Efficient depth reduction for composites is possible

Periklis Papakonstantinou
Rutgers Business School
1/27/2016 at 11:00 am
Core A (Room 301)

Abstract

In 1989 it was shown by Allender and Hertrampf that every circuit of depth $d$ and gates AND, OR, NOT, and MODp can be reduced to a depth 3 circuit of size $2^{O((\log n)^{O(d)})}$. The question about MODm gates was handled a year later by Yao, and subsequently by Beigel and Tarui, with a triple-exponentially size bound, i.e. $2^{O((\log n)^{2^{O(d)}})}$.

We resolve the question for composites obtaining the same asymptotic result as Allender-Hertampf.

Depth reduction is a fundamental question on its own. It also has significant implications. For example, one of its immediate consequences is an exponential depth-improvement in Williams’ program for separations of NEXP.

This is joint work with Shiteng Chen.

Organizer(s): Eric Allender, Pranjal Awasthi, Michael Saks and Mario Szegedy