

Satisfiability Checking - WS 2016/2017

Series 13

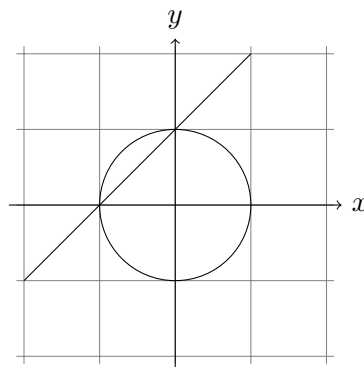
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Exercise 1

The Cylindrical Algebraic Decomposition aims at decomposing the whole solution space into *sign-invariant regions*. Each such region is represented by a single sample point.

- Why can you decide satisfiability using only a few sample points, although the solution space is infinitely large?
- The notion of *delineability* of intervals is crucial for the CAD. Explain why the CAD method relies on this notion. Are sign-invariant regions delineable in general, or can you give regions that are not delineable?
- Consider the following problem. Give a minimal selection of sample points that could be used to solve this example. You can give the sample points as dots in the diagram.

$$p_1 : x^2 + y^2 - 1 = 0 \wedge p_2 : x - y + 1 = 0$$



- Due to the way how the CAD algorithm determines the sample points, the set of sample points that will actually be used is much larger. Try to give a set of sample points that may be used by an actual implementation in the above example and argue why the additional sample points are included.