We presuppose a universe Λ of *labels*, with a special element τ.

Definition 1 (transduction system). *A* transduction system *(or* transducer*) is a tuple $S = \langle Q, Q^{\mathsf{S}}, \iota, T \rangle$ where*

- *Q is a set of states;*
- *$Q^{\mathsf{S}} \subseteq Q$ is a set of* steady *states;*
- *$\iota \in Q^{\mathsf{S}}$ is the initial state;*
- *$T \subseteq Q \times \Lambda \times \Lambda \times Q$ is a transition relation, such that $(q, a, b, q'), (q', c, d, q'') \in T$ with $q \notin Q^{\mathsf{S}}$ implies $a = b$.*

A transduction system is a transition system *if $Q^{\mathsf{S}} = Q$ and $(q, a, b, q') \in T$ implies $b = \tau$.*

A state that is not steady is called *transient*, and we use $Q^{\mathsf{T}} = Q \setminus Q^{\mathsf{S}}$ to denote the set of transient states. We also use $q \overset{a}{\underset{b}{\mapsto}} q'$ to denote $(q, a, b, q') \in T$, and if S is a transition system, we typically leave out the second (lower) label altogether.