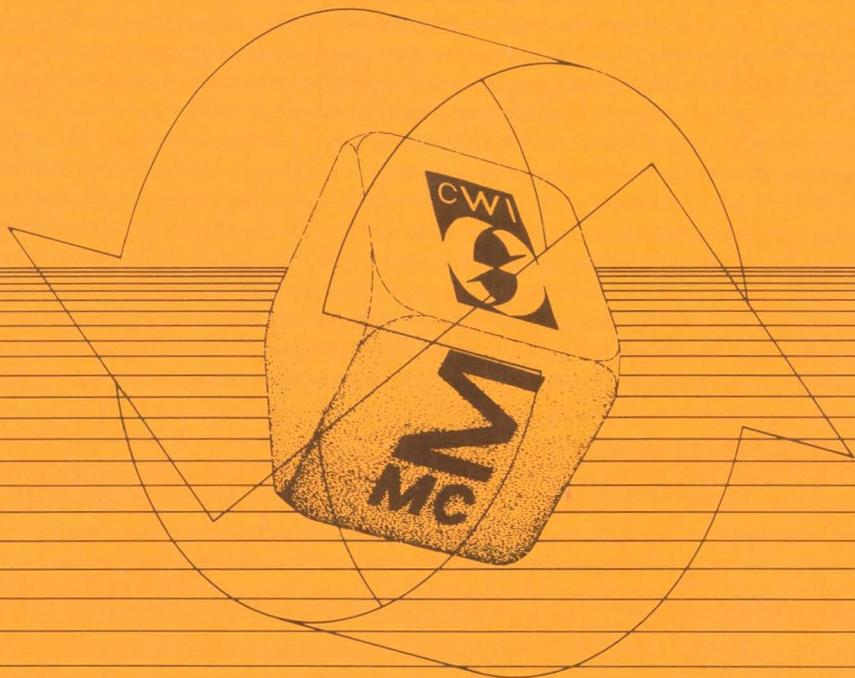




ARCHIEF

Symposium
'Wiskunde en Informatica'



Centrum voor Wiskunde en Informatica
25 november 1983

SYMPOSIUM "WISKUNDE EN INFORMATICA"

Dit symposium wordt gehouden ter gelegenheid van de naamsverandering van het *Instituut Mathematisch Centrum in Centrum voor Wiskunde en Informatica*. In vijf voordrachten zal de vruchtbare wisselwerking tussen wiskunde en informatica op een aantal terreinen worden geïllustreerd.

Programma

- 09.45-10.00 P.C. Baayen (wetenschappelijk directeur CWI)
Opening
- 10.00-10.45 A.J. Baddeley (Bath, Engeland)
Stochastic geometry and image analysis
- 11.15-12.00 D.S. Scott (Pittsburgh, USA)
Infinite words
- 12.30-13.30 Lunch
- 13.30-14.15 C.B. Jones (Manchester, Engeland)
Systematic program development
- 14.15-15.00 J.T. Schwartz (New York, USA)
Dextrous multifinger manipulation
- 15.30-16.15 L. Lovász (Budapest, Hongarije)
Combinatorial algorithms

Tijd & plaats

Vrijdag 25 november 1983, zaal Z011, Centrum voor Wiskunde en Informatica, Kruislaan 413, 1098 SJ Amsterdam.

Aanmelding

Het symposium is vrij toegankelijk. Voor de lunch kan men zich opgeven door de bijgevoegde kaart in te vullen en vóór 20 november op te sturen. De kosten van de lunch bedragen *f* 7,00 en dienen ter plaatse te worden voldaan.

Proceedings

De tekst van de voordrachten zal, aangevuld met overzichtsartikelen door Nederlandse wiskundigen en informatici, in 1984 worden gepubliceerd als eerste deel in de serie *CWI Monographs*.

Organisatie

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ABSTRACTS

Stochastic geometry and image analysis

A.J. Baddeley

We outline a statistical approach to the analysis of images, point patterns and other geometrical data. Stochastic geometry is an old branch of probability theory in which the usual random variables are replaced by random geometrical objects or random sets; it began with simple geometrical games such as Buffon's needle. Elementary models of random sets (randomly-positioned circles, triangles, lines, points etc.) continue in an important role as the basis of random sampling methods, and in hypothetical models for astronomy and cell biology. The elementary theory is able to make usable predictions for such models and for quasi-geometrical problems like "random search". An important application is to *stereology*, concerned with drawing inferences about a three-dimensional solid (rock, bone, living tissue) on the basis of a few two-dimensional sections, projections or other image data.

Quite general random sets are conceivable: in the current theory a random set or image is characterised using only true/false information of the form " X intersects T ", where X is the image and T ranges over a predetermined class of sets called *traps*. This leads to a particular philosophy of image analysis generally associated with the French school of *mathematical morphology*. Another consequence is a set of statistical methods which rely strongly on elementary counting procedures. Spatial statistics deals with the interpretation of patterns of points (which might represent trees or cell nuclei mapped by some experiment) and this has been heavily influenced by the more abstract parts of stochastic geometry. At this stage, the elementary models resurface as a statistical reference point against which the real image data are analysed.

The stochastic geometry approach is able to cope with unexpectedly bizarre geometrical behaviour such as fractal (fractional dimensional) irregularity, indistinctness and non-rectifiability of curves.

Infinite words

D.S. Scott

A discussion of how to compactify the free monoid.

Systematic program development

C.B. Jones

Computer systems (hardware and software) are often both large and complex; their intended use frequently makes errors unacceptably expensive. Theoretical results which treat program correctness as a mathematical problem are now beginning to be used in practical applications. One collection of ideas being used in this way is known as the "Vienna Development Method" (VDM). An overview of the specification and design verification ideas of VDM will be given followed by a review of areas where further research is required.

Dextrous multifinger manipulation

J.T. Schwartz

The problem of using a multi-fingered robot hand to grasp and turn an object of partly unknown shape raises challenging subproblems of multidimensional control and of real-time software design. This talk will outline recent Courant Institute work on the underlying theory of this *manipulation problem*, and will also describe the pragmatic approach to it that we will be following. Recent related theoretical work on motion planning problems, some involving a few bodies moving amidst obstacles, some involving many such bodies, will be reviewed.

Combinatorial algorithms

L. Lovász

It appears that the field of algorithmic combinatorics has experienced an exceptionally productive interplay of different fields of mathematics and computer science over the last decade: complexity theory has provided a general framework; from classical combinatorics, deep techniques and results have been analyzed and extended to an algorithmic setting; operations research supplied important practical problems. The talk surveys some of these developments and some of the most active directions in current research.