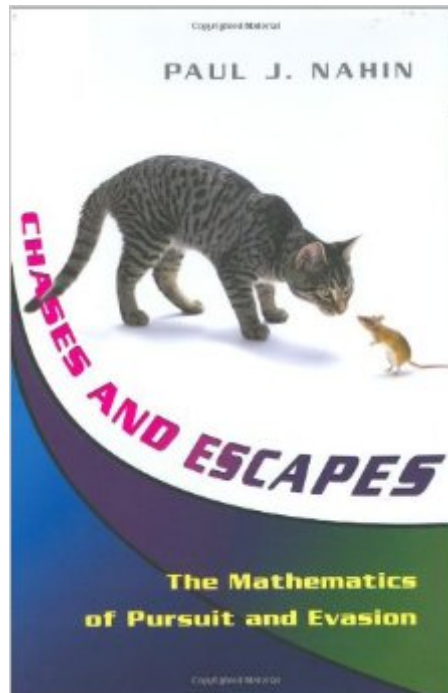


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Chases And Escapes: The Mathematics Of Pursuit And Evasion



Synopsis

We all played tag when we were kids. The rules couldn't be easier--one player is designated "it" and must try to tag out one of the others. What most of us don't realize is that this simple chase game is in fact an application of pursuit theory, and that the same principles of games like tag, dodgeball, and hide-and-seek are at play in military strategy, high-seas chases by the Coast Guard, even romantic pursuits. In *Chases and Escapes*, Paul Nahin gives us the first complete history of this fascinating area of mathematics. Writing in an accessible style that has been enjoyed by popular-math enthusiasts everywhere, Nahin traces the development of modern pursuit theory from its classical analytical beginnings to the present day. Along the way, he informs his mathematical discussions with fun facts and captivating stories. Nahin invites readers to explore the different approaches to solving various chase-and-escape problems. He draws upon game theory, geometry, linear algebra, target-tracking algorithms--and much more. Nahin offers an array of challenging puzzles for beginners on up, providing historical background for each problem and explaining how each one can be applied more broadly. *Chases and Escapes* includes solutions to all problems and provides computer programs that readers can use for their own cutting-edge analysis. This informative and entertaining book is the first comprehensive treatment of the subject, one that is sure to appeal to anyone interested in the mathematics that underlie the all-too-human endeavor of pursuit and evasion.

Book Information

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Suppose you are given a problem which says: "Three dogs are placed at the vertices of an

equilateral triangle; they run one after the other. What is the curve described by each of them?" How would you solve the problem? If this makes you scratch your head a little, don't worry. This problem actually appeared on the Cambridge University Mathematical Tripos Examination in 1871 and is one of the so-called "n-bug" problem. Obviously when n goes to infinity, the curve of each bug becomes a circle. On p. 110, Professor Nahin started to analyze this problem by writing down the radial and transverse components of the velocity, and step-by-step, he showed us how to solve this seemingly complicated problem, yet only elementary calculus (and perhaps some college physics) is needed. The approach is elegant. This book, which has a subtitle of *The Mathematics of Pursuit and Evasion*, obviously has a lot of mathematics and many equations, and it is not for general readers who are afraid of math. However, the book provides many elegant pursuit problems with military applications. For those who enjoy the real applications of calculus and perhaps like to do some calculations on the back of an envelope, this is a superb book.

Pursuit theory has been a favorite mathematical recreation of mine since the early 1990's. In this book, the author explores many continuous and discrete pursuit/evasion situations with clarity and succinctness. I encourage anyone with a background in differential equations to work through the problems in this book. They are rewarding and may very well inspire new discoveries on the subject. For the lay person, the problems are intriguing in their own right (e.g., "Pursuit of Invisible Targets") but the solutions are derived and expressed mathematically. At the very least, this book presents a truly fascinating application of mathematics to anyone who picks it up.

This is an excellent review of the math of pursuit and escape paths. I have not read the book completely, but I concentrated my reading on a couple of problems I was mostly interested in: The Lady in the Lake problem, and the Lion-and-Man problem. These two problems are strictly connected, and have more immediate geometric explanations than the equations of the problems presented in the book. However, these alternative explanations are missing in the book; too bad because they add a lot to the understanding and intuition of the problems. In one case actually, (Lion-and-Man problem), I believe the outcome of the problem is different from the one provided. This doesn't detract from this enjoyable book, which is well written, with very approachable, step-by-step math passages.

Whenever you see a Paul Nahin's book, you may expect something nice, well-written about a theme in mathematics. With an undeniable ability to transform technical subjects into tasty and

readable texts (for the layman), this particular book is a treat for those interested in graph theory.
Can't miss it!

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