Technische Universität Braunschweig

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Algebraic Automata Theory

Sheet 0, 2017-10-22

Exercise 1 [10 POINTS]

As we have seen, monoids precisely the are 1-object categories, while monoid-homomorphisms are precisely the functors between those. Characterize the natural transformations in this setting.

Exercise 2 [10 POINTS]

Check that the family of functions

$$(\mathbb{P}(X))^* \xrightarrow{\delta_X} \mathbb{P}(X^*) \quad , \quad X \in \boldsymbol{set}$$

that map a string of n subsets $A_i \subseteq X$-to their concatenation, *i.e.*, a subset of $X^n \subseteq X^*$, constitutes a distributive law between the free monoid monad and the power-set monad. What about a distributive law in the opposite direction?

Exercise 3 [15 POINTS]

Consider $\mathbb{R}\text{AT}$ as a functor on suitable category. Try to find a monad-structure on $\mathbb{R}\text{AT}$. How does this relate to other monads induced by $\mathbb{F}$ and $\mathbb{P}$?

due on Thursday, 2017-10-27, 13:15,