

House of Graphs

a database of interesting graphs

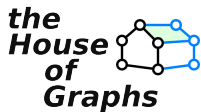
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- What this talk does **not** contain: new theoretical results.
- **But...** hopefully it can help you to obtain new results.



- 1 Introduction
- 2 Demo
- 3 Perspectives

The House of Graphs:

- Complete lists of and generators for some graph classes.
- Searchable database of *special* graphs...
 - *Interesting* and *relevant* in the study of graph theoretic problems.
 - Counterexamples to conjectures.



Why House of Graphs?

- Number of graphs grows very fast:

n		n		n	
2	1	8	11117	14	29003487462848061
3	2	9	261080	15	31397381142761241960
4	6	10	11716571	16	63969560113225176176277
5	21	11	1006700565	17	245871831682084026519528568
6	112	12	164059830476	18	1787331725248899088890200576580
7	853	13	5033590786921	19	24636021429399867655322650759681644

Table: Number of non-isomorphic connected graphs with n vertices.

- Even when restricted to regular graphs, cubic graphs, trees,...



Why House of Graphs?

- Number of graphs grows very fast.
- Lists of graphs are useful for tests and scientific discovery (conjectures, proofs,...).
- Some graphs (e.g. the Petersen graph) or graph classes (e.g. snarks) appear repeatedly in the literature...
- ...while others will probably always be just part of the huge mass.

If Orwell had been a mathematician he might have said...

"All graphs are interesting, but some graphs are more interesting than others."



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Main goal

- Offer a searchable database.
 - "Relatively" small size...
- But:
 - Still gives you a good chance to find counterexamples.
 - Obtain results that allow generalization.



What makes a graph interesting?

Important: we will not try to give an exact definition of which graphs are *interesting*!

- Depends on the problem one wants to study.
- Which graphs could be eligible?
 - Appearing in the [literature](#).
 - Contained in some lists (e.g. [websites](#)).
 - Pointed out by a [conjecture-making](#) system.
 - Being used by [you](#) or other researchers.
- House of Graphs allows users to add new graphs.



Graphs in the literature (papers or books)

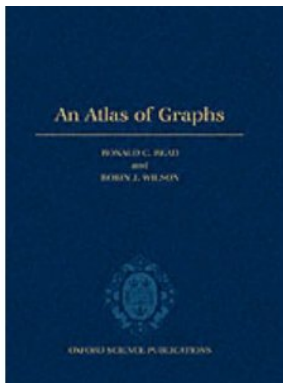
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Examples of books:



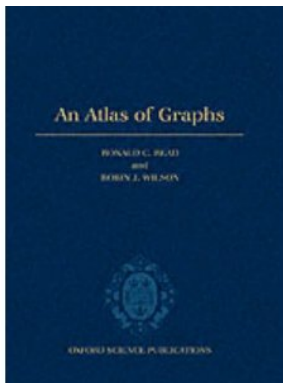
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⇒ **Problem:** unusable for coding tests.



Graphs on websites

Connected regular graphs

The following table contains numbers of connected regular graphs with given number of vertices and degree. For the empty fields the number is not yet known (to me). The latest numbers (for $n=19, k=6$; $n=16, k=7$) have been contributed by Jason Kimberley (University of Newcastle, Australia, 2009), who ran GENREG up to 250 cores.

Vertices	Degree 3	Degree 4	Degree 5	Degree 6	Degree 7
4	1	0	0	0	0
5	0	1	0	0	0
6	2	1	1	0	0
7	0	2	0	1	0
8	5	6	3	1	1
9	0	16	0	4	0
10	19	59	60	21	5
11	0	265	0	266	0
12	85	1544	7848	7849	1547
13	0	10778	0	367860	0
14	509	88168	3459383	21609300	21609301
15	0	805491	0	1470293675	0
16	4060	8037418	2585136675	113314233808	733351105934
17	0	86221634	0		0
18	41301	985870522			
19	0	11946487647			
20	510489				
22	7319447				
24	117940535				
26	2094480864				

Static lists:

- [Brendan McKay](#)
- [Markus Meringer](#)
- [Gordon Royle](#)
- [Ted Spence](#)



Databases:

- [AutoGraphiX](http://www.gerad.ca/~agx), www.gerad.ca/~agx : database of AGX conjectures + extremal graphs.
- [Jason Grout](#), the “small graph database” (graphs up to 8 vertices).
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⇒ All very specialized...



Initial list of special graphs

House of Graphs = meta-directory (lists & generators)
+ list of special graphs

- Meta-directory contains $> 10^8$ graphs.

Initial list of special graphs?

- Extremal graphs found by *GraPHedron* [H. Mélot].
- Named graphs in the literature.
- Snarks which occurred as counterexamples.
- Ramsey graphs.
- etc.

⇒ Currently contains > 3000 graphs.



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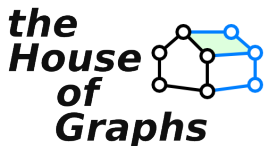
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Important functionality: users can upload their own interesting graphs.



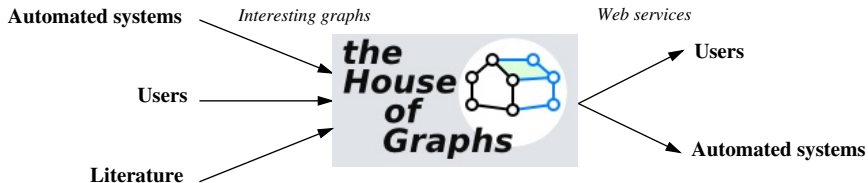
Demonstration



<http://hog.grinvin.org>



Perspectives



How can you help?



How can you help?

- By using it.
- By uploading special graphs.
- Mail us about problems, suggestions, ideas, etc.



Thanks for your attention!

<http://hog.grinvin.org>

