

From London to Hanoi and back — graphs for neuropsychology

Andreas M. Hinz

Mathematics Department, University of Munich, Theresienstr. 39, 80333 Munich, Germany [andreas.hinz@mathematik.uni-muenchen.de]

2000 MATHEMATICS SUBJECT CLASSIFICATION. 05C

Since Hamilton's Icosian Game, graphs have been used to represent mathematical puzzles. One of the most famous ones, the Tower of Hanoi (TH), is very popular in psychological tests. However, until quite recently the mathematical theory of the underlying graph structure for this and related puzzles like the Tower of London has not been fully exploited. We present the results of a project which aimed at providing neuropsychologists with a computerized test tool which makes use of the mathematical analysis of the so-called *tower puzzles*. It is hoped that they can be utilized to measure cognitive skills for diagnostic purposes.

Topological, metrical and symmetry properties of *Oxford*, *London* and *Hanoi graphs*, the state graphs of the corresponding puzzles, will be displayed. Among these, Hanoi graphs H_p^n , where p stands for the number of pegs and n for the number of discs involved in the TH, have been studied intensely in recent years. For instance, hamiltonicity has been established, planarity settled [1] and issues of distance approached successfully [2]. However, a number of open problems concerning diameters and chromatic indices are left over, some of which can be investigated by computer experiments.

- [1] Hinz, A.M., Parisse, D., On the Planarity of Hanoi Graphs, *Exposition. Math.* **20** (2002), 263–268.
- [2] Hinz, A.M., Klavžar, S., Milutinović, U., Parisse, D., Petr, C., Metric properties of the Tower of Hanoi graphs and Stern's diatomic sequence, *European J. Combin.* **26** (2005), 693–708.