

GRAPH GENERATORS

MILAN RANDIC

Drake University

The concept of graph generators is introduced as a collection of permutation matrices with successive multiplication to generate a graph. The derived graphs are transitive; specifically, all vertices are equivalent. The choice of generators (just as is the case in group theory) is not unique, but they allow condensation of the information of transitive graphs. For example, trivalent graphs on 24 vertices (and fewer) are characterized by proper selection of three 4×4 permutation matrices; tetravalent graphs on 24 vertices (and fewer) are characterized by proper selection of four 4×4 permutation matrices, etc.

QUOTIENT STRUCTURES IN BINARY SYSTEMS
WITH NO IDENTITY ELEMENT

Don Pilgrim

Luther College

The notion of a subgroup H of a group G is important because it affords a way to partition G into a quotient structure by means of the equivalence relation $a \equiv b \pmod{H} \Leftrightarrow ba^{-1} \in H$. To prove that \equiv is an equivalence relation on G we have to make heavy use of the identity element in G . This raises the question as to whether or not we can use substructures to partition binary systems that don't have an identity element. This paper shows how we can use analogy with the group case to discover that the answer is affirmative in inverse semigroups.

EXTENDING MINTY'S ALGORITHM FOR NETWORK MINIMIZATION PROBLEMS

Robert Arnold

Iowa State University

Minty's Algorithm is a well-known method for solving shortest-route problems in networks. A small modification allows one to use Minty to solve a wide variety of problems, including traveling-salesman and some stochastic route ones.

BAYES, BUEHLER AND BUEHLER-BAYES CONFIDENCE BOUNDS

Margarita Guerrero

Iowa State University

We review the ideas behind Bayes and Buehler one-sided confidence intervals and suggest a hybrid Buehler-Bayes version. Optimal Buehler-Bayes intervals typically are shorter than Buehler intervals, and longer than Bayes intervals.

GOVERNORS REPORT
Iowa Section of the MAA
April 13, 1984
Donald V. Meyer

1. I'd appreciate the opportunity to serve as your Iowa Section Governor. I'd like to share the following concerns of the Board with you.
2. Summer Meetings. Should the MAA summer meetings continue in their current format? The Council of the AMS voted in favor of cancelling the summer meetings of the Society in the future. Effective dates are not clear at this time.
3. Note that the Two Year College Mathematics Journal has become the College Mathematics Journal.
4. Certificates of Meritorious Service. Keep in mind that in the 1985 calendar year we will select someone from the Iowa Section of the MAA to receive a Certificate of Meritorious Service to be given at the 1986 annual meeting. We would appreciate any suggestions on procedure and/or nominations.
5. TEAM. The MAA has received a three-year grant from the Fund for the Improvement of Post-Secondary Education to support a project entitled Teaching Experimental Applied Mathematics (TEAM). We can be a part of this joint effort.
6. Book Sales. The MAA continues to promote the sale of books. Most recently they advertised the two Dolciani volumes Great Moments in Mathematics and the books in the new Mathematical Library by mailing a brochure to 24,000 readers of the Mathematics Teacher. College bookstores are invited to become "Authorized MAA Book Agencies," a plan devised to put more MAA books on bookstore shelves.

UNIFIED FIELD BASED MATHEMATICS AT MAHARISHI
INTERNATIONAL UNIVERSITY

Catherine Corini Wadsworth

Maharishi International University

Mathematics is taught at MIU using the Maharishi unified field base integrated system of education. Every lesson in mathematics is taught with reference to the knowledge of the whole discipline and the source of all branches of mathematics is shown to be the field of pure intelligence, which the student experiences as the simplest state of his own awareness, transcendental consciousness.

COMPUTER GRAPHICS AT UNI

Walter E. Beck

University of Northern Iowa

A course in computer graphics is being offered during the current semester at UNI. This paper will discuss hardware and software being used to support the course, the objectives of the course, programming assignments being used and the instructor's assessment of the course to this point.

ON HERMITE QUINTIC INTERPOLATION

Frank A. Odoom

Iowa State University

The author derives and appropriately scales an equally spaced barycentric hermite quintic interpolation polynomial to achieve a stable accurate solution of the interpolation problem. Example of an application to ordinary differential equation is given.

COUNTING SELF-AVOIDING WALKS ON A REGULAR
3-DIMENSIONAL NETWORK

Jennifer L. Meyer

Drake University

While the count of random walks is a straightforward computational problem (numbers are given by various powers of the adjacency matrix) enumerations of self-avoiding walks introduces serious difficulties. We will outline the count of self-avoiding walks on a regular honeycomb 3-dimensional grid (a network realized in diamond crystal structure). Our approach involves counting the paths of length n (which can intersect itself), counting the cycles of size n (using logical exclusive/or), and combining the two in deriving self-avoiding paths of length n .

CONSTRUCTION OF COMPLEX TRANSITIVE GRAPHS

Grant Izmirlan

Drake University

Transitive graphs are characterized by having all vertices equivalent. Such graphs can be constructed, as outlined by Randic and Woodworth, by multiplication of symmetric permutation matrices. Here we consider 5×5 matrices as the source for graph generators. We will illustrate derivation of various transitive graphs having from 10 to 120 vertices. In view of the complexity of construction, we use computer multiplication of matrices and a computer search for resultant graphs.

INTERPRETATION OF DISCARDED ROOTS
OF ALGEBRAIC EQUATIONS

Bernadette Baker

Drake University

Some roots of algebraic equations are discarded as having no meaning in the problem as posed. For example, a negative root in a distance problem is discarded because distance is positive. On selected illustrations, we will show that with some modification of the formulation of the problem, discarded roots can be interpreted meaningfully. Hence mathematical formalism is "far sighted" and anticipates alternative solutions to many such problems that a narrow viewing would overlook. The search for alternative interpretations of discarded roots can be very challenging -- some are simpler than others, some remain to be resolved. We propose that solutions of algebraic problems always have interpretation -- it is our lack of imagination that makes some such cases as yet unsolved.

MATHEMATICAL MODELS FOR THE DENDRITIC
TREE OF A NERVE CELL

Jack Heidel

Iowa State University

Two different mathematical models are discussed. The first one is the "topological" approach of Martin Berry and Milan Randic, treating the dendritic tree as a directed graph and studying the branching patterns. The second model is "metrical" in character and attempts to characterize the length of the individual branches and the length of the tree as a whole. The approach here is to adopt Sol Rubinov's differential equation theory, developed for growth of a cell culture, to the growth of a dendritic tree.