SMT, CAD & Applications

Gereon Kremer October 9th, 2018

RWTH AACHEN UNIVERSITY

Satisfiability modulo theories solving

Is an existentially quantified first-order formula φ satisfiable?

$$\exists x.\varphi(x) \equiv true$$

Theories: arithmetic, bit-vectors, floating-point, arrays, uninterpreted functions

RWTH AACHEN UNIVERSITY

Satisfiability modulo theories solving

Is an existentially quantified first-order formula φ satisfiable?

$$\exists x.\varphi(x) \equiv true$$

Theories: arithmetic, bit-vectors, floating-point, arrays, uninterpreted functions

Applications:

- Software verification
- Test-case generation
- Termination proving
- Controller synthesis
- Scheduling and planning
- Product design automation
- And growing ...

RWTH AACHEN UNIVERSITY

Satisfiability modulo theories solving

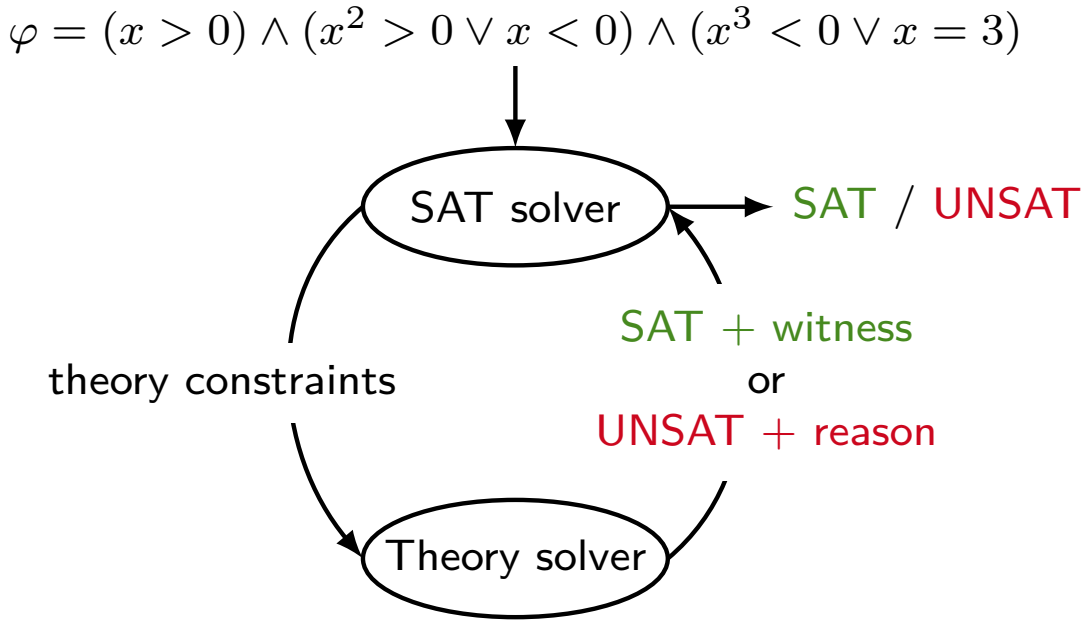
Is an existentially quantified first-order formula φ satisfiable?

$$\exists x.\varphi(x) \equiv true$$

Theories: arithmetic, bit-vectors, floating-point, arrays, uninterpreted functions

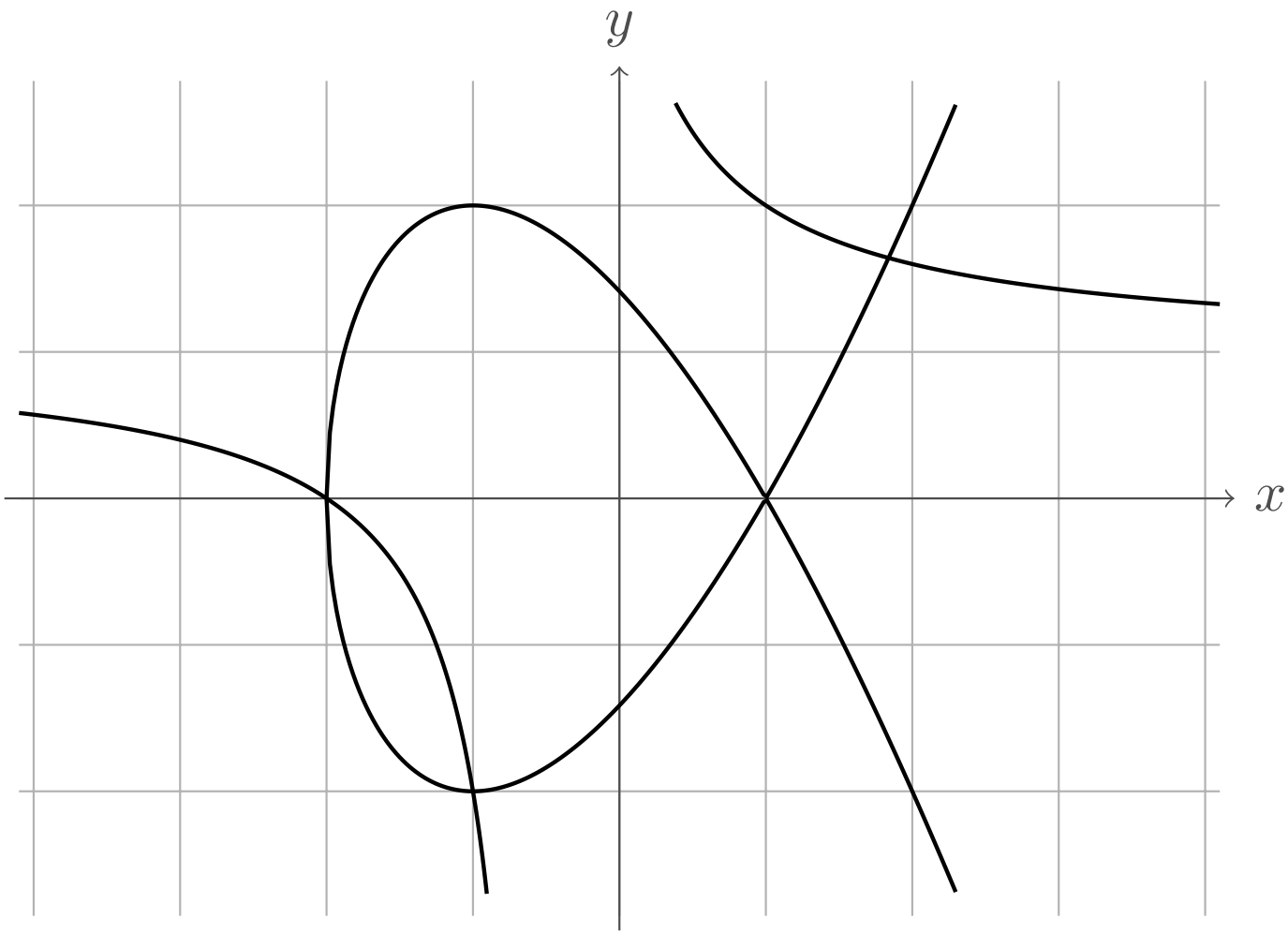
Applications:

- Software verification
- Test-case generation
- Termination proving
- Controller synthesis
- Scheduling and planning
- Product design automation
- And growing ...



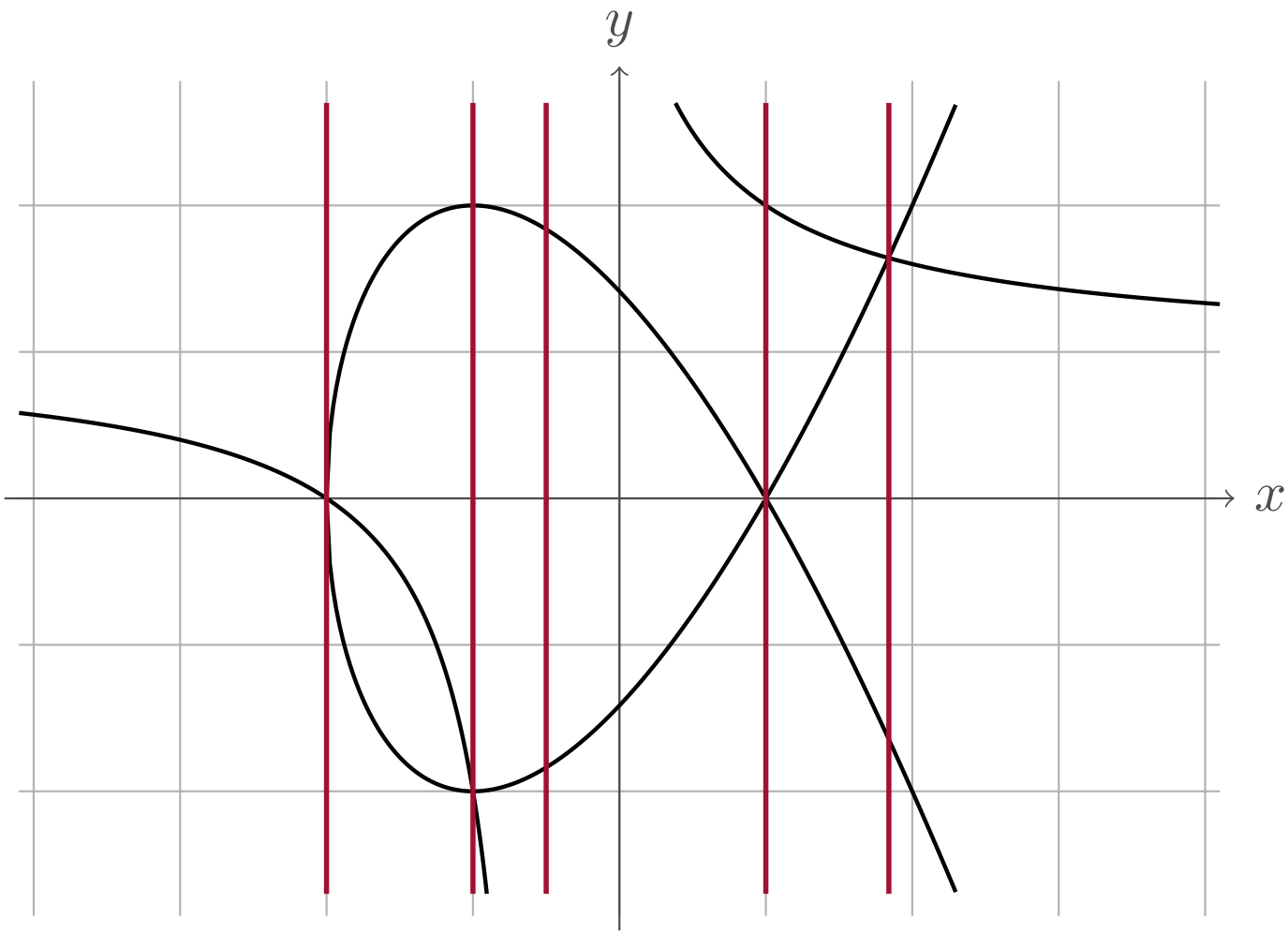
RWTH AACHEN UNIVERSITY

Cylindrical Algebraic Decomposition



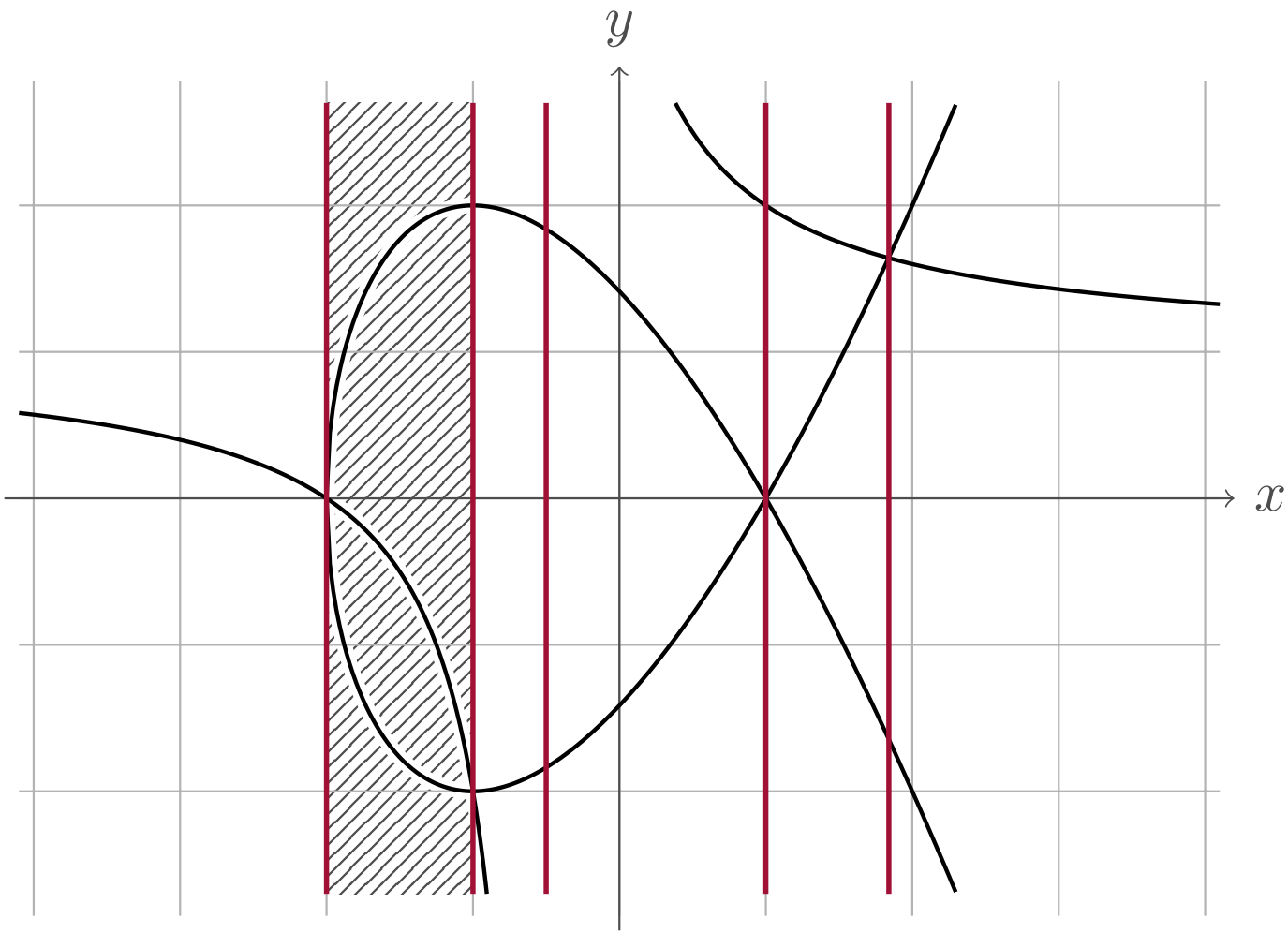
RWTH AACHEN UNIVERSITY

Cylindrical Algebraic Decomposition



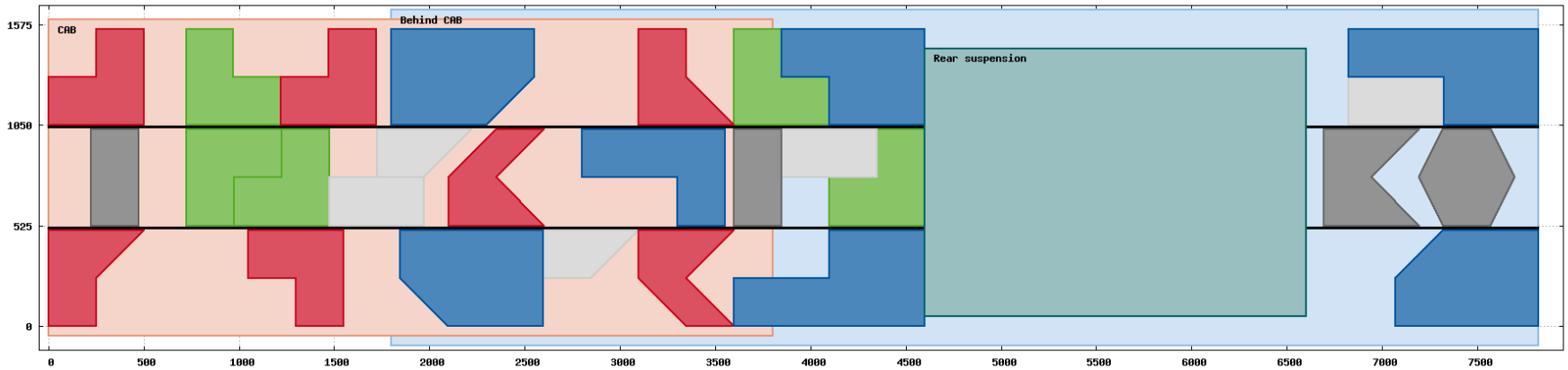
RWTH AACHEN UNIVERSITY

Cylindrical Algebraic Decomposition



Applications

- Configuration management (automotive)
- Geometric layout planning (automotive)



- Optimal deployments of cloud application (Zephyrus 2)
- Strategies for cooperating robots (RoboCup Logistics League)
- Generalization of counterexamples (MCSAT)
- Quantifier elimination