Forthcoming Papers

Merging Information Under Constraints: A Logical Framework
S. Konieczny and R. P. Pérez

The paper considers the problem of merging several belief bases in the presence of integrity constraints and proposes a logical characterization of operators having a majority behaviour or a consensual one. Then a representation theorem in terms of pre-orders on interpretations is given. The close connection between belief revision and merging operators is shown and it is shown that the proposal extends the pure merging case (i.e. without integrity constraints) studied in a previous work. Finally it is shown that Liberatore and Schaerf commutative revision operators can be seen as a special case of merging.

A Tableau Calculus for Temporal Description Logic
H. Sturm and F. Wolter

In this paper we present a tableau calculus for a temporal extension of the description logic $\mathcal{ALC}$, called $\mathcal{TALC}$. This logic is based on the temporal language with 'Until' interpreted over the natural numbers with expanding $\mathcal{ALC}$-domains. The tableau calculus forms an elaborate combination of Wolper's tableau calculus for propositional linear temporal logic, the standard tableau-algorithm for $\mathcal{ALC}$, and the method of quasimodels introduced by Wolter and Zakharyaschev. Based on those three ingredients the paper provides a new method of how tableau-based decision procedures can be constructed for many-dimensional logics which lack the finite model property. The method can be applied to deal with other temporalized formalisms as well.

Lazy List Comprehension in Logic Programming
B. Elbl

The pure prolog evaluation of a goal yields a list of answers, but the tools provided for manipulating these structures are very poor. We discuss augmenting pure prolog with a list comprehension construct that offers the possibility of referring to the finite or infinite list of answers produced. Thus meta-predicates can be defined. A substructural calculus is used to give an axiomatic semantics to the extended language. Soundness and completeness of the intended evaluation with respect to this semantics is proved.

Complete Proof System for QPTL
Y. Kesten and A. Pnueli

The paper presents an axiomatic system for quantified propositional temporal logic (QPTL), which is propositional temporal logic equipped with quantification over propositions (Boolean variables). The advantages of this extended temporal logic is that its expressive power is strictly higher than that of the unquantified version (PTL) and is equal to that of S1S, as well as that of $\omega$-automata. Another important application of QPTL is its use for formulating and verifying refinement relations between reactive systems. In fact, the completeness proof is based on the reduction of a QPTL formula into a Büchi automaton, and performing equivalence transformations on this automata, formally justifying these transformations as a bi-directional refinement.

Tractability Results in the Block Algebra
P. Balbiani, J.-F. Condotta and L. Fariñas del Cerro

In this paper we define the notion of a block algebra, which is based upon a spatial application of Allen's interval algebra. In the $p$-dimensional Euclidean space, where $p \geq 1$, we consider only blocks whose sides are parallel to the axes of some orthogonal basis. The block algebra consists of a set of relations (the block relations) together with the fundamental operations of composition, converse and intersection. The $13^p$ basic relations of this algebra constitute the exhaustive list of the relations possibly holding between two blocks. We are interested in the problem of testing the consistency of a set of spatial constraints between blocks, i.e. a block network. The consistency question for block networks is NP-complete. We first extend the notions of convexity and preconvexity to the block algebra. Similarly to the interval algebra case, convexity leads to a tractable set whereas, contrary to the interval algebra case, preconvexity leads to an intractable set. Nevertheless we characterize a tractable subset of the preconvex relations: the strongly preconvex relations. Moreover we show that strong preconvexity and ORD-Horn representability are the same.

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Theoremhood-preserving Maps Characterizing Cut Elimination for Modal Provability Logics

S. Demri and R. Goré

Propositional modal provability logics like $\mathcal{G}$ and $\mathcal{Gz}$ have arithmetical interpretations where $\square \varphi$ can be read as ‘formula $\varphi$ is provable in Peano Arithmetic’. These logics are decidable but are characterized by classes of Kripke frames which are not first-order definable. By abstracting the aspects common to their characteristic axioms we define the notion of a formula generation map $F(p)$ in one propositional variable. We then focus our attention on the properly displayable subset of all (first-order definable) Sahlqvist modal logics. For any logic $L$ from this subset, we consider the (provability) logic $L^P$ obtained by the addition of an axiom based upon a formula generation map $F(p)$ so that $L^P = L + F(p)$. The class of such logics includes $\mathcal{G}$ and $\mathcal{Gz}$. By appropriately modifying the right introduction rules for $\square$, we give (not necessarily cut-free) display calculi for every such logic. We define the pseudo-displayable subset of these logics as those whose display calculi enjoy cut-elimination for sequents of the form $\top \vdash \varphi$ for any formula $\varphi$. We then show that for any provability logic $LF$ having a conservative tense extension, there is a map $f$ on formulae such that $LF$ is pseudo-displayable if and only if $f$ maps theorems of $LF$ to theorems of the underlying logic $L$ and vice versa. By using a standard renaming technique we can guarantee that there is a polynomial-time translation from $LF$ into $L$. All proofs are purely syntactic and show the versatility of display calculi since similar results using traditional Gentzen calculi are not possible for as broad a range of logics and require further conditions. Our maps generalize previously known maps from $\mathcal{G}$ into $\mathcal{K4}$. An application of our results gives a $O((n \log n)^2)$ translation from the (‘second order’) provability logic $\mathcal{Gz}$ into a decidable subset of first-order logic. Since each of our logics $L$ is a Sahlqvist logic, it is first-order definable, and hence each $L$ has a translation into first-order logic. Our results therefore show that all pseudo-displayable logics $LF$ are ‘essentially first-order’ even though their characteristic axiom may not be first-order definable.

The Expressive Power of Temporal Logic of Actions

A. Estrin and M. Kaminski

It is shown that a stutter-invariant property is expressible in Temporal Logic of Actions if and only if it is expressible in Second-order Temporal Logic. In particular, validity questions can be translated from one logic to the other. The proof is based on equivalence transformations between the formulas of Temporal Logic of Actions and Second-order Temporal Logic. The translation from Second-order Temporal Logic into Temporal Logic of Actions is linear and the translation from Temporal Logic of Actions into Second-Order Temporal Logic is quadratic.

Future issues

Relevance Principle for Substructural Logics with Mingle and Strong Negation

N. Kamide

A Decision Algorithm for Stratified Context Unification

M. Schmidt-Schauß

Space-efficient Decision Procedures for Three Interpolable Propositional Intermediate Logics

G. Fiorino

Display Calculi for Nominal Tense Logics

S. Demri and R. Goré

Modal Logics Between Propositional and First-order

M. Fitting

Labelled Tableaux for Nonmonotonic Reasoning: Cumulative Consequence Relations

A. Artosi, G. Governatori and A. Rotolo