

## Algebraic techniques in the degree-diameter problem

Jozef Širáň

Open University and  
Slovak University of Technology

The *degree-diameter problem* is to determine the largest order  $n(d, k)$  of a graph of maximum degree  $d \geq 3$  and diameter  $k \geq 2$  and classify of the corresponding graphs. Although the problem originated more than five decades ago and generated more than a hundred of papers on the topic, only seven exact values of  $n(d, k)$  in the above range for  $d$  and  $k$  have been known. Nevertheless, a number of highly non-trivial bounds on  $n(d, k)$  are available and most of these have been proved by algebraic techniques involving spectral theory and group theory. The aim of the talk is to give an overview of the techniques and outline further research opportunities in this area.