

Formalizing AMR Inference via Hybrid Logic Tableaux

CL Masters Thesis Defense

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Introduction

Motivation

Approach

AMR with Tense and Aspect


AMR with Scope

Hybrid Logic

Hybrid Logic Variants

First-Order Hybrid Tense Logic

FHTL Tableau Example

(1)		
(2)	$@_s(\exists x)[P((\exists y)[f(x, y) = f(y, x)]) \vee \neg(\exists z)[x = z]]$	
(3)	$@_sP((\exists y)[f(s_1, y) = f(y, s_1)]) \vee \neg(\exists z)[s_1 = z]$	
		
(4)	$@_sP((\exists y)[f(s_1, y) = f(y, s_1)])$	$@_s\neg(\exists z)[s_1 = z]$
(5)	$@_sPt$	$@_s\neg[s_1 = s_1]$
(6)	$@_t(\exists y)[f(s_1, y) = f(y, s_1)]$	$@_s[s_1 = s_1]$
(7)	...	\otimes

Model Checking Example

- *Every computer will be located at a desk.*

- AMR with quantification and tense:

```
(s / scope
  :pred (b / be-located-at-91 :ongoing -
        :complete +
        :time (a / after
               :op1 (n / now))
  :ARG0 (c / computer)
  :ARG1 (d / desk
        :quant (e / every)))
:ARG0 d
:ARG1 c)
```

- *FHTL* translation:

$$@_{now}(\forall y)[desk(y) \rightarrow (\exists x)[computer(x) \wedge F(be-located-at-91(x, y))]]$$

Model Checking Example

Define a small *FHTL* model $\mathfrak{M} = (T, \mathcal{R}, (D_t)_{t \in T}, I_{nom}, (I_t)_{t \in T})$ where:

$$T = \{\text{yesterday}, \text{now}, \text{tomorrow}\}$$

$$\mathcal{R} = \{(\text{yesterday}, \text{now}), (\text{now}, \text{tomorrow}), (\text{yesterday}, \text{tomorrow})\}$$

$$I_{nom} = \{(y, \text{yesterday}), (n, \text{now}), (t, \text{tomorrow})\}$$

$$D_{\text{yesterday}} = \{\text{computer}_1, \text{desk}_1\}$$

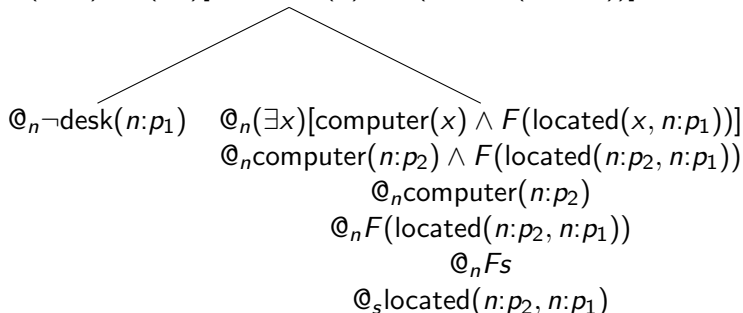
$$D_{\text{now}} = \{\text{computer}_1, \text{computer}_2, \text{desk}_1, \text{desk}_2, \text{desk}_3\}$$

$$D_{\text{tomorrow}} = \{\text{computer}_1, \text{computer}_2, \text{desk}_1, \text{desk}_2\}$$

Model Checking Example

$$@_n(\forall y)[\text{desk}(y) \rightarrow (\exists x)[\text{computer}(x) \wedge F(\text{located}(x, y))]]$$

$$@_n \text{desk}(n:p_1) \rightarrow (\exists x)[\text{computer}(x) \wedge F(\text{located}(x, n:p_1))]$$



Where we assign $s = t = \text{tomorrow}$, $n:p_2 = \text{computer}_1$ and $n:p_1 = \text{desk}_2$, or $n:p_2 = \text{computer}_2$ and $n:p_1 = \text{desk}_1$ we see that \mathfrak{M} satisfies the *FHTL* sentence.