Possible-Translations Semantics:
a special way of combining logics

João Marcos

IFCH – Unicamp, Brazil

`<vegetal@cle.unicamp.br>`

The task of finding, for non-classical logics, semantics which are both strongly adequate and intuitively acceptable is often a hard one. Possible-translations semantics were devised in order to help solving this predicament [1]. Here we shall understand logics simply as sets (of formulas) endowed with a consequence relation, and translations as morphisms between logics, i.e. maps preserving their consequence relations. The idea of *possible-translations semantics* is to base an interpretation to a given logic $\mathcal{L}$ on the combination of an appropriate set of translations of the formulas of $\mathcal{L}$ into a class of logics with known semantics.

Some examples will be considered. We will begin by presenting some paraconsistent fragments of classical logic which, despite not being characterizable by finite matrices, can be characterized by a suitable combination of three-valued logics [6]. In this process, decidability of the considered logics is attained as a byproduct: to evaluate a given formula we just have to evaluate all of its possible translations using the three-valued matrices. Next we will see how possible-translations semantics provide a straightforward way of talking about a deductive limit to a given hierarchy of logics [4]. Finally, we will show how many-valued logics themselves could be seen as suitable combinations of copies of classical logic, giving rise to the concept of *society semantics* [3].

One of the most general approaches to the combination of logics comes from Gabbay's *fibring* [5]. Examples of fibred logics usually deal with the construction of previously unknown rich and complex logics by way of fibring simpler ones. We call this *splicing logics*. The examples of possible-translations semantics mentioned above clearly go the other way around, showing how a complex logic could be analyzed into its ingredients. We call this *splitting logics*. Of course, both possible-translations semantics and fibring can go either direction, splitting and splicing logics. We will mention some open problems in this study and give some hints on a categorial approach to these questions, by way of sheaves [2].

References

[1] W. Carnielli, Many-valued logics and plausible reasoning. In:*Proceedings of the* XX *International Congress on Many-Valued Logics*, IEEE Computer Society, (1990) pp.328–35.

[2] W. Carnielli and M. E. Coniglio, A categorial approach to the combination of logics. To appear in *Manuscrito*, v.22, n.2, (1999), Campinas, CLE. 17p.

[3] W. Carnielli and M. Lima-Marques, Society semantics and multiple-valued logics. In:*Advances in Contemporary Logic and Computer Science:* Proceedings of the XI Brazilian Conference on Mathematical Logic, May 1996, Salvador, Bahia, Brazil. Contemporary Mathematics, v.235, (1999) American Mathematical Society, pp.33–52.

[4] W. Carnielli and J. Marcos, Limits for paraconsistent calculi. Submitted to publication, 13p.

[5] D. Gabbay, *Fibring Logics*. Clarendon Press, Oxford University Press, 1999. 476p.

[6] J. Marcos, *Possible-Translations Semantics* (in Portuguese). Campinas, August 1999. xxviii + 240p. Thesis – IFCH, Unicamp.
see `http://www.unicamp.br/cle/recent_students.htm`