

# CRACK

**Enrico Franconi**

IRST, I-38050 Povo TN, Italy

franconi@irst.itc.it

## CRACK:

The tests were performed using CRACK version 1.0 beta 18. CRACK is a description logic system with both TBox and ABox, using the logic *ALCRLFO*. CRACK reasoning procedures are based on a sound and complete tableaux algorithm [1].

## Availability:

Source code (CLTL2 compliant common lisp) is available on request. An online working version of CRACK is available at <http://krr.irst.itc.it:1024/crack/>.

## Advantages:

CRACK- and its graphical interface for displaying taxonomies – has been successfully tested in the following common-lisp CLTL2 environments: Allegro 4.2/4.3 (Solaris and Linux), Macintosh MCL 2.0/3.3/4.2, Lucid 4.2/Liquid 5.0 (Solaris), CMU Common Lisp 17f. CRACK can be installed to act as a server over a TCP/IP network from any of the above environments; code libraries for developing clients in C++, Java, and Tcl/Tk are available.

CRACK is the only implemented system having both **one-of** and inverse roles. It handles also role hierarchies and functional roles.

As a disadvantage, CRACK does not implement neither number restrictions nor full axioms. CRACK algorithms are non-terminating for particular combination of operators, most notably *ALLIO* with ABox. CRACK does not employs yet the semantic branching optimization.

## Hardware and Software:

PC clone; 200MHz Pentium II CPU; 64MB RAM; Linux; Allegro CL 4.3.

## Results:

The synthetic TBox **hc412** generated a memory overflow: this is an example of a sub-language of *ALCRLFO* where the complexity of satisfiability is PSPACE-complete requiring exponential space in CRACK.

Note that the translation of KRSS knowledge bases into CRACK's syntax is not complete. As a result, the

processing is incomplete with respect to most of the realistic TBoxes and to all random TBoxes.

## References

- [1] Paolo Bresciani, Enrico Franconi, and Sergio Tessaris. Implementing and testing expressive description logics: a preliminary report. In *Proceedings of DL '95*, pages 131–139, Rome, Italy, June 1995.

Table 1: Tableaux'98 Concept Satisfiability Tests

| Test     | Incoherent |         | Coherent |         |
|----------|------------|---------|----------|---------|
|          | Size       | Correct | Size     | Correct |
| k_branch | 2          | Y       | 1        | Y       |
| k_d4     | 2          | Y       | 3        | Y       |
| k_dum    | 3          | Y       | 21       | Y       |
| k_grz    | 1          | Y       | 21       | Y       |
| k_lin    | 5          | Y       | 3        | Y       |
| k_path   | 2          | Y       | 6        | Y       |
| k_ph     | 3          | Y       | 3        | Y       |
| k_poly   | 21         | Y       | 21       | Y       |
| k_t4p    | 1          | Y       | 1        | Y       |

Table 2: Synthetic Tbox Classification Tests

| Test  | Concepts | Time (s)  | Correct |
|-------|----------|-----------|---------|
| hc14  | 10       | 0.21      | Y       |
| hc18  | 18       | 0.78      | Y       |
| hc112 | 26       | 1.84      | Y       |
| hc24  | 46       | 0.28      | Y       |
| hc28  | 94       | 4.24      | Y       |
| hc212 | 142      | 11.07     | Y       |
| hc34  | 18       | 1.25      | Y       |
| hc36  | 26       | 0.60      | Y       |
| hc38  | 34       | 2.23      | Y       |
| hc44  | 7        | 0.00      | Y       |
| hc48  | 7        | 1.53      | Y       |
| hc412 | 7        | >10000.00 | ?       |

Table 3: Tableaux'98 KB Tests

| Test     | Incoherent |          |         | Coherent |          |         |
|----------|------------|----------|---------|----------|----------|---------|
|          | Size       | Concepts | Correct | Size     | Concepts | Correct |
| k_branch | 1          | 73       | Y       | 1        | 71       | Y       |
| k_d4     | 3          | 114      | Y       | 2        | 104      | Y       |
| k_dum    | 3          | 82       | Y       | 21       | 650      | Y       |
| k_grz    | 1          | 110      | Y       | 21       | 1,349    | Y       |
| k_lin    | 21         | 934      | Y       | 9        | 939      | Y       |
| k_path   | 1          | 33       | Y       | 1        | 91       | Y       |
| k_ph     | 2          | 28       | Y       | 3        | 73       | Y       |
| k_poly   | 3          | 164      | Y       | 2        | 102      | Y       |
| k_t4p    | 1          | 77       | Y       | 0        | 0        | Y       |

Table 4: Realistic Tbox Classification Tests

| Test           | Concepts | Time (s)  | Correct |
|----------------|----------|-----------|---------|
| ckb-roles      | 79       | 1.19      | Y       |
| datamont-roles | 120      | 1.18      | N       |
| espr-roles     | 142      | 0.00      | Y       |
| fss-roles      | 132      | 0.37      | Y       |
| wines          | 267      | 2.37      | N       |
| wisber-roles   | 140      | 1.63      | N       |
| galen1         | 2,728    | >10000.00 | ?       |
| galen2         | 3,926    | 124.75    | N       |

Table 5: Tableaux'98 Abox Realisation Tests

| Test       | Conc's | Ind's | Time (s)  | Correct |
|------------|--------|-------|-----------|---------|
| k_branch_n | 71     | 27    | 0.02      | Y       |
| k_d4_n     | 48     | 24    | 0.01      | Y       |
| k_dum_n    | 71     | 14    | 0.01      | Y       |
| k_grz_n    | 109    | 19    | 0.00      | Y       |
| k_lin_n    | 10     | 10    | 0.01      | Y       |
| k_path_n   | 91     | 174   | >1,000.00 | ?       |
| k_ph_n     | 7      | 8     | 0.01      | Y       |
| k_poly_n   | 66     | 128   | >1,000.00 | ?       |
| k_t4p_n    | 72     | 0     | >1,000.00 | ?       |