Visual Exploration of Generation Algorithms for Finite Automata on the Web

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1 Introduction

In previous articles we presented a PC based educational software on lexical analysis [1] and semantical analysis [4]. These systems were developed using an authoring system under MS Windows. The user can not change regular expressions or input words for nondeterministic respectively deterministic finite automata. To overcome these restrictions we developed GaniFA, our Java applet for visualization of algorithms from automata theory. It can be downloaded from our web page `http://www.cs.uni-sb.de/GANIMAL` as a JAR-file and requires a Java Plug-In 1.2. We invite the reader to use it in own web-based exercises, lecture notes or presentations on finite automata. Furthermore this web page gives a short overview, how this applet can be customized and embedded into HTML web pages.

2 GaniFA

The GaniFA applet visualizes and animates the following algorithms [5]:

- Generation of a non-deterministic finite automaton (NFA) from a regular expression RE, see Figure 1.
- Removal of ε-transitions of a NFA.
- Transformation of a deterministic finite automaton (DFA) from a NFA without ε-transitions.
- Minimization of a deterministic finite automaton (minDFA).
- For each of the above automata generated above, the applet can visualize the computation of the automaton on an input word.

GaniFA is customizable through a large set of parameters. In particular, it is possible to visualize only some of the algorithms and to pass a finite automaton or a regular expression as well as an input word to the applet. The GaniFA applet was embedded into an electronic textbook on the theory of finite automata, which can be studied with the help of a usual web browser like Netscape Communicator or MS Internet Explorer. Currently there are English and German versions of the textbook and of the applet itself.
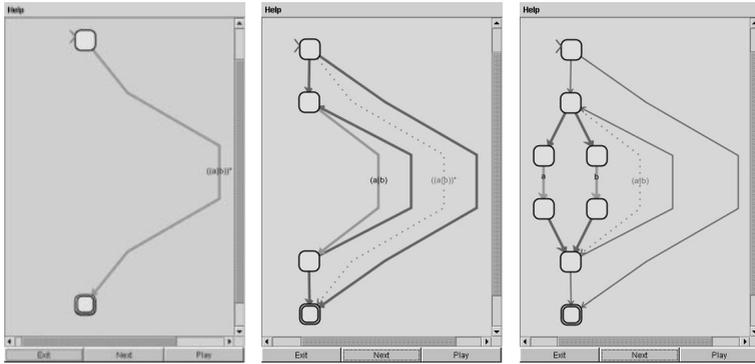
Fig. 1. Layout of the intermediate and final NFA for the RE $(a|b)^*$.

3   Conclusion

Although GaniFA and our electronic textbook only cover a small part of the
theory on generating finite automata, they can be very useful for introductory
courses. They provide a new way to access the material and allow for explorative,
self-controlled learning [3]. Teachers can not only use our textbook as it is, but
they can also embed GaniFA in their on lecture notes and exercises. As part of
our future work, we plan to use the technical framework underlying GaniFA and
GANIMAM [2] to implement customizable, interactive web-based visualizations
of other computational models[1].

References

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