Concurrency Theory

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Sheet 4

Due: Monday, 2025-11-24

Exercise 4.1 (Complete Lattices)

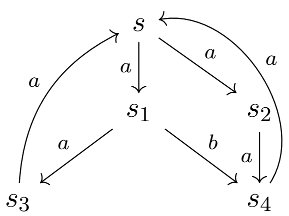
(a) Let $M = \{a, b, c\}$. Define a relation R such that (M, R) is a complete lattice.

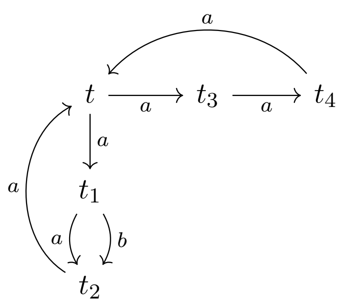
(b) For a totally ordered set S, $(\mathcal{P}(S), \subseteq)$ is a complete lattice. Define another relation R such that $(\mathcal{P}(S), R)$ is a complete lattice.

(c) Is $(\mathbb{R}, \leq)$ a complete lattice? If not, how can you extend $\mathbb{R}$ such that it becomes a complete lattice?

Exercise 4.2 (Fixpoint Charactrization of Strong Bisimularity)

*Re*consider the two LTS from **Exercise 2.1** below.

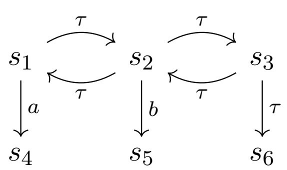


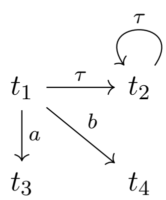


Show that $s \sim t$ by **computing** the relation $\rho \subseteq \sim$ as the greatest fixpoint of $\mathcal{F}$.[1]

Exercise 4.3 (Fixpoint Charactrization of Weak Bisimularity)

*Re*consider the two LTS from **Exercise 3.1** below.





Show that $s \approx t$ by **computing** the relation $\rho \subseteq \sim$ as the greatest fixpoint of $\mathcal{F}$.

If you have questions, please post a message in the dedicated chat.

[1] It is okay to enumerate the induced equivalence classes of pairs, as demonstrated in the lecture slides.

Exercise 4.4 (Coinduction)

Show that the infinite list $s_1 = a :: b :: a :: b :: \ldots$, for $a, b \in A$ where A is any set, is a valid infinite list using the coinductive proof method.