New Directions in Reasoning about Belief and Knowledge

Workshop at ILLC, University of Amsterdam

09:30-16:10, June 12, 2018

On the occasion of the two PhD defenses by Malvin Gattinger and Chenwei Shi we will have a workshop at ILLC at the University of Amsterdam.

Date and Time: Tuesday, June 12th 2018, 9:30-16:10
Location: KdVI Seminar Room F3.20, Science Park 107, Amsterdam

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Programme

09:30 - 10:00  Chenwei Shi (ILLC, University of Amsterdam)
(t.b.a.)
10:00 - 10:30  Malvin Gattinger (ILLC, University of Amsterdam)
Symbolic Dynamic Gossip
(10 minutes break)
10:40 - 11:10  Kaile Su (Jinan University Guangzhou and Griffith University Brisbane)
MCTK 2
11:10 - 11:40  Beishui Liao (Zhejiang University)
Reasoning about values, norms and preferences in formal argumentation
11:40 - 12:10  Aybüke Özbün and Ana Lucia Vargas Sandoval (ILLC, University of Amsterdam)
APAL with Memory is Better
(1 hour lunch break)
13:10 - 13:40  Rineke Verbrugge (ALICE, Rijksuniversiteit Groningen)
Finite model theory for provability logic
13:40 - 14:10  Andreas Herzig (CNRS/IRIT, Université Paul Sabatier)
(t.b.a.)
14:10 - 14:40  Davide Grossi (ALICE, Rijksuniversiteit Groningen)
On the Graded Acceptability of Arguments
(10 minutes break)
14:50 - 15:20  Yanjing Wang (Department of Philosophy, Peking University)
Call Me by Your Name — Epistemic Logic with Assignments and Non-rigid Names
15:20 - 15:50  Hans van Ditmarsch (CNRS/LORIA Nancy and ReLaX Chennai)
Asynchronous announcements
15:20 - 16:10  Jan van Eijck (ILLC, University of Amsterdam and CWI, Amsterdam)
Truth in Troubled Times
Titles and Abstracts

Chenwei Shi

Malvin Gattinger: Symbolic Dynamic Gossip

Kaile Su: MCTK2

Beishui Liao: Reasoning about values, norms and preferences in formal argumentation

In ethical, legal and social artificial intelligence systems, agents are often associated with a set of values and norms. Different agents may have different preference orderings of the values, which in turn determine the orderings of the norms that promote or demote values. In this talk, I will review some formal argumentation-based approaches for reasoning about values, norms and preference, and discuss some further researcher problems.

Aybüke Özgün and Ana Lucia Vargas Sandoval: APAL with Memory is Better

Arbitrary Public Announcement Logic (APAL) and its relatives are natural extensions of Public Announcement Logic (PAL), involving the addition of operators $\Box \varphi$ and $\Diamond \varphi$, quantifying over public announcements $[\theta] \varphi$ of some given type. These logics are of great interest both philosophically and from the point of view of applications.

Motivations range from supporting an analysis of Fitch’s paradox [4] by modeling notions of ‘knowability’ (expressible as $\Diamond K \phi$), to determining the existence of communication protocols that achieve certain goals (cf. the famous Russian Card problem, given at a mathematical Olympiad [5]), and more generally to epistemic planning [3], and to inductive learnability in empirical science [1]. One problem with the APAL formalism and many of its variants is that they use infinitary axiomatizations. It is therefore not guaranteed that the validities of these logics are recursively enumerable.

In this talk, we introduce Arbitrary Public Announcement Logic with Memory (APALM), obtained by adding to the models a ‘memory’ of the initial states, representing the information before any communication took place (“the prior”), and adding to the syntax operators that can access this memory. We show that APALM is recursively axiomatizable (in contrast to the original Arbitrary Public Announcement Logic, for which the corresponding question is still open). We present a complete recursive axiomatization, that uses a natural finitary rule. If time permits, we also discuss this logic’s expressivity and the appropriate notion of bisimulation.

This is joint work with Alexandru Baltag, presented in [2].

References
Rineke Verbrugge: Finite model theory for provability logic

It has been shown in the late 1960s that each formula of first-order logic without constants and function symbols obeys a zero-one law: As the number of elements of finite models increases, every formula holds either in almost all or in almost no models of that size. Therefore, many properties of models, such as having an even number of elements, cannot be expressed in the language of first-order logic. Halpern and Kapron proved zero-one laws for classes of models corresponding to the modal logics K, T, S4, and S5 and for frames corresponding to S4 and S5.

In this talk, we discuss zero-one laws for provability logic, with respect to both model and frame validity. Moreover, we axiomatize validity in almost all relevant finite models and in almost all relevant finite frames. We consider the complexity of deciding whether a given formula is almost surely valid in the relevant finite models and frames. Finally, we discuss some repercussions for provability in formal arithmetic.

Andreas Herzig

Davide Grossi: On the Graded Acceptability of Arguments

I will introduce a theory of the degree of justification of arguments, which relies solely on the structure of a Dung argumentation graph. The theory is based on the graded generalization of the two key notions underpinning Dung’s solutions for attack graphs: self-defense and conflict-freeness. This leads to a natural generalization of Dung’s theory, whereby standard solutions are weakened or strengthened depending on the level of self-defense and conflict-freeness they meet. I will sketch the fixpoint theory of these graded solutions, establishing existence results for them. I will conclude by pointing at interfaces between graded solutions for attack graphs and modal logic.

This is joint work with Sanjay Modgil (King’s College London).

Yanjing Wang: Call Me by Your Name: Epistemic Logic with Assignments and Non-rigid Names

In standard epistemic logic, agent names are usually assumed to be common knowledge. This is unreasonable for various applications, in particular in social networks. Inspired by term modal logic and assignment operators in dynamic logic, we introduce a lightweight modal predicate logic whose names are not rigid. The language can handle various de dicto / de re distinctions in a natural way. We show the decidability of the logic over arbitrary and reflexive models and give a complete axiomatization over S5 models.

This is joint work with Jeremy Seligman.

Hans van Ditmarsch: Asynchronous Announcements

We propose a multi-agent epistemic logic of asynchronous announcements, where truthful announcements are publicly sent but individually received by agents uncertain about atomic propositions describing the state of the world, and about each other’s uncertainty. Additional to epistemic modalities, the logic therefore contains two types of dynamic modalities, namely for sending messages and for receiving messages. The semantics defines truth relative to the current state of reception of messages for all agents, where we assume that messages are received in the order in which they are being sent. What an agent knows is a function of her initial uncertainty and of the messages she has received so far. More precisely: after an announcement an agent knows that a proposition is true, if and only if on condition of the truth of that announcement, the agent
knows that after that announcement and after any number of other agents also receiving it, the proposition is true. Knowledge need not be truthful, because some messages that were already sent may not yet have been received by the knowing agent, so that her knowledge may be outdated. Interestingly, messages that are announcements may result in partial synchronization, namely when an agent learns from receiving an announcement that prior announcements must already have been received by other agents.

We show that on multi-agent epistemic models (with arbitrary accessibility relations), each formula in asynchronous announcement logic is equivalent to a formula in basic multi-agent modal logic, and we provide a complete axiomatization, and also on the class of S5 models (for initial uncertainty of agents). We then determine the complexity of model checking and of satisfiability. As is maybe to be expected, your uncertainty about other agents having received messages increases the complexity of the logic in comparison to standard public announcement logic.

This is joint work with Philippe Balbiani.

Hans van Ditmarsch is a long-term visitor at ReLaX from January until June 2018. ReLaX is an international joint research unit of CNRS, Université de Bordeaux, École Normale Supérieure Paris-Saclay, Chennai Mathematical Institute and the Institute of Mathematical Sciences. As a CNRS unit, ReLaX is CNRS UMI 2000. It is attached to the INS2I (Institute for Information Sciences). ReLaX was created on January 1, 2017. Its director is Madhavan Mukund. Its deputy director is Pascal Weil.

Jan van Eijck: Truth in Troubled Times