

Model-Checking Exercises

Sommersemester 2009 / Sheet 5

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We are going to discuss the examples together at 16.7. For questions about the exercises or examples, please send me an email campete1@in.tum.de.

Example 5.1: Craig interpolants

Let F and G formulas of propositional logic, and let Z the atomic propositions, that are in F , but do not occur in G . Show:

1. $\exists Z : F$ is a Craig interpolant between F and G
2. Show, that $J := \exists Z : F$ is the strongest Craig interpolant between F and G , i.e. for any other interpolants J' holds: $J \Rightarrow J'$.
3. Argue, that symmetrical $K := \forall Z : \neg G$ is the weakest Craig interpolant, that is, for any other interpolants K' holds: $K' \Rightarrow K$.

Example 5.2: Bisimulation

Assume, that two Kripke structures S and S' are not bisimilar. Show, that there is a **CTL**-formula, that differs S from S' .

Example 5.3: Abstraction

Prepare an abstract model for the following C program, that uses the predicates $(z = 0)$ and $(x = y)$.

```
int x, y, z, w;
void foo() {
  do {
    x = y;
    if (w == 1)
      x++;
    z = w - 1 ;
  } while (x != y);
  if (z) assert(0); // Error
}
```

1. Display manually, that the error condition in the model is achievable.
2. Improve the model by means of an appropriate predicate, to exclude the error.