,* which is a list of key terms the student should become familiar with.

Part I begins with "The Speech System and Basic Anatomy" whose main focus is on the building blocks of anatomy, although it does briefly discuss the speech chain. It includes an explanation of anatomical planes (full body & vocal tract), an introduction to the hard and soft materials in the body (bones and cartilages vs. muscles) that are discussed in detail in the other chapters, as well as a brief discussion of the different types of devices available to track and measure articulatory movements. These are then cross-referenced with the chapters in which each device will be discussed.

The second chapter "Where It All Starts: The Central Nervous System" gives an overview of said system, its composition, and how it sends messages to other parts of

https://doi.org/10.1017/cnj.2016.5 Published online by Cambridge University Press