

Revisiting Shinohara's Algorithm for Computing Descriptive Patterns

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Zusammenfassung: A pattern α is a word of constants and variables and its pattern language $L(\alpha)$ contains all words that can be obtained by uniformly replacing the variables with constant words. A pattern α is descriptive for a finite set S of words if $L(\alpha)$ contains S in the closest possible way. We generalise Shinohara's algorithm for computing descriptive patterns to subclasses of patterns and characterise those subclasses for which it is applicable. Furthermore, within this set of pattern classes, we characterise those for which Shinohara's algorithm has a polynomial running time (under the assumption $\mathcal{P} \neq \mathcal{NP}$). Moreover, we also investigate the complexity of the consistency problem of patterns, i. e., finding a pattern that separates two given finite sets of words.

Die Lamplighter-Gruppe $\mathbb{Z}_3 \wr \mathbb{Z}$ als Automatengruppe

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Zusammenfassung: Im Allgemeinen ist es möglich, aus bireversiblen Automaten Gruppen zu generieren.

In diesem Vortrag wird ein bireversibler Automat G mit drei Status über einem Alphabet mit drei Elementen konstruiert. Es wird gezeigt, wie daraus eine Gruppe generiert wird und dass die aus G generierte Gruppe isomorph zur verallgemeinerten Lamplighter-Gruppe $\mathbb{Z}_3 \wr \mathbb{Z}$ ist.

Durch die Isomorphie der Lamplighter Gruppe zu einer Automatengruppe lassen sich einige außergewöhnliche Eigenschaften dieser Gruppe beweisen.

Linking Theorems for Tree Transducers

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Zusammenfassung: Links from synchronous grammars are typically transient and disappear once the linked nonterminals are rewritten. They are promoted to primary objects here, preserved in the semantics, and carefully studied. It is demonstrated that the links computed during the derivation of an input and output tree pair are hierarchically organized and that the distance between (input and output) link targets is bounded. Based on these properties, two linking theorems are developed that postulate the existence of certain natural links in each derivation for a given input and output tree pair. These linking theorems allow easy, high-level proofs that certain tree translations cannot be implemented by (compositions of) linear extended multi bottom-up tree transducers.

RegEx und Wortgleichungen: Ein Vergleich

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Zusammenfassung: In den letzten Jahren wurden mehrere unterschiedliche Modelle untersucht, die reguläre Sprachen um unterschiedliche Wiederholungsoperatoren erweitern. Wir vergleichen zwei dieser Modelle: Zum einen *RegEx*, reguläre Ausdrücke mit Rückreferenzen (wie sie in den meisten modernen Implementierungen von regulären Ausdrücken vorkommen), zum anderen *Wortgleichungen mit rationalen Nebenbedingungen*.

Es stellt sich heraus, dass die Klassen der von diesen Modellen definierten Sprachen unvergleichbar sind; allerdings verfügen sie über eine reichhaltige Schnittmenge. Außerdem können mehrere bekannte obere und untere Schranken zwischen den Modellen übertragen werden.

Longest Gapped Repeats and Palindromes

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Zusammenfassung: A gapped repeat (resp., palindrome) in a word w is a factor uvu (resp., u^Rvu) of w . We show efficient algorithms building the longest previous gapped repeat/palindrome tables: for each position i of w we compute the longest factor u occurring both at position i and once again on a position $j < i$ (or, resp., whose mirror image u^R occurs in the prefix of length $i - 1$ of w) such that there is a gap v (subject to various restrictions) between i and the previous occurrence of the respective factor u (resp., u^R). Such tables provide a good image of the long gapped repeats and symmetries of the input word.

The results presented here were obtained together with Marius Dumitran, and published in the proceedings of MFCS 2015.

An Approach to Computing Downward Closures

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Zusammenfassung: The downward closure of a word language is the set of all (not necessarily contiguous) subwords of its members. It is known that the downward closure of every language is regular. However, algorithms for computing a finite automaton for the downward closure of a given language are known only for few language classes. This work presents a simple general approach to this problem. It is used to prove that downward closures are computable for (i) every language class with effectively semilinear Parikh images that is closed under rational transductions, (ii) matrix languages, and (iii) indexed languages (equivalently, languages accepted by higher-order pushdown automata of order 2).

Zu Beziehungen zwischen subregulären Sprachfamilien

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Zusammenfassung: Wir zeigen, dass jede definite Sprache von einem geordneten deterministischen endlichen Automaten akzeptiert wird. Damit wird ein auf dem Theorietag 2014 vorgestelltes Ergebnis verbessert. Außerdem beweisen wir, dass jede Sprache, die regulär und unter Suffixbildung abgeschlossen ist, auch potenzseparierend ist. Dies steht im Gegensatz dazu, dass nicht-reguläre Sprachen, die unter Suffix-Bildung abgeschlossen sind, nicht notwendigerweise potenzseparierend sind. Zum Schluss wird eine Hierarchie präsentiert, die zusätzlich die Familien der monoidalen, endlichen, nilpotenten, kombinatorischen, regulären nicht-zählenden, regulären kommutativen, regulären zirkulären und vereinigungsfreien Sprachen enthält.

Infinite and Bi-infinite Words with Decidable Monadic Theories

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Zusammenfassung:

1. The set of recursive ω -words with decidable monadic second order theories is Σ_3 -complete.
 2. We characterise the bi-infinite words with decidable monadic second order theories.
 3. We show that such “tame” bi-infinite words exist in every Turing degree.
 4. We determine, for any bi-infinite word, the number of indistinguishable bi-infinite words.
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Parameterized Prefix Distance Between Regular Languages

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Zusammenfassung: We investigate the parameterized prefix distance between regular languages. The prefix distance between words is extended to languages in such a way that the distances of all words up to length n to the mutual other language are summed up. Tight upper bounds for the distance between unary as well as non-unary regular languages are derived. It is shown that there are pairs of languages having a constant, degree k polynomial, and exponential distance. Moreover, for every constant and every polynomial, languages over a binary alphabet are constructed that have exactly that distance. From the density and census functions of regular languages the orders of possible distances between languages are derived and are shown to be decidable.

Characterization of $+\omega$ -picture languages

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Abstract: In this manuscript we define a new class of two-dimensional languages called $+\omega$ -picture languages. These are pictures with finite number of rows and infinite number of columns. We introduce two devices to characterize this family: Büchi two-dimensional on-line tessellation automata (2OTA) and tiling systems (TS) with a Büchi accepting condition. We use these devices to extend the well-known characterization of Büchi recognizable ω -languages found by Büchi to our setting. Moreover, we show that the class of $+\omega$ -picture languages recognized by tiling systems and the one defined by a new existential monadic second-order logic is equivalent.
