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WebMath: REPOST(please ignore) online math communication

- **To:** webmath@camel.math.ca
 - **Subject:** WebMath: REPOST(please ignore) online math communication
 - **From:** June Lester <jalester@cecm.sfu.ca>
 - **Date:** Thu, 30 Mar 2000 14:29:06 -0800
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Sorry for sending this again, folks, but it seems that my original post didn't make it into the archives, and I wanted to be able to refer people to it. It was dated Feb.29, so there may have been a "son of Y2K" software problem - not easily fixable and not worth trying for a "one off" thing anyway. There were no other posts that day, so everything else should have appeared. Thanks for your indulgence.

June

Originally posted Feb. 29, 2000.

First of all, a thank you to all of you who replied to my "mathematical exposition" post a while back - lots of interesting stuff there. I meant to get back to this sooner, but time is getting scarcer every day, it seems. For those interested, I'll append a list of the contributed URLs at the end of this email.

What I'm trying to get a handle on is how we use the new technologies to present/communicate mathematics effectively. I'm using "communication" here to mean "directed communication", in the sense of "I have an idea/concept/train of thought in my head and I want to induce the same or a reasonable facsimile of it in yours." As opposed to a resource, which says "Here's a collection of material that you can explore to look for information you need or just for fun." A print analogy would be a textbook

instead of an encyclopedia. (This is not a hard and fast distinction - directed communication can contain examples of resources and vice versa - and is not meant as a valuation of either.) More than instances of the *inclusion* of technology, I'm looking for examples of good *integration* of the technology with what is being communicated. The aim is to develop criteria for effective online mathematical exposition - maybe a sort of Strunk & White for mathematical hypermedia. (Is S&W known outside North America? - if not, it's a "how to use english to communicate effectively" classic, <<http://www.strunkandwhite.com/>>.) We all learned in school to write paragraphs with topic sentences, to outline essays, etc. in order to communicate more effectively - what new skills and rules do we need to communicate mathematics with the new media? Or are we still learning to spell with it?

To elaborate a bit on two facets of the question:

HYPERTEXT. How do we structure hypertext to communicate mathematics effectively? For an expository mathematical paper in the "theorem-proof" style, for example, one obvious option would be to have the main sequence of ideas and theorem statements on the first page, with linked proofs to the theorems on subsidiary pages and sublinks to proofs of lemmas, etc. Another would be an introductory section on the main page and the remaining sections as sequential links. Is either better than the other, and why? Are there other ways of organizing expository mathematics hypertextually? Or, for more educationally-oriented material, is there something more we can do with hypertext beyond the "click here to step through the details of the example" model?

The only analysis of how hypertext works that I've been able to find is the 1989 book "Mapping Hypertext" by Robert Horn. Interesting book (haven't read it all yet), but not mathematics specific or even education specific, so a bit too general for what I want. Anyone have more relevant references/links/resources?

MULTIMEDIA AND INTERACTIVITY. What makes a mathematical animation or use of interactivity relevant and effective rather than gratuitous or ineffective? I'm looking for criteria to determine things like "how well does that particular animation communicate the mathematical idea it was intended to communicate?" And then "how does it do that?" Or "I can drag the points of that geometric figure around like so. Does my doing so increase my understanding of the ideas the accompanying text is trying to communicate? and just how?" Or "how *should* this equation behave when I click on it to communicate something useful about the mathematics it represents?" In other words, just how does the animation or interactivity communicate/illustrate/illuminate the idea, and how well does it do it?

For educational mathematics, this is clearly related to instructional design. Do there exist ID references/links/resources which discuss these issues in any sort of concrete way (i.e. in specifics vs. abstractions)? Or other non-ed resources?

And since this email is already long enough, I'll stop there. :o) Any and all discussion, resources, links, whatever gratefully received. Meanwhile, here's the list of links contributed to my last post on this, plus a favourite of my own at the end.

Cut the Knot!

<<http://www.maa.org/editorial/knot/knot-index.html>>

Animating Web Pages with the TI-92: Gettysburg 1998

<<http://ourworld.compuserve.com/homepages/davidbowers/Getty98/main.htm>>

Eric Weisstein's World of Mathematics

<<http://mathworld.wolfram.com/>>

EULER Project Homepage

<<http://www.emis.ams.org/projects/EULER/>>

Exploring Emergence <<http://el.www.media.mit.edu/groups/el/projects/emergence/>>

Favorite Mathematical Constants

<<http://www.mathsoft.com/asolve/constant/constant.html>>

Fibonacci Numbers, the Golden section and the Golden String

<<http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fib.html>>

Graphics for complex analysis

<<http://www.math.psu.edu/dna/complex-j.html>>

M niinkuin matematiikka

<http://www.math.hut.fi/matta/Iso_M/Kansi.htm>

MAA Online - Columns

<<http://www.maa.org/news/columns.html>>

Math Goodies: Interactive Math Lessons With A Problem-Solving Approach!

<<http://www.mathgoodies.com/>>

Mathematical Atlas: A gateway to Mathematics

<<http://math-atlas.org/>>

Mathletics, Maths Department, Portsmouth and Brunel Universities

<<http://L62.csm.port.ac.uk/mathletics.html>>

MathSearch

<<http://www.maths.usyd.edu.au:8000/MathSearch.html>>

MathsNet

<<http://www.anglia.co.uk/education/mathsnnet/>>

MuPAD Home Page

<<http://www.mupad.de/>>

New Mathwright Library

<<http://www.mathwright.com/>>

Oundle

<<http://www.argonet.co.uk/oundlesch/>>

Catalog of Isohedral Tilings by Symmetric Polygonal Tiles

<<http://forum.swarthmore.edu/dynamic/one-corona/>>

Virtual Reality Polyhedra

<<http://www.georgehart.com/virtual-polyhedra/vp.html>>

W4T at UCD

<<http://www-math.cudenver.edu/w4t/>>

My favourite: the Maths Online Gallery

<<http://www.univie.ac.at/future.media/moe/galerie.html>>.

(Take a look at the Didactical Background presented with each applet.)

Cheers

June

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