Linear-time Properties L08 01 Feb 2010

Given a DLTS $\mathcal{L} = \langle S, Act, \longrightarrow, AP, D \rangle$

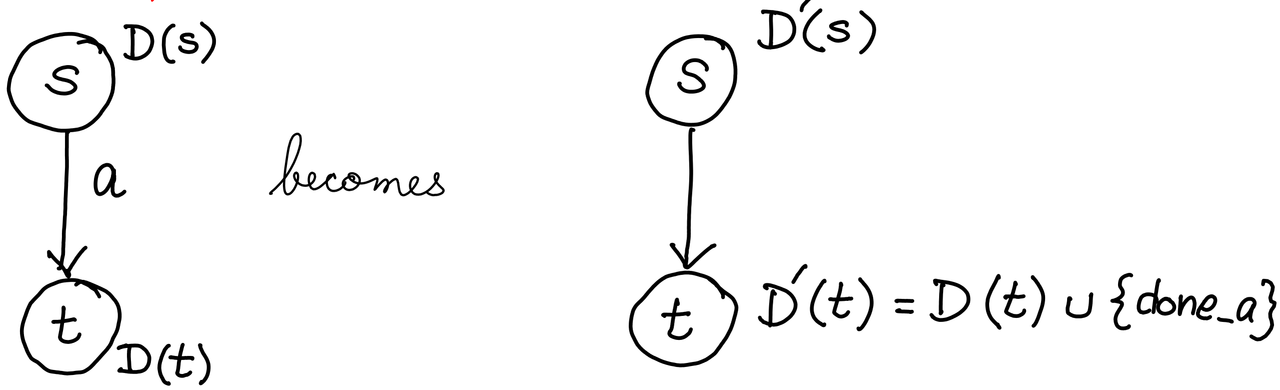
For the purpose of analysing linear-time properties we usually assume a DTS ignoring the set of actions labelling transitions.

However if the labels on the transitions are indeed important we may create fresh atomic propositions to take these into account.

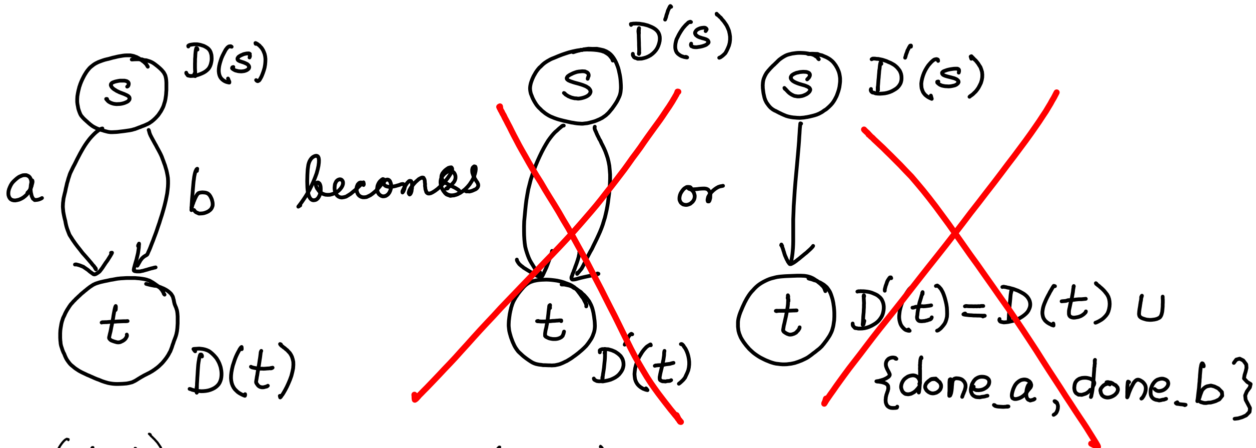
<u>Example</u>. For any finite state DLTS $\mathcal{L}$, there can occur only a finite number of different actions. Hence for such a DLTS it is sufficient to consider the set of actions Act to be finite.

Then

1. For each $a \in Act$ we associate new atomic propositions done_a and decorate each target state with with the appropriate action_proposition. Hence

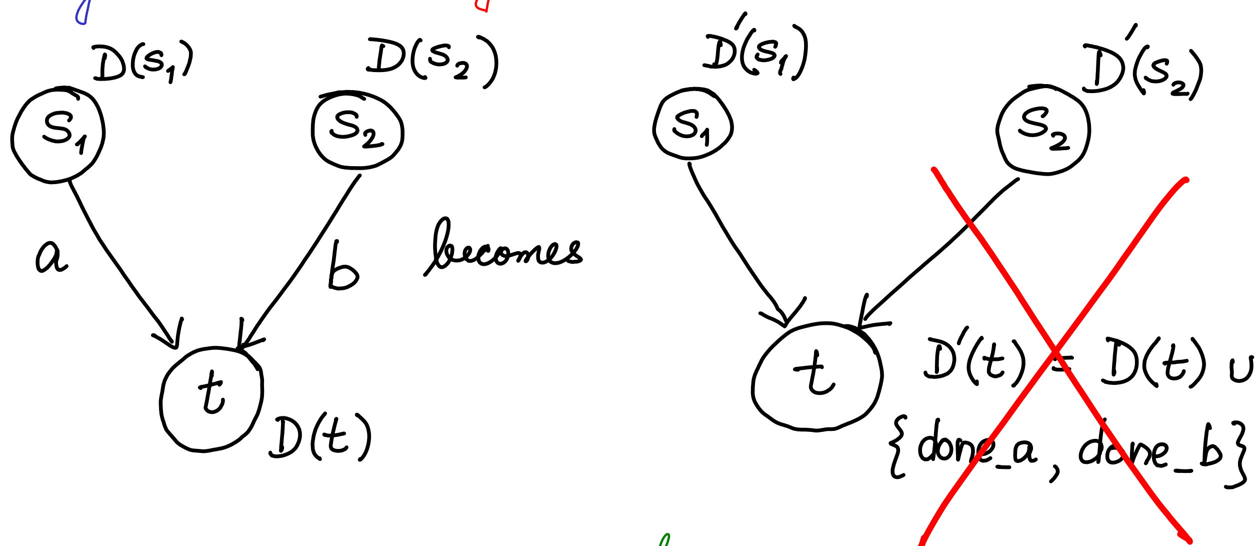


Of course such hacks cannot be blindly applied since the decoration of a state denotes the **conjunction*** of all the atoms in its decoration. Hence the following transformations are wrong!

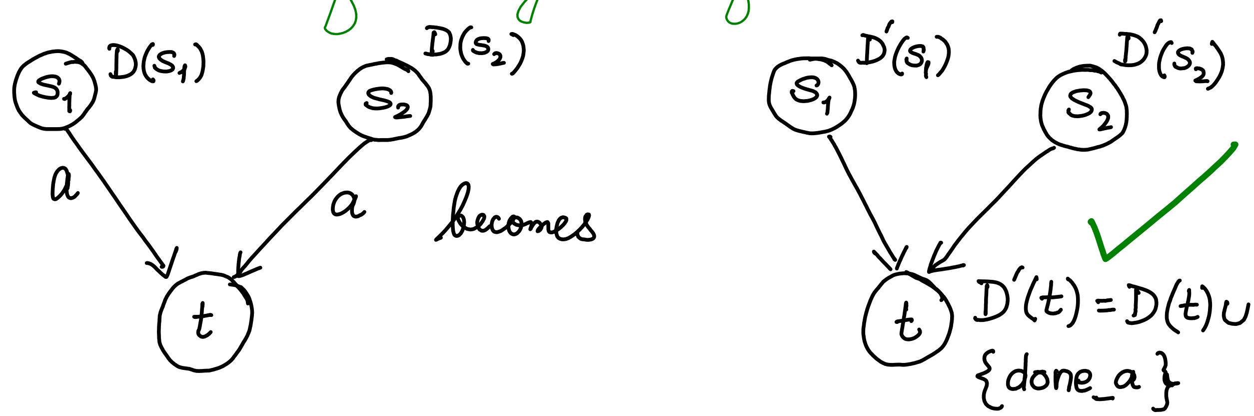


(1.1) (1.1a) (1.1b)

* Refer to the semantics of the ∧ operator to see why this is wrong



However the following transformation



is correct provided there are no other transitions with any other label into t.

However we could rectify the defects in this transformation provided the following condition is satisfied

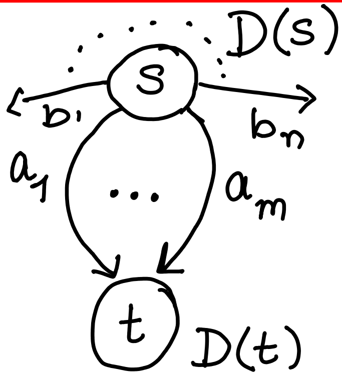
CONDITION 1. $\mathcal{L}$ is a finite transition system

CONDITION 2 For any states s, t and action a there is at most **one** transition of the form $s \xrightarrow{a} t$.

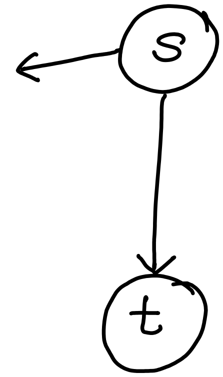
For any DLTS $\mathcal{L}$ satisfying the above conditions we define the set of atoms

$$AP_{Act} = AP \cup \{ \text{from\_s\_A} \mid s \in S, A \subseteq_f Act \} \cup \{ \text{can\_A} \mid A \subseteq_f Act \}$$

and define the following transformation for each transition in the DLTS $\mathcal{L}$ to obtain a DTS $\mathcal{D} = \langle S, \longrightarrow, AP_{Act}, D_{Act} \rangle$ as follows:



becomes



$D_{Act}(s) = D(s) \cup \{can\_B\}$

$D_{Act}(t) = D(t) \cup \{from\_s\_A\}$

where $B = s \longrightarrow$

and $A = \{a \in B \mid s \xrightarrow{a} t\}$