1st Workshop on Relating Logic

September 25-26 2020
Emerging Field: Logic and Philosophy of Science
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CALL FOR PAPERS

Description Relating Logic (RL) is a logic of relating connectives (just as Modal Logic is a logic of modal operators). The basic idea behind a relating connectives is that the logical value of a given complex proposition is the result of two things: (i) the logical values of the main components of this complex proposition supplemented with (ii) a valuation of the relation between these components. The latter element is a formal representation of an intensional relation that emerges from the connection of several simpler propositions into one more complex proposition.

More formally, let $A_1, \ldots A_n$ be propositions with some fixed logical values and let c be an n-ary relating connective. Then the logical value of complex sentence $\mathsf{c}(A_1, \ldots, A_n)$ depends not only on the logical values of $A_1, \ldots A_n$, but additionally on the value of the connection between $A_1, \ldots A_n$. It therefore depends on an additional valuation of pairs (n-tuples) that is the part of the overall process of evaluation of the logical values of complex propositions built with relating connectives. This way we can form logical systems to deal with reasoning about non-logical relationships.

Often when we replace the parameters of classically valid arguments with real sentences and the classical connectives with certain natural language connectives, bizarre inferences result, such as the one below:

$$\frac{\begin{array}{c} \text{Ann has not died or Mark is in despair.} \\ \text{Mark is not in despair or Ann is calling for a doctor.} \end{array}}{\text{Ann has not died or Ann is calling for a doctor.}} \quad \text{(a)}$$

The problem arises because when we construct everyday arguments, we consider not only the logical values of the sentences but also expect certain non-logical relationships to hold between them, such as a causal relationship in the

case above. Further examples of such relationships conveyed by arguments expressed in natural language are analytic, temporal, content, preference and connexive relationships. A formal language needs more than the standard formal apparatus of disjunction and conjunction for handling extensional phenomena; it needs machinery to make sense of intensional phenomena too.

It is easy to observe that if we interpret the expression *or* present in (a) in models $\langle v, \mathrm{R} \rangle$ (where v is a binary valuation of variables and R is a binary relation defined on a set of formulas) in the following way: $\langle v, \mathrm{R} \rangle \models A \vee B$ iff $\langle v, \mathrm{R} \rangle \models A$ or $\langle v, \mathrm{R} \rangle \models B$, and $\mathrm{R}(A, B)$, then inference (a) is not valid.[1] However, if we assume that R is transitive, then (a) is valid.

Although the simplest model for a relating logic is a pair: $\langle v, \mathrm{R} \rangle$, the situation may get more complicated. We can use multi-relating models to represent more types of non-logical relations between sentences. In addition, the valuation of relationships between sentences may not be binary but may be many-valued or more subtly graded. Furthermore, we can mix relating semantics with possible world semantics, equipping all worlds with additional valuations of complex sentences. Last, but not least, any semantics may be treated as relating one, when we assume that in case of complex sentences a relationship is represented by a universal relation.

The solution that relating logics offers seems to be quite natural, since when two (or more) propositions in natural language are connected by a connective, some sort of emergence occurs. In fact, the key feature of intensionality is that adding a new connective results in the emergence of a new quality, which itself does not belong to the components of a given complex proposition built by means of the same connective. An additional valuation function determines precisely this quality. Talk of emergence is justified here, because the quality that arises as a result of the connections between the constituent propositions is not reducible to the properties of those propositions. Consequently, if the phenomenon of emergence is to be properly captured, we need additional valuations in a model. The key feature of relating semantics is that it enables us to treat non-logical relations between sentences seriously.

Problems   Within RL the following seem to be of special importance:

1. problem α: axiomatization of logics defined by relating semantics (by given classes of valuations/relations)

2. problem β: relating semantics for logics defined as some set of formulas closed under some rules of inference

3. problem γ: defining philosophical logics by relating semantics (reduction of various logical connectives to relating connectives)

4. problem δ: relationships between relating semantics and other kinds of formal semantics (problem of reduction)

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[1] Preserving, of course, the classical meaning of negation and writing $\vee$ instead of *or*.

5. problem η: combining relating semantics with other kinds of formal semantics.

Aims   The main aim of the workshop is to create an international, logical community that explores the potential of RL and relating semantics.

Scope   Topics of submissions include among others:

- applications of relating semantics,
- algebraic interpretation of relating logics,
- comparison of relating semantics with other formal semantics,
- history of relating logics,
- modal extensions of relating logics,
- model theory of relating logics,
- philosophical logics defined by relating semantics,
- proof theory for relating logics,
- philosophical foundations of relating logics,
- other related topics (like dependence logic, set-assignment semantics etc.)

Publication   We plan to prepare a special issue of Logic and Logical Philosophy journal (https://apcz.umk.pl/czasopisma/index.php/LLP/index). The issue would include extended and reviewed papers presented during the Workshop on Relating Logic.

Support   If you would like to participate physically in the workshop, but you need some financial support, you can count on our help.

Contact   For more information, please do not hesitate to write to:

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IMPORTANT DATES

Paper submission deadline: 15 August 2020
Workshop: 25–26 September 2020

IMPORTANT NOTE ON COVID-19 SITUATION   We are continuously monitoring the COVID-19 situation in light of information from national and local authorities. If necessary, alternative solutions, such as remote presentations will be implemented. We will do our best to ensure that the workshop runs smoothly, be it one that takes place under normal conditions or be it one that occurs partially or wholly on-line. So, if you can not travel to Toruń for some reason, stay safe at home, and take part online.

Exemplary literature

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5. Epstein, Richard L., 1987, "The algebra of dependence logic", *Reports of Mathematical Logic* 21: 19–34.

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8. Jarmużek, Tomasz, 2020, "Relating semantics as fine-grained semantics for intensional propositional logics", in A. Giordani and J. Malinowski (eds.), *Logic in High Definition. Trends in Logical Semantics*, Springer.

9. Jarmużek, Tomasz, and Bartosz Kaczkowski, 2014, "On some logic with a relation imposed on formulae: Tableau System $\mathcal{F}$", *Bulletin of the Section of Logic* 43(1/2): 53–72.

10. Jarmużek, Tomasz, and Mateusz Klonowski, 2020a, "Some intensional logics defined by relating semantics and tableau systems", in A. Giordani and J. Malinowski (eds.), *Logic in High Definition. Trends in Logical Semantics*, Springer.

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13. Jarmużek, Tomasz, and Jacek Malinowski, 2019b. "Modal Boolean connexive logics: semantics and tableau approach", *Bulletin of the Section of Logic* 48(3): 213–243.

14. Klonowski, Mateusz, 2020, *Aksjomatyzacja monorelacyjnych logik wiążą-cych* (Axiomatization of Monorelational Relating Logics), PhD, Nicolaus Copernicus University in Toruń.

15. Klonowski, Mateusz, 2018, "A Post-style proof of completeness theorem for symmetric Relatedness Logic S", *Bulletin of the Section of Logic* 47(3): 201–214.

16. Krajewski, Stanisław, 1991, "One or many logics? (Epstein's set-assignement semantics for logical calculi)", *The Journal of Non-Classical Logic* 8(1): 7–33.

17. Krajewski, Stanisław, 1982, "On relatedness logic of Richard L. Epstein", *Bulletin of the Section of Logic* 11(1/2): 24–28.

18. Ledda, Antonio, Francesco Paoli, and Michele P. Baldi, 2019, "Algebraic analysis of demodalised analytic implication", *Journal of Philosophical Logic* 48: 957–979.

19. Malinowski, Jacek, 2019, "Barbershop paradox and connexive implication", *Ruch Filozoficzny* (*Philosophical Movement*), vol. 75, no. 2: 107–114.

20. Malinowski, Jacek, and Rafał Palczewski, 2020, "Relating semantics for connexive logic", in A. Giordani and J. Malinowski (eds.), *Logic in High Definition. Trends in Logical Semantics*, Springer.

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24. Walton, Douglas N., 1979a, "Philosophical basis of relatedness logic", *Philosophical Studies* 36(2): 115–136.

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