Table 1.1: Equivalence relations.

E_1	$\neg\neg p$	$\Leftrightarrow$	p				
E_2	$\neg(p \vee q)$	$\Leftrightarrow$	$\neg p \wedge \neg q$	E_3	$\neg(p \wedge q)$	$\Leftrightarrow$	$\neg p \vee \neg q$
E_4	$p \vee q$	$\Leftrightarrow$	$q \vee p$	E_5	$p \wedge q$	$\Leftrightarrow$	$q \wedge p$
E_6	$p \vee (q \vee r)$	$\Leftrightarrow$	$(p \vee q) \vee r$	E_7	$p \wedge (q \wedge r)$	$\Leftrightarrow$	$(p \wedge q) \wedge r$
E_8	$p \wedge (q \vee r)$	$\Leftrightarrow$	$(p \wedge q) \vee (p \wedge r)$	E_9	$p \vee (q \wedge r)$	$\Leftrightarrow$	$(p \vee q) \wedge (p \vee r)$
E_{10}	$p \vee p$	$\Leftrightarrow$	p	E_{11}	$p \wedge p$	$\Leftrightarrow$	p
E_{12}	$p \vee \mathbf{F}$	$\Leftrightarrow$	p	E_{13}	$p \wedge \mathbf{T}$	$\Leftrightarrow$	p
E_{14}	$p \vee \mathbf{T}$	$\Leftrightarrow$	$\mathbf{T}$	E_{15}	$p \wedge \mathbf{F}$	$\Leftrightarrow$	$\mathbf{F}$
E_{16}	$p \vee \neg p$	$\Leftrightarrow$	$\mathbf{T}$	E_{17}	$p \wedge \neg p$	$\Leftrightarrow$	$\mathbf{F}$
E_{18}	$p \vee (p \wedge q)$	$\Leftrightarrow$	p	E_{19}	$p \wedge (p \vee q)$	$\Leftrightarrow$	p
E_{20}	$p \to q$	$\Leftrightarrow$	$\neg p \vee q$	E_{21}	$\neg(p \to q)$	$\Leftrightarrow$	$p \wedge \neg q$
E_{22}	$\neg \Box p$	$\Leftrightarrow$	$\Diamond \neg p$	E_{23}	$\neg \Diamond p$	$\Leftrightarrow$	$\Box \neg p$
E_{24}	$\bigcirc(p \vee q)$	$\Leftrightarrow$	$\bigcirc p \vee \bigcirc q$	E_{25}	$\bigcirc(p \wedge q)$	$\Leftrightarrow$	$\bigcirc p \wedge \bigcirc q$
E_{26}	$\Diamond(p \vee q)$	$\Leftrightarrow$	$\Diamond p \vee \Diamond q$	E_{27}	$\Box(p \wedge q)$	$\Leftrightarrow$	$\Box p \wedge \Box q$

Table 1.2: Implication relations.

I_1	$p \wedge q$	$\Rightarrow$	p	I_2	$p \wedge q$	$\Rightarrow$	q
I_3	p	$\Rightarrow$	$p \vee q$	I_4	q	$\Rightarrow$	$p \vee q$
I_5	$\neg p$	$\Rightarrow$	$p \to q$	I_6	q	$\Rightarrow$	$p \to q$
I_7	$\neg(p \to q)$	$\Rightarrow$	p	I_8	$\neg(p \to q)$	$\Rightarrow$	$\neg q$
I_9	$\Diamond(p \wedge q)$	$\Rightarrow$	$\Diamond p \wedge \Diamond q$	I_{10}	$\Box p \vee \Box q$	$\Rightarrow$	$\Box(p \vee q)$

$$A||B = \left\langle Q^A \times Q^B, \Sigma^A \cup \Sigma^B, \delta, \langle q_i^A, q_i^B \rangle, Q_m^A \times Q_m^B, (Q_x^A \times Q^B) \cup (Q^A \times Q_x^B) \right\rangle$$

$$\delta(\langle q^A, q^B \rangle, \sigma) = \begin{cases} \delta^A(q^A, \sigma) \times \delta^B(q^B, \sigma) & \sigma \in \Sigma^A \cap \Sigma^B \\ \delta^A(q^A, \sigma) \times \{q^B\} & \sigma \in \Sigma^A \setminus \Sigma^B \\ \{q^A\} \times \delta^B(q^B, \sigma) & \sigma \in \Sigma^B \setminus \Sigma^A \end{cases}$$

Table 1.3: CTL* formulas and their equivalent μ-calculus fixpoints

CTL* formula	Equivalent μ-calculus fixpoint
$\exists\Diamond p$	$\mu y.p \vee \exists\bigcirc y$
$\exists\Box p$	$\nu y.p \wedge \exists\bigcirc y$
$\exists p\mathcal{U}q$	$\mu y.q \vee (p \wedge \exists\bigcirc y)$
$\exists p\mathcal{W}q$	$\nu y.q \vee (p \wedge \exists\bigcirc y)$
$\exists(p \to \Diamond q)$	$\mu y.\neg p \vee q \vee \exists\bigcirc y$
$\exists\Box p \wedge \exists\Diamond q$	$\nu y.(p \wedge \exists\bigcirc y) \wedge \mu z.(q \vee \exists\bigcirc z)$
$\exists\Box\exists\Diamond p$	$\nu y.(\mu z.p \vee \exists\bigcirc z) \wedge \exists\bigcirc y$
$\exists\Box\Diamond p$	$\nu y.\mu z.(p \wedge \exists\bigcirc y) \vee \exists\bigcirc z$
$\exists\Diamond\Box p$	$\mu y.\nu z.(p \vee \exists\bigcirc y) \wedge \exists\bigcirc z$
$\exists\Box p\mathcal{U}q$	$\nu y.\mu z.(q \wedge \exists\bigcirc y) \vee (p \wedge \exists\bigcirc z)$

$$
\begin{aligned}
[\![p]\!] &= \{x \,|\, p \in \lambda(x)\}, \\
[\![y]\!] &= Y \in 2^X, \\
[\![\neg\psi]\!] &= \sim[\![\psi]\!] = X \setminus [\![\psi]\!], \\
[\![\psi_1 \vee \psi_2]\!] &= [\![\psi_1]\!] \cup [\![\psi_2]\!], \\
[\![\psi_1 \wedge \psi_2]\!] &= [\![\psi_1]\!] \cap [\![\psi_2]\!], \\
[\![\exists\bigcirc y]\!] &= \text{Pre}^{\exists}([\![y]\!]) \;=\; \{x \,|\, (\exists a \in \Sigma(x))\, \delta(x,a) \subseteq [\![y]\!]\}, \\
[\![\forall\bigcirc y]\!] &= \text{Pre}^{\forall}([\![y]\!]) \;=\; \{x \,|\, (\forall a \in \Sigma(x))\, \delta(x,a) \subseteq [\![y]\!]\}, \\
[\![\mu y.\psi]\!] &= \mu Y.\Psi(Y) \;=\; \bigcap\big\{Y \in 2^X \,\big|\, Y = \Psi(Y)\big\}, \\
[\![\nu y.\psi]\!] &= \nu Y.\Psi(Y) \;=\; \bigcup\big\{Y \in 2^X \,\big|\, Y = \Psi(Y)\big\}.
\end{aligned}
$$

$$
\begin{aligned}
J^*(x) &= \max_{a\in\Sigma(x)} \big[\rho(x,a) + \gamma J^*(\delta(x,a))\big] = \max_{a\in\Sigma(x)} Q(x,a) \\
Q(x,a) &= \rho(x,a) + \gamma J^*(\delta(x,a)) = \rho(x,a) + \gamma \max_{b\in\Sigma(\delta(x,a))} Q(\delta(x,a),b) \\
\mu(x) &= \arg\max_{a\in\Sigma(x)} Q(x,a).
\end{aligned}
$$