Dynamics in Logic IV, 2016 - Saturday 29 October 2016

Aula Congrescentrum, Building 20, Mekelweg 5, 2628 CC Delft. Room: Commissiekamer 4.

10:00-10:15 Coffee/tea and Registration
10:15-11:15   Davide Grossi: Aggregation, Fixpoints, And Liquid Democracy (keynote talk)
11:15-12:00   Helle Hvid Hansen: Coalgebraic Dynamic Logics
12:00-12:45   Zeinab Bakhtiari: Neighbourhood Contingency Bisimulation
12:45-13:30 LUNCH
13:30-14:30   Marta Bílková: Epistemic Logics Based On Information States Semantics (k.t.)
14:30-15:15   Aybüke Özgün: Justified Belief, Knowledge and the Topology of Evidence
15:15-15:30 Coffee/tea
15:30-16:15   Guillaume Aucher: Expedition In The Update Universe
16:15-17:00   Michael Moortgat: Resource Control In Grammar Logics
17:00-17:45   Alexander Kurz: Tool Support For Multi-Type Display Calculi
18:30-   DINNER

> **Davide Grossi** (University of Liverpoll - Department of Computer Science)
Aggregation, Fixpoints, And Liquid Democracy (Joint work with Zoé Christoff)
The talk focuses on the issue of aggregation of binary opinions in a group of agents, or judgment aggregation. I will explore some formal interfaces between a special form of aggregation known as proxy voting (aka liquid democracy) and a process of opinion diffusion on networks where each agent's opinion may be dictated by a (unique) influencer (Boolean DeGroot Processes). The study sheds novel light on the relation between processes of aggregation and of opinion diffusion.

> **Helle Hvid Hansen** (TU Delft - Department of Engineering Systems and Services)
Coalgebraic Dynamic Logics (Joint work with Clemens Kupke)
In Propositional Dynamic Logic (PDL) programs are interpreted as relations, and program constructs as operations on relations. The axiomatisation of PDL essentially consists of modal logic K together with reduction axioms for program constructs. Similarly, in Parikh's Game Logic (GL), games are interpreted as monotonic neighbourhood functions, and game constructs by operations on these. Completeness of Game Logic remains an open question, but the proposed axiomatisation is essentially monotonic modal logic M together with reduction axioms. These similarities suggest that a more general picture exists that encompasses both.
In this talk I will present a coalgebraic generalisation of PDL and GL in which programs (or games) are coalgebras for a monad T, the program constructs arise from Kleisli composition and algebraic structure on T, and the axioms of these logics correspond to certain compatibility requirements between the modalities and this structure. This setup allows us to prove two general completeness results: strong completeness without iteration, and (weak) completeness with iteration and "negation-free" pointwise operations.

> **Zeinab Bakhtiari** (Université de Lorraine)
Neighbourhood Contingency Bisimulation (Joint work with: H. van Ditmarsch and H. H. Hansen)
We introduce a notion of bisimulation for contingency logic interpreted on neighbourhood structures, characterize this logic as bisimulation invariant fragment of modal logic and of first-order logic, and compare it with existing notions in the literature.

> **Marta Bílková** (Faculty of Arts, Charles University in Prague - Department of Logic)
Title: **Epistemic Logics Based On Information States Semantics** (Supported by the project SEGA: From Shared Evidence to Group Agency of Czech Science Foundation and DFG no. 16-07954J)
To model knowledge or belief of rational agents logically, specifying what kind of agents and, consequently, what notion of knowledge and belief one has in mind is essential. A prototypical rational agent for us is a scientist working with collections of data--and those, in contrast with complete and consistent descriptions of a state of the world, might be incomplete and inconsistent. The agent, by weighting the evidence supported by the available data carefully, eventually accepts some of the available information as known or believed. But only confirmed data coming from a reliable source might be accepted (cf. e.g. with the notion of scientific or rational scepticism).
The background propositional logic we use to model collections of data is therefore a par- ticular logic of information states, where collections of data are modeled as not necessarily consistent or complete

theories. We allow for some information states to act as reliable sources of confirmation of data available at the current state. The modal part of the logic then consists of epistemic operators of knowledge and belief confirmed by a reliable source, which are, in contrast to standard approaches, diamond-like operators. Such logics have been studied in [1], based on distributive substructural logics.

In this talk, we present a multiagent version of such logics extended with common knowledge and belief operators. The semantics is now given by information frames, which, inspired by [4], are based on semilattices. The principal epistemic relation between the states is the one of being a reliable source of information and the epistemic operators are modeled as backward-looking diamond modalities. This actually is not so strange as prominent examples of such frames can be extracted from monotone neighborhood models where knowledge or belief is modeled as a box modality.

We in particular address the following points: axiomatization, proof theory and strong completeness for the underlying modal logic, and strongly complete infinitary proof theory for the logic with common knowledge and common belief operators in spirit of [2, 3].

References

[1] Bílková, M., O. Majer and M. Peliš, Epistemic logics for sceptical agents, Journal of Logic and Computation, first published online March 21, 2015.

[2] G. Jager, M. Kretz, T. Studer, Canonical completeness of infinitary μ, The Journal of Logic and Algebraic Programming 76 (2008), 270–292.

[3] G. Renardel de Lavalette, B. Kooi, R. Verbrugge, Strong Completeness and Limited Canonicity for PDL, Journal of Logic, Language and Information, 2008, Volume 17, Issue 1, pp. 69–87.

[4] V. Punčochář Spaces of Information States, Under review.

> **Aybüke Özgün** (LORIA, Université de Lorraine - ILLC, University of Amsterdam)
Justified Belief, Knowledge and the Topology of Evidence (with A. Baltag, N. Bezhanishvili, S. Smets)
In this talk, I will present a topological semantics for evidence-based belief, as well as for a notion of ("soft", defeasible) knowledge, and explore their connections with various notions of evidence possession. We will not only focus on truthful evidence but also formalize conceptions of possibly false and misleading evidence. The basic pieces of evidence possessed by an agent are modelled as non-empty sets of possible worlds and form a primitive component of our models.This setting builds on the evidence model framework of van Benthem and Pacuit (van Benthem et al., 2011), as well as our own previous work (Baltag et al., 2013) on (a topological semantics for) Stalnaker's doxastic-epistemic axioms (Stalnaker, 2006). We prove completeness, decidability and finite model property for the associated logics.

> **Michael Moortgat** (Utrecht Institute of Linguistics OTS - Language, logic and information)
Resource Control In Grammar Logics
To recover the expressivity of intuitionistic logic, linear logic uses the `!' modality which brings back copying and deletion (Contraction, Weakening) in a controlled form.

In grammar logics, the need for controlled resource management makes itself felt in a similar way. Natural language resources (words, phrases) may be linearly ordered (absence of commutativity for the composition operation) or configured into trees (absence of associativity). As in the linear logic case, the point is not so much to ban reordering/restructuring completely, but to have the means to control them. To achieve structural control, [KM97] introduce an adjoint pair of modalities which are then used to define back-and-forth translations between logics with a stricter and with a more liberal resource management regime.

In the talk, I will present the linguistic motivation for this approach, and discuss what happens when one extends the `intuitionistic' Lambek-style grammar logics to bilinear systems of the type originally proposed by Grishin. In the latter, next to multiplicative conjunction (resource composition, fusion), one finds a multiplicative disjunction (decomposition, fission), and linear distributivities relating the two.

References

[KM97] Kurtonina N. and M. Moortgat (1997), "Structural control". In P. Blackburn and M. de Rijke, Specifying Syntactic Structures, CSLI Publications, pp. 75--113.

> **Alexander Kurz** (University of Leicester - Department of Computer Science)
Tool Support For Multi-Type Display Calculi (with S. Balco, S. Frittella, G. Greco, A. Palmigiano)
In this talk we will argue that the modular nature of display calculi both favours and makes necessary the development of a range of tools supporting both the development and applications of multi-type display calculi. I will present the prototype of a tool as well as an outline of future research challenges in the area.