# A PACKAGE FOR CHECKING SOME STAR-FREE LANGUAGES

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We implement a set of procedures for deciding whether or not a language given by its minimal automaton or by its syntactic semigroup is locally testable, threshold locally testable, strictly locally testable, or piecewise testable. The level of local testability of semigroup is also found. We estimate bounds for level of local testability of transition graph and check his $k$-testability. Some new effective polynomial time algorithms have been implemented as $C^{++}$ package (TESTAS).

Piecewise testable and locally testable languages are the best-known subclasses of star-free languages and they define two important directions in investigations of these languages.

A locally testable language $L$ is a language with the property that for some nonnegative integer $k$, called the order or the level of local testability, whether or not a word $u$ is in the language $L$ depends on (1) the prefix and suffix of the word $u$ of length $k-1$ and (2) the set of intermediate substrings of length $k$ of the word $u$. Local testablility has a wide spectrum of applications. We implement in our package a polynomial time algorithms of order $O(n^2)$ for local testability problem of automaton and of syntactic semigroup of the language, for finding the order of local testability for syntactic semigroups [1], for estimations on the order of local testability (of order $O(n^2)$) and for checking the $k$-testability of graph (of order $O(n^{k+1})$).

The locally threshold testable languages generalize the concept of locally testable language. We use in our package a polynomial time algorithm for the local threshold testability problem.

A language is piecewise testable iff its syntactic monoid is $J$-trivial (meaning that distinct elements of monoid generate distinct ideals). We implement an algorithm to verify piecewise testability of automaton and of syntactic semigroup of the language (both of of order $O(n^2)$).

## References

[1] A.N. Trahtman, A polynomial time algorithm for local testability and its level. *Int. J. of Algebra and Comp.* v. 9, **1**(1998), 31-39..