

flea  
bit(e)s and pieces

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*Hofstadter's Law: It always takes longer than you expect,  
even when you take into account Hofstadter's Law.*

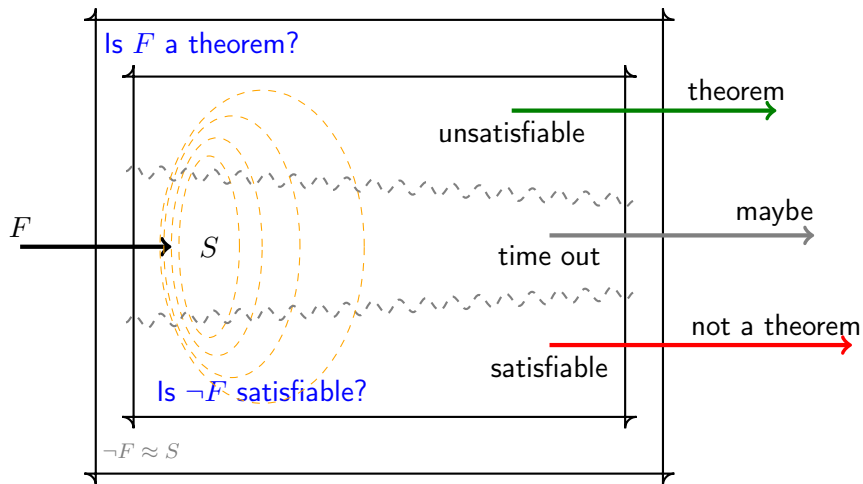
— Douglas Hofstadter, Gödel, Escher, Bach: An Eternal Golden Braid

## 1 Previously

# References

-  Clark Barrett, Pascal Fontaine, and Cesare Tinelli, *The Satisfiability Modulo Theories Library (SMT-LIB)*, [www.SMT-LIB.org](http://www.SMT-LIB.org), 2016.
-  Bruno Dutertre, *Yices 2.2*, Computer-Aided Verification (CAV'2014) (Armin Biere and Roderick Bloem, eds.), Lecture Notes in Computer Science, vol. 8559, Springer, July 2014, pp. 737–744.

## Goal



### Definition (Ordered Resolution)

$$\frac{L \vee C \quad \neg L' \vee D}{(C \vee D)\sigma}$$

where

$L\sigma$  strictly maximal in  $C\sigma$ ,  $\neg L'\sigma$  maximal in  $D\sigma$ ,  $\sigma = \text{mgu}(L, L')$ .

### Definition (Inst-Gen)

$$\frac{L \vee C \quad \neg L' \vee D}{(L \vee C)\sigma \quad (\neg L' \vee D)\sigma}$$

where

$$\text{sel}(L \vee C) = L \quad \text{sel}(\neg L' \vee D) = \neg L' \quad \sigma = \text{mgu}(L, L')$$

## Example (Resolution)

$$\frac{\frac{P(x) \vee \neg P(y) \quad \neg P(a)}{\neg P(y) \quad P(b)} \quad x \mapsto a}{\square} \quad y \mapsto b$$

## Example (Inst-Gen)

$$S_0 \perp = \{P(\perp) \vee \neg P(\perp), \neg P(a), P(b)\} \quad \text{satisfiable}$$

$$\frac{P(x) \vee \neg P(y) \quad \neg P(a)}{P(a) \vee \neg P(y)} \quad x \mapsto a$$

$$S_1 \perp \supsetneq \{\neg P(a), P(b), P(a) \vee \neg P(\perp)\} \quad \text{satisfiable}$$

$$\frac{P(b) \quad P(a) \vee \neg P(y)}{P(a) \vee P(b)} \quad y \mapsto b$$

$$S_2 \perp \supsetneq \{\neg P(a), P(b), P(a) \vee \neg P(b)\} \quad \text{unsatisfiable}$$

## Subsumption

$S = \{C, D, \dots\} \quad \exists \theta \ C\theta \subseteq D \quad C \text{ subsumes } D$

$S \text{ satisfiable} \xrightarrow{\checkmark} (S \setminus D) \text{ satisfiable}$

$\theta \text{ is proper, } S \perp \text{ satisfiable} \xrightarrow{\times} (S \setminus D) \perp \text{ satisfiable}$

$\theta \text{ is renaming, } S \perp \text{ satisfiable} \xrightarrow{\checkmark} (S \setminus D) \perp \text{ satisfiable}$

## Example

$\{P(x, y), \neg P(a, z)\}$	$\{P(x, y), \neg P(a, z), P(a, z)\}$
$\{P(\perp, \perp), \neg P(a, \perp)\}$	$\{P(\perp, \perp), \neg P(a, \perp), P(a, \perp)\}$