Semantics. The minimal tense logic $K_t$ is defined by the axioms (A0)–(A6) and the rules detachment and necessitation.

(A0, R1) A set of axioms for two-valued propositional logic with detachment.

We need to add the following axioms:

(A1) $\Gamma \vdash A \Rightarrow \Gamma, \Theta \vdash \Delta; A \otimes B$

(A2) $\Gamma \vdash \Delta; A \otimes B \Rightarrow \Gamma; \Theta \vdash \Delta; A \otimes B$

(A3) $\Gamma \vdash \Delta; A \Rightarrow \Gamma, \Theta \vdash \Delta; A, B$

(A4) $\Gamma \vdash \Delta; A \otimes B \Rightarrow \Gamma, \Theta \vdash \Delta; A, B$

(A5) $\Gamma \vdash \Delta; A \otimes B \Rightarrow \Gamma, \Theta \vdash \Delta; A, B$

(A6) $\Gamma \vdash \Delta; A \otimes B \Rightarrow \Gamma, \Theta \vdash \Delta; A, B$

The Boolean gaggle $\Theta_{K_t}$ is defined as $\langle A; -, \wedge, \vee, f, h \rangle$, where (a1)–(a4) hold.

(a1) $\langle A; -, \wedge, \vee \rangle$ is a Boolean algebra;

(a2) $f(0) = 0, h(1) = 1, f(a \vee b) = f(a) \vee f(b), h(a \wedge b) = h(a) \wedge h(b)$;

(a3) $h(a) \leq h(b)$, if $a \leq b$;

(a4) $f(a) \leq b$ if $a \leq b$.

The Boolean gaggle $\Theta_{K_t}$ is defined as $\langle A; -, \wedge, \vee, f, h \rangle$, where (a1)–(a4) hold.

Decidability. Multiplicative–exponential linear logic (MELL) is the following sequent calculus. $(\Gamma, \Delta, \Theta$ and $\Lambda$ are multisets of formulas.)

$$
\Gamma \vdash A
$$

$$
\begin{array}{cccc}
\Gamma, \Delta; !A & \vdash \Delta; ?A & A; \Gamma \vdash \Delta; !A & \Gamma \vdash \Delta; ?A \\
A; \Gamma \vdash \Delta & ?A; \Gamma \vdash \Delta; !A & \Gamma \vdash \Delta; ?A & \Gamma \vdash \Delta; ?A
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The demi-relevant logic $RL$ is obtained by replacing $(!W \vdash)$ with $(W \vdash)$, and $(!W \vdash)$ with $(\vdash W)$. 

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Some relevant references and sources


