Implementation of 2D Pattern Matching Algorithm using Pushdown Automata

Our goals
- analysis and optimisation of the original algorithm
- implementation of the algorithm using platform-independent tools
- to benchmark the algorithm using various reference pictures and patterns

Main drawbacks of the algorithm
- the amount of data the automaton has to process (the picture-to-tree transformation creates a lot of redundant data)
- non-determinism of the indexing automaton

Optimisation
- the redundancies were removed for faster processing
- the number of non-deterministic transitions was reduced to only one for simpler simulation
- two non-deterministic automaton simulation approaches using sets of deterministic sub-automata were proposed (BFS, DFS)

Implementation
- ANSI C compliant
- consists of several modules
  - resource loader
  - on-the-fly input generator
  - automaton simulator
- both approaches of automaton simulation were implemented

Testing
- the testing was performed on Intel x86 and Sun SPARC platforms
- focused on algorithm performance for various categories of pictures and comparison of automaton simulation approaches
- categories: colour and grayscale photographs, OCR text, random noise...
- DFS approach gave better results in all tests
- time complexity $O(n^2)$, space complexity $O(n)$ (for the DFS)

Jiří Šembera
Supervisor: Ing. Jan Žďárek, Ph.D.
Department of Computer Science and Engineering
Faculty of Electrical Engineering
Czech Technical University in Prague