Lawful bicycle riding given the circumstances

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1 Circumstantial modal base

Assume $D_s = \{w_1, w_2, w_3, w_4\}$. To keep things simple, let's assume that we are focused on world w_2, where the circumstances are that I crash my bike if I ride with one hand, and I am riding my bike home:

(1) $$\mathbf{mb}(w_2) = \left\{ \begin{array}{c} [\![\text{I crash my bike if I ride with one hand}]\!] \\ [\![\text{I am riding my bike home}]\!] \end{array} \right\} = \left\{ \begin{array}{c} \{w_2, w_3\} \\ \{w_1, w_2, w_3, w_4\} \end{array} \right\}$$

For later, note that $\bigcap \mathbf{mb}(w_2) = \{w_2, w_3\} \cap \{w_1, w_2, w_3, w_4\} = \{w_2, w_3\}$.

2 Bicycle laws ordering source

Here are the ideals for bike riding:

(2) $$\mathbf{os} = \left\{ \begin{array}{c} [\![\text{I wear a helmet when biking}]\!] \\ [\![\text{I signal with my left hand when turning}]\!] \\ [\![\text{I keep both hands on the handlebars when biking}]\!] \\ [\![\text{I do not crash my bike}]\!] \end{array} \right\} = \left\{ \begin{array}{c} \{w_1, w_2, w_3, w_4\} \\ \{w_1\} \\ \{w_3, w_4\} \\ \{w_1, w_2, w_3\} \end{array} \right\}$$

These can't all be satisfied at once. In particular, the second and third contradict each other.

3 Bicycle laws partial order on worlds

Here are all the pairs for $<_{\mathbf{os}}$:

(3) a. $w_1 <_{\mathbf{os}} w_2$ # because $\{\{w_1, w_2, w_3, w_4\}, \{w_1, w_2, w_3\}\} \subset \{\{w_1, w_2, w_3, w_4\}, \{w_1\}, \{w_1, w_2, w_3\}\}$

b. $w_3 <_{\mathbf{os}} w_2$

c. $w_3 <_{\mathbf{os}} w_4$

4 The best worlds

For world w_2, the best worlds for our modal base given our ordering source are

(4) $$\begin{aligned} \text{best}_{\mathbf{os}}(\mathbf{mb}(w_2)) &= \{w \in \textstyle\bigcap \mathbf{mb}(w_2) : \text{there is no } w' \in \textstyle\bigcap \mathbf{mb}(w_2) \text{ such that } w' <_{\mathbf{os}} w\} \\ &= \{w_3\} \end{aligned}$$

This is the set of worlds in $\bigcap \mathbf{mb}(w_2)$ that never appear on the right side of $<_{\mathbf{os}}$ in (3).

5 A modal claim

Given the circumstances and the bicycle laws, I should not signal when riding my bike (in world w_2):

(5) $$p = [\![\text{I don't signal with my left hand when turning on my bike}]\!] = \{w_2, w_3, w_4\}$$

(6) $$\begin{aligned} [\![\mathbf{must}]\!](\mathbf{mb})(\mathbf{os})(p)(w_2) &= \text{T if for all } w' \in \text{best}_{\mathbf{os}}(\mathbf{mb}(w_2)), w' \in p \\ &= \text{T if } \{w_3\} \subseteq \{w_2, w_3, w_4\} \end{aligned}$$