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Deterministic regular functions of infinite words

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Olivier Carton, Gaëtan Douéneau-Tabot, Emmanuel Filiot, and Sarah Winter

Abstract: Regular functions of infinite words are (partial) functions realized by deterministic two-way transducers with infinite look-ahead. Equivalently, Alur et. al. have shown that they correspond to functions realized by deterministic Muller streaming string transducers, and to functions defined by MSO-transductions. Regular functions are however not computable in general (for a classical extension of Turing computability to infinite inputs), and we consider in this paper the class of deterministic regular functions of infinite words, realized by deterministic two-way transducers without look-ahead. We prove that it is a well-behaved class of functions: they are computable, closed under composition, characterized by the guarded fragment of MSO-transductions, by deterministic Büchi streaming string transducers, by deterministic two-way transducers with finite look-ahead, and by finite compositions of sequential functions and one fixed basic function called map-copy-reverse.

Presenter: FILIOT, Emmanuel

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