Visual representation of digraph

T. Bauer* N. Cohen** A.N. Trahtman***

Bar-Ilan University, Dep. of Math., 52900, Ramat Gan, Israel

The main topic of the investigation is the visual representation of the transition graph of an automaton in the graphical form on the base of structure properties of the graph. The matrix representation could not demonstrate the structure of the automaton, it can be done better by the help of the graphical facilities.

One of the most popular programs in the area of the visualization of a graph is the package GRaphViz (http://home.so-net.net.tw/oodtsen/wingraphviz), a project of AT&T Labs research. It provides a collection of tools for generating graph layouts.

The package TESTAS (http://www.cs.biu.ac.il/∼trakht/syn.html) tested the properties of GRaphViz. Unfortunately, the time of the creation of the image was too long. It seems that the complexity of the algorithm is even not polynomial. The edges are curved, the properties of the automaton are not demonstrated, therefore clearness of the graph is far from desired. The approach of GRaphViz seems too general and does not use the specificity of the transition graph of an automaton.

Therefore for to remove the shortages of visualization packages similar to GRaphViz we consider another approach paying attention mostly to the structure properties of the automaton and to the complexity of used algorithms. The consideration is restricted to the class of the transition graphs of the deterministic finite automata, a very private case of a graph, so some possible restrictions can be used. The graph is presented as a union of the set of the strongly connected components (SCC). A linear algorithm for finding SCC is implemented. The vertices of every SCC form a cycle in the graph layout. All SCC are ordered according to the *weight* defined by the size of SCC and the number of ingoing edges. The edges of the graph with different labels differ by its colors, so the labels of the edges can be omitted.

The pictorial diagram demonstrates the inner structure of the graph and is clear illustration of the graph presented by its SCC. The traditional problem of placing of the states with their labels and the edges together with labels is solved on the base of a linear algorithm. However, the placing of the objects is not the most important problem on the list of our tasks.

The algorithm is implemented in C++ as a part of the package TESTAS. The linearity of the implemented algorithms ensures the momentary appearance of the representation.

* Email: verynice3@walla.com
** Email: noambox@gmail.com
*** Email: trakht@macs.biu.ac.il