What to do with the missing Moore graph?

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The problem

Does there exist

1. a regular 57-valent graph of order 3250 and diameter 2?

2. a strongly regular graph with parameters $(3250, 57, 0, 1)$?

3. a regular 57-valent graph of order 3250 and girth 5?

4. a regular 57-valent graph of girth 5 and diameter 2?

(Hoffman & Singleton 1960)

Progress in 50+ **years?**

- Exoo & Jajcay: Dynamic Cage Survey.

  116 references, 3.5 of them about the problem.

- Miller & Širáň: Moore Graphs and Beyond: A survey of the Degree/Diameter Problem.

  356 references, 2.5 of them about the problem.

No papers – why is it bad?

- No grants.
- No promotions.
- No tenure.

No papers – why is it really bad?

- No propagation of ideas.
- Necessity to begin from scratch.
- No combination of ideas.

Alternatives

- Internet: blogs, web pages, forums.
- Students.
- Papers.

What to look for?

- more information,
- additions assumptions,
- relations to other object,
- estimates on necessary resources,
- . . .

More information

- Group actions
- Equitable partitions
- Other

Additional assumptions

	GA	EP	O
independent set of size 400		•	
number of Petersen subgraph			•
11 HoSi graphs sharing a pentagon	•		
(induced) 15 disjoint HoSi graphs	•	•	•

Related objects

- Rank 3 groups of degree 3250 and subdegree 57.
- Two distance sets in $\mathbb{R}^f$.
- Other cages.
- System of 400 packings of $PG(3,7)$.
- Geometric objects in characteristics $2, 3, 5, 11, 13, 19$?
- Something else?

Resources

- Search space.
- CPU years.
- Comparison to other problems (factorization, Ramsey numbers, Fermat primes, etc.).
- Quantum computing?

Thank You