Langages formels
Exercise 5

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3 mars 2021

Hand this exercise in before the end of the 11th March

Exercise 1: Transition monoid

1. Give the transition monoid of the following automaton $\mathcal{A}$:

    ![Automaton Diagram]

2. Give a word representing each equivalence class of the syntactic congruence of the language recognized by $\mathcal{A}$.

Exercise 2: Iterating factors

Let $\Sigma$ be an alphabet and $L \subseteq \Sigma^*$ a language. We define the iterating factors of $L$ as the set $I(L) = \{ w \in \Sigma^* \mid \exists u, v \in \Sigma^*. uw^*v \subseteq L \}$. Prove that if $L$ is regular, then $I(L)$ is also regular.

Hint: use a monoid $M$, $P \subseteq M$ and morphism $\mu$ recognizing $L$.

Exercise 3: Syntactic congruence

Let $P$ be the language of balanced strings of parentheses over alphabet $\Sigma = \{ (, ) \}$, e.g. $(())(\) \in P$ but $(\) \notin P$ and $)(\notin P$.

1. What are the equivalence classes of the relation $\equiv_P$?
2. Is $P$ recognizable?