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Some progress on Skolem's problem and related topics

Abstract:

Skolem's problem asks to determine whether a given integer linear recurrence sequence has a zero term. This problem, whose decidability has been open for 90 years, arises across a wide range of topics in computer science and dynamical systems. In 1970, a generalization of this problem was conjectured by Loxton and Schlickewei, which can be stated as follows: Let $\{u_n\}_n$ be a non-degenerate linear recurrence sequence of integers with Binet's formula given by $u_n = \sum_{i=1}^{m} P_i(n)\alpha_i^n$. Assume $\max_i|\alpha_i| > 1$. For any $\epsilon > 0$, there is an effectively computable constant $C(\epsilon)$, such that, if the integer n is solution of the inequality $|u_n| < \left(\max_i\{|\alpha_i|\}\right)^{n(1-\epsilon)}$, then $n < C(\epsilon)$. A non-effective proof of this conjecture was given by Van der Poorten, and recently Fuchs and Heintze provided a different proof of the non-effective case of this conjecture based on results due to Schmidt and Evertse. In this talk, we provide a survey on Skolem's problem and sketch the proof of the weak version of the conjecture by giving an effective upper bound on the number of solutions of that inequality. The higher dimensional version of this conjecture will also be discussed in this presentation.

Joint work with Florian Luca, James Maynard, Joel Ouaknine, and James Worrell.

Eingeladen von Clemens Fuchs