Postscript to "Translating SUMO-K to Higher-Order Set Theory"

Chad E. Brown[1]

Czech Technical University in Prague, Czech Republic

Abstract. We briefly note an issue with the code translating SUMO to set theory as reported on in a paper at FroCoS in 2023 [1].

A translation from SUMO [3][1] to higher-order set theory [2] was presented at FroCoS 2023 [1]. The corresponding code is available online.[2]

The code was written in LISP as LISP can natively read and manipulate S-expressions and SUMO is written using S-expressions. However, S-expressions in LISP are case insensitive while SUMO's S-expressions are case sensitive. To account for this, an attempt was made to locate potential conflicts in SUMO (e.g., using names "hole" and "Hole" in different ways) and rename these so that case insensitivity would play no role. Unfortunately, this manual attempt to fix these issues apparently failed, as there remain case sensitivity issues in the version of SUMO used in the translation.

A particular case is the use of "attribute" as a binary relation and "Attribute" as a class. An example of a SUMO declaration using both is as follows:

```
(domain attribute 2 Attribute)
```

This entry translates to

```
s_ATTRIBUTE__domseq_1: domseq s_ATTRIBUTE 1 = s_ATTRIBUTE.
```

That is, we assume that `s_ATTRIBUTE` is a set which should encode a binary relation where the intended domain of its second (counting from 0) argument is the set `s_ATTRIBUTE` itself. While this is not obviously inconsistent, it was unintended and *may* be inconsistent.

Given this issue and potentially other case sensitivity issues, the translation of SUMO into higher-order set theory by the available code should not be assumed to create consistent results. As a consequence, if an ATP determines the translation of a SUMO query to be provable, this may simply be due to potential inconsistencies produced by these case sensitivity issues.

References

1. Brown, C.E., Pease, A., Urban, J.: Translating SUMO-K to higher-order set theory. In: Sattler, U., Suda, M. (eds.) Frontiers of Combining Systems. pp. 255–274. Springer Nature Switzerland, Cham (2023)

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[1] https://www.ontologyportal.org

[2] http://grid01.ciirc.cvut.cz/~chad/sumo2set-0.9.tgz

2. Brown, C.E., Pąk, K.: A tale of two set theories. In: Kaliszyk, C., Brady, E.C., Kohlhase, A., Coen, C.S. (eds.) Intelligent Computer Mathematics - 12th International Conference, CICM 2019, Prague, Czech Republic, July 8-12, 2019, Proceedings. Lecture Notes in Computer Science, vol. 11617, pp. 44–60. Springer (2019)
3. Pease, A., Schulz, S.: Knowledge Engineering for Large Ontologies with Sigma KEE 3.0. In: The International Joint Conference on Automated Reasoning (2014)