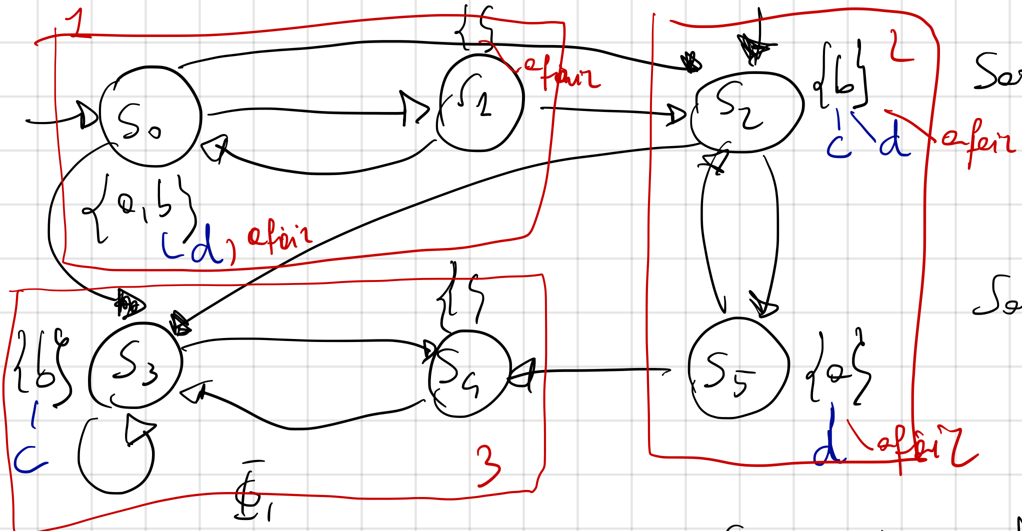


$Sat(a \land \neg b) = \{s_0, s_5\} \cap \{s_1, s_4, s_5\}$

$= \{s_5\}$

$Sat(b) = \{s_0, s_2, s_3\}$

$Sat(b \land \neg a) = Sat(b) \cap Sat(\neg a) = \{s_0, s_2, s_3\} \cap \{s_1, s_2, s_3, s_4\}$

$= \{s_2, s_3\} \xrightarrow[\Psi_2]{} c$

$Sat(\exists(b \, U \, (a \land \neg b))) = \{s_5, s_2, s_0\} \longrightarrow d$ $\quad T := \emptyset$

$\boxed{sfair \;\; \Box\Diamond c \longrightarrow \Box\Diamond d}$

SCC1: ✓ sfair is satisfied

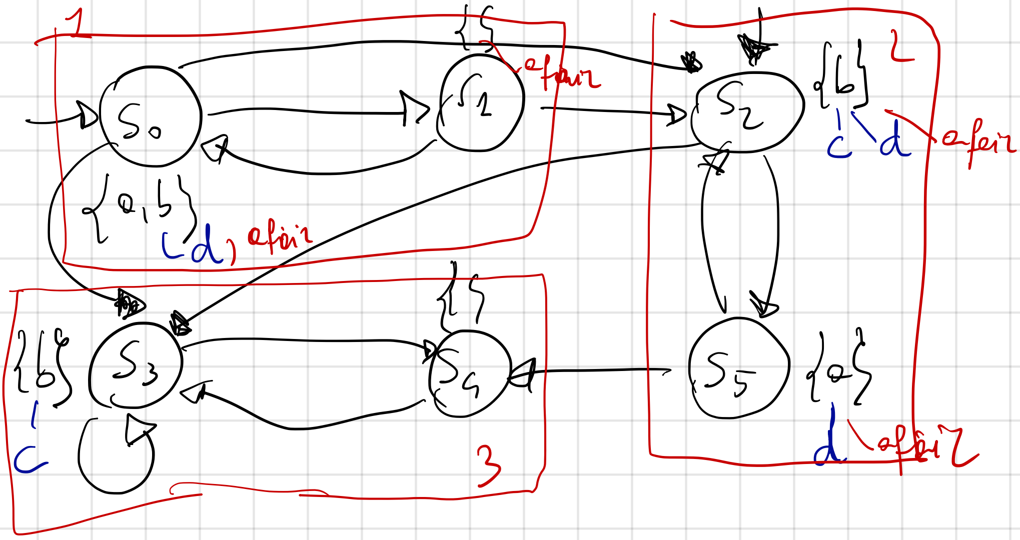
SCC2: ✓ - - - - -

SCC3: NO

$T = SCC1 \cup SCC2 = \{s_0, s_1, s_2, s_5\}$

T can be reached by the states $\{s_0, s_1, s_2, s_5\}$

Thus $Sat_{sfair}(\exists \Box true) = \{s_0, s_1, s_2, s_5\} \leftarrow$ afair



$$\Phi = \forall \Box \forall \Diamond a \equiv \neg \exists \Diamond \neg \forall \Diamond a \equiv \neg \exists \Diamond \exists \Box \neg a \equiv$$

$$\equiv \neg \exists (\text{true}\ \mathcal{U}\ \exists \Box \neg a)$$

Let's find $Sat_{afair}(\neg \exists (\text{true}\ \mathcal{U}\ \exists \Box \neg a))$

traversing the parse tree of the formula bottom-up.

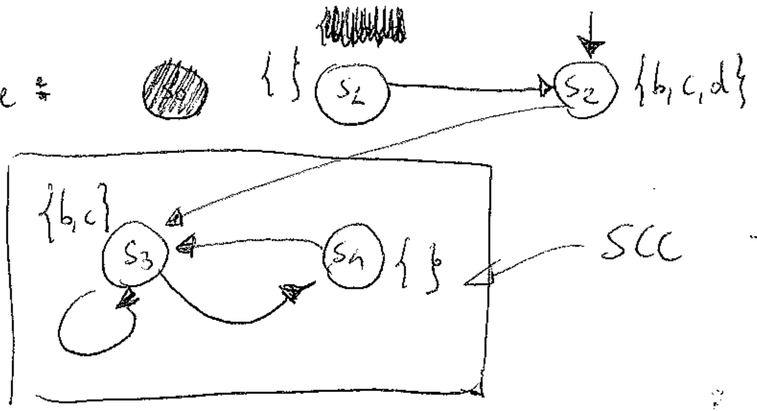
$Sat_{efair}(\neg \exists (true\ \mathcal{U}\ \exists \Box \neg a))$ $\qquad efair \equiv \Box\Diamond c \longrightarrow \Box\Diamond d$

$Sat_{efair}(a) = \{s_0, s_5\}$

$Sat_{efair}(\neg a) = S \setminus \{s_0, s_5\} = \{s_1, s_2, s_3, s_4\}$ ← new AP "e" labels these states

$Sat_{efair}(\exists \Box e) = \{\}$. Explanation: ← new AP "f" labels no states

G_e :



SCC there is no cycle D such that

$D \cap Sat(d) \neq \emptyset$

or

$D \cap Sat(c) = \emptyset$

$Sat_{efair}(\exists\ true\ \mathcal{U}\ f) = Sat(\exists(true\ U\ (f \wedge efair))) = \{\}$ → new AP "g" labels no states

Since $Sat(f \wedge efair) = \{\}$

$Sat_{efair}(\neg g) = S = \{s_0, s_1, s_2, s_3, s_4, s_5\}$

NOTE: $s_3, s_4 \models \forall \Box \forall \Diamond a$ because there is NO fair path starting from them, so the CTL formulas on $\forall$ are trivially true. ~~[illegible]~~.