

# Abstracting Gradual Typing: An Erratum

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## 1. Erratum: July 20, 2018

Section 6.4 of the POPL2016 paper Abstracting Gradual Typing has an erroneous proposition, whose falsity mildly affects some subsequent discussion. The following proposition and corollary are erroneous.

**Proposition 1** (Erroneous). *Let  $\langle \tilde{T}_1, \tilde{T}_{21} \rangle, \langle \tilde{T}_{22}, \tilde{T}_3 \rangle \in \text{EV}^{<}$  be evidence for consistent judgements, and let  $\tilde{T}_2 = \tilde{T}_{21} \sqcap \tilde{T}_{22}$ . Then:*

$$\Delta^{<}(\tilde{T}_1, \tilde{T}_2, \tilde{T}_3) = \langle \pi_1(\mathcal{I}_{<}(\tilde{T}_1, \tilde{T}_2)), \pi_2(\mathcal{I}_{<}(\tilde{T}_2, \tilde{T}_3)) \rangle.$$

**Corollary 2** (Erroneous).

$$\langle \tilde{T}_1, \tilde{T}_{21} \rangle \circ^{<} \langle \tilde{T}_{22}, \tilde{T}_3 \rangle = \langle \pi_1(\mathcal{I}_{<}(\tilde{T}_1, \tilde{T}_2)), \pi_2(\mathcal{I}_{<}(\tilde{T}_2, \tilde{T}_3)) \rangle.$$

where  $\tilde{T}_2 = \tilde{T}_{21} \sqcap \tilde{T}_{22}$ .

Corrected versions of the above proposition and corollary follow:

**Proposition 3** (Corrected). *Let  $\langle \tilde{T}_1, \tilde{T}_{21} \rangle, \langle \tilde{T}_{22}, \tilde{T}_3 \rangle \in \text{EV}^{<}$  be evidence for consistent judgements, and let  $\tilde{T}_2 = \tilde{T}_{21} \sqcap \tilde{T}_{22}$ . Then:*

$$\Delta^{<}(\tilde{T}_1, \tilde{T}_2, \tilde{T}_3) = \mathcal{I}_{<}(\pi_1(\mathcal{I}_{<}(\tilde{T}_1, \tilde{T}_2)), \pi_2(\mathcal{I}_{<}(\tilde{T}_2, \tilde{T}_3))).$$

**Corollary 4** (Corrected).

$$\langle \tilde{T}_1, \tilde{T}_{21} \rangle \circ^{<} \langle \tilde{T}_{22}, \tilde{T}_3 \rangle = \mathcal{I}_{<}(\pi_1(\mathcal{I}_{<}(\tilde{T}_1, \tilde{T}_2)), \pi_2(\mathcal{I}_{<}(\tilde{T}_2, \tilde{T}_3))).$$

where  $\tilde{T}_2 = \tilde{T}_{21} \sqcap \tilde{T}_{22}$ .

However, the following theorem (regarding consistent equality) from the paper is correct.

**Proposition 5.**

$$\Delta^=(\tilde{T}_1, \tilde{T}_1 \sqcap \tilde{T}_2, \tilde{T}_2) = \langle \tilde{T}_1 \sqcap \tilde{T}_2, \tilde{T}_1 \sqcap \tilde{T}_2 \rangle.$$

The correction to this theorem affects subsequent discussion of the difference between gradual subtyping with and without rows: in particular, the theorem and corollary apply to *both* systems, not

just the system with gradual rows. So in fact, consistent transitivity in either case can be reduced to gradual meet  $\sqcap$  and interior  $\mathcal{I}_{<}$ .

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