What a Difference 21 Years Makes! – Adventures in Mathematics Publishing

BY KEN LEVASSEUR

A new open source test in discrete mathematics, Applied Discrete Structures, has emerged from the UML Department of Mathematical Sciences. In the early 1980s, when the numbers of computer science majors was growing exponentially, discrete mathematics courses started appearing in mathematics departments to serve this new population of students. Good textbooks were scarce and so Professor Alan Doerr and I launched a project to write a textbook on the subject. Applied Discrete Structures for Computer Science (SRA, 1984) was a modest success, with dozens of adoptions nationwide and a second edition at the end of the decade.

Twenty-one years after the publication of the 2nd edition of Applied Discrete Structures for Computer Science, in 1989 the publishing and computing landscape have both changed dramatically. We signed a contract for the second edition with Science Research Associates but by the time the book was ready to print, SRA had been sold to MacMillan. Soon after, the rights had been passed on to Pearson Education, Inc. In 2010, the long-term future of printed textbooks is uncertain. In the meantime, textbook prices (both printed and e-books) have increased and a growing open source textbook movement has started.

One of our objectives in revisiting this text is to make it available to our students in an affordable format. In its original form, the text was peer-reviewed and was adopted for use at several universities throughout the country. For this reason, we see Applied Discrete Structures as not only an inexpensive alternative, but a high-quality alternative. As indicated above the computing landscape is very different from the 1980s and accounts for the most significant

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The Tangents Problem

This problem was suggested by Professor Jim Propp, in memory of Martin Gardner, 1914-2010.

The Grasshopper Puzzle: A grasshopper starts on the number line at 3. When she’s at position \( k \) (with \( 0 < k < 10 \)), she steps either one position to the left or one position to the right. More specifically, if she’s never been to position \( k \) before, she steps randomly; but if she’s been to position \( k \) before, she does the opposite of what she did the last time she was at \( k \).

When the grasshopper reaches either position 0 or position 10, she hops back to position 3 in a single jump.

Show that, when the grasshopper hops (from position 0 or position 10) to position 3 for the 10th time, she has visited position 0 exactly 7 times and position 10 exactly 3 times.

Up to four correct solutions from among all that are submitted by September 1, 2011 will earn the solver a “UML Math” T-shirt. You may submit your solution to mathematics@uml.edu or mail it to Ken Levasseur, Department of Mathematical Sciences, North Campus/ Olney Hall, UMass Lowell, Lowell MA 01854.

The Spring 2010 Problem

Given a chess board with 1 in. sided squares, what is the radius of the largest circle that crosses only black squares?

A circle of maximum radius is centered in the center of a black square with radius equal to one half the square root of 10 inches. Correct solutions were submitted by Maureen Hamilton, Mark Atwood, and Trevor Cappallo.

Here is Maureen’s take on the problem:

1) The center of the circle must be the center of one of the chess squares since otherwise a radius in one direction would hit one color and a radius in the other direction would hit the other color.
2) One of the radii must go from the center of this square to a point where two black squares meet such that one black square is on the right and the other black square is above.
3) There are now only two possibilities for the circle whose circumference goes through only black squares. The first is the smaller circle centered in the center of a white square where four of its radii hit the corners of this square. The second is the circle centered in the center of a black square with a radius one half the square root of 10.
Recent Faculty Publications

The following is a partial list of faculty publications from the past three years. For an expanded and list, visit the department web page, http://faculty.uml.edu/math.

- Vladimir Bolotnikov, Alexander Kheifets, Caratheodory-Julia type conditions and symmetries of boundary asymptotics for analytic functions on the unit disk, Mathematische Nachrichten, 282, 11 (2009), 1513-1536.

UML Mathematical Sciences Online

Have you visited Mathematical Sciences web page lately? Our new address is http://faculty.uml.edu/math

Have you lost your past issues of Tangents? Go to the alumni section of the UML Math web page for links to back issues.

You can follow us on Twitter: http://twitter.com/UMassLowellMath

No, you can't friend us on Facebook, we have to draw the line someplace.

Steve Pennell, Chair

Writers: Ken Levasseur, Ann Marie Hurley, Dan Klain, Ravi Montenegro, Guntram Mueller (emeritus), Alex Olsen, Raj Prasad, Jim Propp, Marvin Stick

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changes in the text. One of the most common programming languages of the 1980s was Pascal, and we used it to illustrate many of the concepts in the text. Although it isn't totally dead, Pascal is far from the mainstream of computing in the 21st century. In 1989, Mathematica had been out for less than a year and it is now a major force in scientific computing. The open source software movement also started in the 1980s and in 2005, the first version of Sage, an open-source alternative to Mathematica was released. In Applied Discrete Structures we have replaced "Pascal Notes" with "Mathematica Notes" and "Sage Notes." Finally, 1989 was the year that World Wide Web was invented by Tim Berners-Lee. There wasn't a single www in the 2nd edition. In this version, we intend to make extensive use of web resources, including video demonstrations.

Current Status
The text is now completely converted to both Mathematica and pdf files and information on downloading them is at http://faculty.uml.edu/klevasseur/ads2. Starting in the Fall 2010 semester, sections of Discrete Structures have been using it. In the first semester alone, the 84 students registered for Discrete Structures I realized a total savings of $12,000 though the use of Applied Discrete Structures as an alternative to the previous text, which cost approximately $150.

Faculty Update

Jim Propp was awarded a 3-year NSF grant to do research on deterministic analogues of random processes the proposal is on the web at http://jamespropp.org/darp.pdf

Jim Propp recently wrote an invited chapter in a textbook on probability theory titled "Markov Chains and Mixing Times." The chapter, coauthored with David Wilson, is titled "Coupling from the Past" and is an exposition of theory that Propp and Wilson developed in the 1990s.

For a list of recent Mathematical Sciences faculty publications, see http://faculty.uml.edu/math/pubs/pubs.html

What Are You Up To?

Want to keep your classmates up to date on what you're doing and where you are? Take a few moments to tell us where you are, and whatever else you might like to share.

We can be contacted by mail at Department of Mathematical Sciences, North Campus, UMass Lowell, Lowell MA 01854. Telephone: (978) 934-2410. Email: mathematics@uml.edu

You might also wish to contact our Office of Alumni Relations, Southwick Hall 250, UML North, Lowell MA 01854-3629. Toll free telephone: (877) UML-ALUM. Email: Alumni_Office@uml.edu

Thanks For the Contributions!

Our thanks to all who have contributed to the Department of Mathematical Sciences over the past few years. Your generosity has allowed us to make purchases, award scholarships, and engage in activities that would otherwise have been impossible.

Many of you have responded generously to UML phonathon and other fundraising contacts. These requests can benefit the Department of Mathematical Sciences directly if you specify that you wish to have your gift directed to Mathematics. Otherwise it will provide valuable assistance to the University at the College level.