Emphiness problem

- Given $G$, $T_m(G) = \emptyset$?
  
  $a, c > 1 \rightarrow 0 \rightarrow 0 \rightarrow b, c < 1 \rightarrow 0$
  
  marked activity state reachable yet $T_m(G) = \emptyset$.

- Given $T \subseteq (\Sigma \times \mathbb{R}^+)$ define
  
  $\text{un-time}(T) \subseteq \Sigma^*$
  
  to be lang. obtained by projecting timed traces of $T$ onto $\Sigma^*$ (by ignoring event occurrence times)

Example:

\[ \rightarrow \begin{array}{c}
\rightarrow \\
\end{array} \]

$\text{un-time}[T_m(G)] = (ab)^*$

- Lemma: $T = \emptyset$ iff $\text{un-time}(T) = \emptyset$.

$\Rightarrow$ suffices to checkemptiness of $\text{un-time}(T)$

- Construct an untimed automaton $R$, called region automaton, such that $L_m(R) = \text{un-time}(T_m(G))$

- Important result (Alur & Dill, 91): $R$ finite state machine

$\Rightarrow$ emptiness of $L_m(R)$ can be verified.