

Re: Lattice visualization tool

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On Wed, 14 Nov 2007, Feng wrote:

Hi, is there any easy-to-use software tools to visualize a lattice (or a poset)? i.e., given a set of elements and order definition (in certain format), the software is able to display a graph presenting the relationship among the elements in an elegant way?

Yes, your mind's eye.
Computers can present only a few finite ordered sets.
Computers will do lousy presenting non-planar ordered sets.

Consider $(\mathbb{N}, |)$, positive integers ordered by $x | y$ when x divides y .

It is a lattice with $\sup x,y = \text{lcm } x,y$, $\inf x,y = \text{gcd } x,y$

Now draw diagram for \mathbb{N} up to 5 or 10. Use monospace font and let the up direction denote greater, ie divides into.
For each two numbers, I've diagramed some of the sup's or lcm's.

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8
/|
4 | 6
\|/
2 3 5
\|/
1

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Level 1 is 1.
Level 2 is primes
Level 3 is product of two primes
Level n is product of n - 1 primes

I've started a diagram for $(\mathbb{N}, |)$ with only three primes for level one.
Exercise.
Finish the diagram for $(\mathbb{N}, |)$ with only three primes at level one, upto level 10. Take a look at the entangled view of this non-planar

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diagram. Is such a diagram of any use?

Thus you'd left attempting to devise a method for visualizing $(N,|)$ that's simple and intuitively clear. In general, how to diagram non-planar graphs onto a plane in an intuitive visual manner.

I suggest you consult with printed circuit and microchip programmers to see what graphics they use to present or visualize their ever more a jumbled tangles of connections.

See if their software can handle $(N,|)$ for 10 or 100 primes at level one upto level 100 or 1000. Of course $(N,|)$ is finite. Another problem would be displaying dense lattices, for example $Q \times R$ with product order, $(q,x) \leq (r,y)$ when $q \leq r, x \leq y$

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