GIACOMO BONANNO

LOGIC AND THE FOUNDATIONS OF THE THEORY OF GAMES AND DECISIONS: INTRODUCTION*

This special issue of *Knowledge, Rationality and Action* contains a selection of papers presented at the sixth conference on "Logic and the Foundations of the Theory of Games and Decisions" (LOFT6), which took place in Leipzig, in July 2004.

The LOFT conferences have been a regular biannual event since 1994.[1] The first conference was hosted by the Centre International de Recherches Mathematiques in Marseille (France), the next four took place at the International Center for Economic Research in Torino (Italy) and the most recent one was hosted by the Leipzig Graduate School of Management in Leipzig (Germany).

The LOFT conferences are interdisciplinary events that bring together researchers from a variety of fields: computer science, economics, game theory, linguistics, logic, mathematical psychology, philosophy and statistics. In its original conception, LOFT had as its central theme the application of logic, in particular modal epistemic logic, to foundational issues in the theory of games and individual decision-making. Epistemic considerations have been central to game theory for a long time. The expression interactive epistemology has been used in the game-theory literature to refer to the analysis of what individuals involved in a strategic interaction know about facts concerning the external world as well as facts concerning each other's knowledge and beliefs. What is relatively new is the realization that the tools and methodology that were used in game theory are closely related to those already used in other fields, notably computer science and philosophy. Modal logic turned out to be the common language that made it possible to bring together different professional communities. The insights gained and the methodology employed in one field can benefit researchers in a different field. Indeed, new and active areas of research have sprung from the interdisciplinary exposure provided by the LOFT conferences.[2]

Over time the scope of the LOFT conferences has broadened to encompass other tools, besides modal logic, that can be used to shed light on the general issues of rationality and agency. Topics that have fallen within the LOFT umbrella include epistemic and

Synthese (2005) 147: 189–192
Knowledge, Rationality & Action 1–4
DOI 10.1007/s11229-005-1346-x

temporal logic, theories of information processing and belief revision, models of bounded rationality, non-monotonic reasoning, theories of learning and evolution, mental models, etc.

The papers collected in this issue of *Knowledge, Rationality and Action* reflect the interdisciplinary composition of the participants in the LOFT conferences and the cross-fertilization that has taken place among different fields.

Giacomo Bonanno proposes a modal logic for belief revision based on three operators, representing initial beliefs, information and revised beliefs. Three simple axioms are shown to characterize the qualitative version of Bayes' rule, which can be stated as follows: if the event representing the information has a non-empty intersection with the support of the initial probability distribution, then the support of the new probability distribution coincides with that intersection. The three axioms capture three aspects of a policy of minimal revision: in the absence of surprises, (1) the information is believed, (2) everything that was believed before continues to be believed and (3) any new belief must be deducible from the initial beliefs and the information received. Soundness and completeness are proved and theorems are derived concerning the interaction between initial and revised beliefs.

Hans van Ditmarsch proposes a framework for studying iterated belief revision based on dynamic epistemic logic. Information states are modeled as Kripke models with several accessibility relations, representing knowledge and degrees of belief. The revision of an information state by a formula ϕ is described by a dynamic modal operator that is interpreted as a binary relation between information states. The author describes five different types of dynamic belief revision and discusses their properties, in particular whether they lead to successful revision, that is, whether revision by ϕ leads to a new information state where ϕ is believed.

The paper by Noël Laverny and Jérôme Lang is related to belief revision as well as to knowledge-based programs. The latter combine knowledge and action in programs by prescribing different actions depending on the current state of knowledge. The authors propose an extension of this approach by introducing graded beliefs, so that a program can prescribe an action conditional on the degree of belief being above a given threshold. They propose the notion of belief-based program built on ordinal conditional functions. The authors distinguish between pure sensing actions (that leave the state of the world unchanged and act only on the agent's mental

state by giving her some feedback about the actual world) and purely ontic action (that change the state of the world without giving any feedback to the agent). The focus of the analysis is on the execution of belief-based programs.

The paper by Martin Peterson and Sven Ove Hansson deals with decision theory. The authors characterize order-independent transformative decision rules. A transformative decision rule alters the representation of a decision problem by changing one of its components (the set of acts, the set of states, the probability distribution or the value assignments). Example of such a rule is the principle of insufficient reason, which prescribes that when there is no reason to believe that one state of the world is more probable than another, the decision maker should transform the initial representation of the decision problem into one in which every state is assigned equal probability. A set of transformative decision rules is order-independent in case the order in which the rules are applied is irrelevant. The main result of the paper is an axiomatic characterization of order-independent transformative decision rules, based on a single axiom.

The paper by Katrin Schulz deals with the paradox of free choice permission in linguistics. An example of a free choice sentence is 'You may go to the beach or go to the cinema', which intuitively seems to convey that the addressee may go to the beach and he may go to the cinema. However, such inference is at odds with standard assumptions about logical analysis. There are two strategies for resolving the tension between intuition and logic: one may either give up standard principles of logic, or one may try to explain the inference in pragmatic terms. The author explores the second strategy and develops it in enough detail to judge its feasibility and adequacy.

The paper by Giacomo Sillari deals with the philosophical problem of how to interpret and understand social conventions, in particular his aim is to cast David Lewis's account of convention in a formal framework. The author proposes a multi-agent modal logic containing, for each agent, a reason-to-believe operator and an indication operator. Sillari discusses the distinction between epistemic and practical rationality and its relationship to the notion of indication and inference. He also argues that a modal logic formalization of belief, supplemented with awareness structures, can be a natural interpretation of the epistemic concepts involved in Lewis's analysis of convention.

I would like to thank Wiebe van der Hoek, managing editor of *Knowledge, Rationality and Action*, for devoting a special issue to LOFT6, Arnis Vilks, Dean of the Leipzig Graduate School of Management, for funding and hosting LOFT6 and Pierfrancesco La Mura and Beate Kanheissner for the excellent local organization of the conference. The papers went through a thorough refereeing and editorial process. I would like to thank the many referees who provided invaluable help and the authors for their cooperation during the revision stage.

NOTES

* The conference was organized by Giacomo Bonanno, Wiebe van der Hoek, Pierfrancesco La Mura and Arnis Vilks with the assistance of a program committee consisting of Johan van Benthem, Vincent Hendricks, Wlodek Rabinowicz, Hans Rott and Marciano Siniscalchi.

[1] Collections of papers from previous LOFT conferences can be found in a special issue of *Theory and Decision* (Vol. 37, 1994, edited by M. Bacharach and P. Mongin), the volume *Epistemic logic and the theory of games and decisions* (edited by M. Bacharach, L.-A. GérardVaret, P. Mongin and H. Shin and published by Kluwer Academic, 1997), two special issues of *Mathematical Social Sciences* (Vols. 36 and 38, 1998, edited by G. Bonanno, M. Kaneko and P. Mongin), two special issues of *Bulletin of Economic Research* (Vol. 53, October 2001 and Vol. 54, January 2002, edited by G. Bonanno and W. van der Hoek) and a special issue of *Research in Economics*, (Vol. 57, 2003, edited by G. Bonanno and W. van der Hoek).

[2] There is substantial overlap between the LOFT community and the community of researchers who are active in another regular, biannual event, namely the conferences on Theoretical Aspects of Rationality and Knowledge (see www.tark.org).

Department of Economics
University of California
Davis, CA 95616|8578
U.S.A.
E-mail: gfbonanno@ucdavis.edu

7 Items

Access to all content Access to some content
Access to no content

1. A Logical Framework for Convention — Add to marked items
   Author: Giacomo Sillari
   Text: PDF (126 kb)

2. A Pragmatic Solution for the Paradox of Free Choice Permission — Add to marked items
   Author: Katrin Schulz
   Text: PDF (217 kb)

3. A Simple Modal Logic for Belief Revision — Add to marked items
   Author: Giacomo Bonanno
   Text: PDF (269 kb)

4. From Knowledge-based Programs to Graded Belief-based Programs, Part I: On-line Reasoning* — Add to marked items
   Authors: Noël Laverny and Jérôme Lang
   Text: PDF (348 kb)

5. Logic and the Foundations of the Theory of Games and Decisions: Introduction* — Add to marked items
   Author: Giacomo Bonanno
   Text: PDF (38 kb)

6. Order-Independent Transformative Decision Rules — Add to marked items
   Authors: Martin Peterson and Sven Ove Hansson
   Text: PDF (126 kb)

7. Prolegomena to Dynamic Logic for Belief Revision — Add to marked items
   Author: Hans P. Van Ditmarsch
   Text: PDF (324 kb)

7 Items