Piotr Kulicki

Logic of actions and norms

In the two part lecture I will present the fundamentals of formal action theory and elements of deontic logic that can be built as extensions of that theory. I will give an account of the main modeling principles formulating the folklore of the discipline and recall some well known results. I will also point out some works I was personally involved in over the last 15 years.

Part I Deontic logic of single-step actions

I will start this part with some philosophical remarks on actions, including various attempts to define what an action is and principles that underlie formalization of actions. Actions themselves, as well as their descriptions, consist of some simple (atomic) elements. I will present how complex actions can be described using Boolean algebra. Then I will introduce deontic operators of prohibition, permission and obligation. I will show how the deontic characteristics of complex actions defined in terms of deontic operators rely on the deontic characteristics of elements of those complex actions. The study of relations between the deontic operators will follow. Finally, I will show some examples of applications of logics built in that way.

Part II Sequentially composed actions and norms defined on them

Actions usually form sequences. Formalization of sequentially composed actions enriches deontic action logic with new insights and problems. I will present an algebraic account of sequentially composed actions taking into account successful and unsuccessful realizations of actions. Then, I will show how the deontic properties of single steps may be extended to the properties of sequences of actions. Sometimes, however, the deontic properties of sequences reflect the whole sequence and its final result rather than their single step elements. As an example of a formal account of such phenomena I will introduce a goal oriented notion of obligation.

The presentation will be based of the following publications:

1. R. Trypuz, P. Kulicki, *A systematics of deontic action logics based on boolean algebra*, Logic and Logical Philosophy, 18 (3-4), 253-270, 2009
2. R. Trypuz, P. Kulicki, *A norm-giver meets deontic action logic*, Logic and Logical Philosophy, 20, (1-2), 59–72, 2011
3. P. Kulicki, R. Trypuz, *How to build a deontic action logic*, in: Michal Pelis, Vit Punchochar (ed.), Logica Yearbook 2011, College Publications London 2012, p. 107-120
4. P. Kulicki, R. Trypuz, *Doing the right things - trivalence in deontic action logic*, in: P. Egre, D. Ripley, Trivalent Logics and their applications. Proceedings of the ESSLLI 2012 Workshop
5. P. Kulicki, R. Trypuz, *Two faces of obligation*, in A. Brożek, J. Jadacki i B. Žarnić (ed.), Theory of Imperatives from Different Points of View (2), Logic, Methodology & Philosophy of Science at Warsaw University, vol 7, Wydawnictwo Naukowe Semper, 2013, p. 70-82
6. P. Kulicki, R. Trypuz, *Modelowanie działań i norm w logice deontycznej*, J. Juchnowski, R. Wiszniowski (ed.), Współczesna teoria i praktyka badań społecznych i humanistycznych. Tom 1, Wydawnictwo Adam Marszałek 2013, p. 57-70
7. P.F. Castro, P. Kulicki, *Deontic Logics Based on Boolean Algebra*, in: R. Trypuz (ed.) Krister Segerberg on Logic of Actions, p. 85-117, Springer 2014
8. R. Trypuz, P. Kulicki, *On Deontic Action Logic Based on Boolean Algebra*, Journal of

Logic and Computation 25 (5), 2015, p. 1241-1260.

9. P. Kulicki, R. Trypuz, *Completely and partially executable sequences of actions in deontic context*, Synthese 192 (4), 2015, p. 1117-1138.
10. R. Trypuz, P. Kulicki, *Jerzy Kalinowski's Logic Revisited*, Studia Logica 103, 2015, p. 389-412.
11. P. Kulicki, R. Trypuz, *Multivalued logics for conflicting norm*. In Deontic Logic and Normative Systems 13th International Conference, DEON 2016, Bayreuth, Germany, July 18-21, 2016, p. 123–138. College Publications, 2016.
12. C. Peterson, P. Kulicki, *Conditional Normative Reasoning with Substructural Logics*, In Deontic Logic and Normative Systems 13th International Conference, DEON 2016, Bayreuth, Germany, July 18-21, 2016, p. 220–236. College Publications, 2016.
13. P. Kulicki, R. Trypuz, *Connecting Actions and States in Deontic Logic*, Studia Logica 105 (5), 915-942, 2017.
14. P. Kulicki, R. Trypuz, *Judging Actions on the Basis of Prima Facie Duties. The case of self-driving cars*, Logic and Logical Philosophy, 28, (4,) p. 767–787, 2019.
15. P. Kulicki, R. Trypuz, M. Sergot, *Who is obliged when many are involved? Labelled transition system modelling of how obligation arises*, Artif Intell Law 29, 395–415, 2021.