Automates d’arbre

TD n°1 : Recognizable Tree Languages and Finite Tree Automata *

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Exercise 1 : First constructions of Tree Automatas

Let $F = \{ f(2), g(1), a(0) \}$. Give a DFTA and a top-down DFTA for the set $G(t)$ of ground instances of the term $t = f(f(a, x), g(y))$ which is defined by :

$$G(t) = \{ f(f(a, u), g(v)) \mid u, v \in T(F) \}$$

Exercise 2 : What is recognizable by an FTA ?

Are the following tree languages recognizable (by a bottom-up FTA) ?
- $F = \{ g(1), a(0) \}$ and $L$ the set of ground terms of even height.
- $F = \{ f(2), g(1), a(0) \}$ and $L$ the set of ground terms of even height.

Exercise 3 : Bottom-up vs Top-down

1) Recall why bottom-up NFTAs, bottom-up DTAs and top-down NFTAs have the same expressiveness.

2) Let $F = \{ f(2), g(1), a(0) \}$. Give a DFTA and a top-down NFTA for the set $M(t)$ of terms which have a ground instance of the term $t = f(a, g(x))$ as a subterm, ie. $M(t) = \{ C[f(a, g(u))] \mid C \in C(F), u \in T(F) \}$.

3) Show that NFTAs and top-down DFTAs do not have the same expressiveness.

*taken from Tree Automata Techniques and Applications. Thanks to Jeremy Dubut for previous years TDs.