An introduction to computational graph theory and generation algorithms – Part 2: Fullerenes and the House of Graphs

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In this talk we will present a new generation algorithm for the Nobel Prize winning fullerenes. (A *generation algorithm* is an algorithm which exhaustively generates all structures – usually graphs – of a given class, typically avoiding the generation of redundant isomorphic copies). Our implementation of this algorithm is more than 3.5 times faster than previous generators and allowed us to generate all fullerenes up to 400 vertices. This enabled us to prove that the smallest counterexample to the spiral conjecture has 380 vertices.
We will also present *the House of Graphs* (https://houseofgraphs.org/), which can be a useful tool when studying graphs. The House of Graphs hosts complete lists of graphs of various graph classes, but its main feature is a searchable database of so called "interesting" graphs, which includes graphs that already occurred as extremal graphs or as counterexamples to conjectures. We will highlight the features of the website and demonstrate how users can perform queries on this database and how they can add new interesting graphs to it.

Keywords: generation algorithm, fullerene, graph database