

Here is an informal explanation of the one-point laws. Let's start with

$$\exists v: D. v=x \wedge b$$

and we are given $x: D$. Let's suppose D is *nat*. The existential quantification is an infinite disjunction.

$$(0=x \wedge b) \vee (1=x \wedge b) \vee (2=x \wedge b) \vee \dots$$

We can use context in each of these disjuncts.

$$\begin{aligned} & (0=x \wedge (b \text{ but replace } x \text{ with } 0)) \\ & \vee (1=x \wedge (b \text{ but replace } x \text{ with } 1)) \\ & \vee (2=x \wedge (b \text{ but replace } x \text{ with } 2)) \\ & \vee \dots \end{aligned}$$

Since x is in *nat*, exactly one of $0=x, 1=x, 2=x, \dots$ is \top and the others are \perp . That's why it's called "one-point". Let's suppose x is 1.

$$\begin{aligned} & (\perp \wedge (b \text{ but replace } x \text{ with } 0)) \\ & \vee (\top \wedge (b \text{ but replace } x \text{ with } 1)) \\ & \vee (\perp \wedge (b \text{ but replace } x \text{ with } 2)) \\ & \vee \dots \end{aligned}$$

$$= \perp \vee (b \text{ but replace } x \text{ with } 1) \vee \perp \vee \dots$$

$$= (b \text{ but replace } x \text{ with } 1)$$

Now the other one

$$\forall v: D. v=x \Rightarrow b$$

and we are given $x: D$. Let's suppose D is *nat*. The universal quantification is an infinite conjunction.

$$(0=x \Rightarrow b) \wedge (1=x \Rightarrow b) \wedge (2=x \Rightarrow b) \wedge \dots$$

We can use context in each of these conjuncts.

$$\begin{aligned} & (0=x \Rightarrow (b \text{ but replace } x \text{ with } 0)) \\ & \wedge (1=x \Rightarrow (b \text{ but replace } x \text{ with } 1)) \\ & \wedge (2=x \Rightarrow (b \text{ but replace } x \text{ with } 2)) \\ & \wedge \dots \end{aligned}$$

Since x is in *nat*, exactly one of $0=x, 1=x, 2=x, \dots$ is \top and the others are \perp . That's why it's called "one-point". Let's suppose x is 1.

$$\begin{aligned} & (\perp \Rightarrow (b \text{ but replace } x \text{ with } 0)) \\ & \wedge (\top \Rightarrow (b \text{ but replace } x \text{ with } 1)) \\ & \wedge (\perp \Rightarrow (b \text{ but replace } x \text{ with } 2)) \\ & \wedge \dots \end{aligned}$$

$$= \top \wedge (b \text{ but replace } x \text{ with } 1) \wedge \top \wedge \dots$$

$$= (b \text{ but replace } x \text{ with } 1)$$

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