

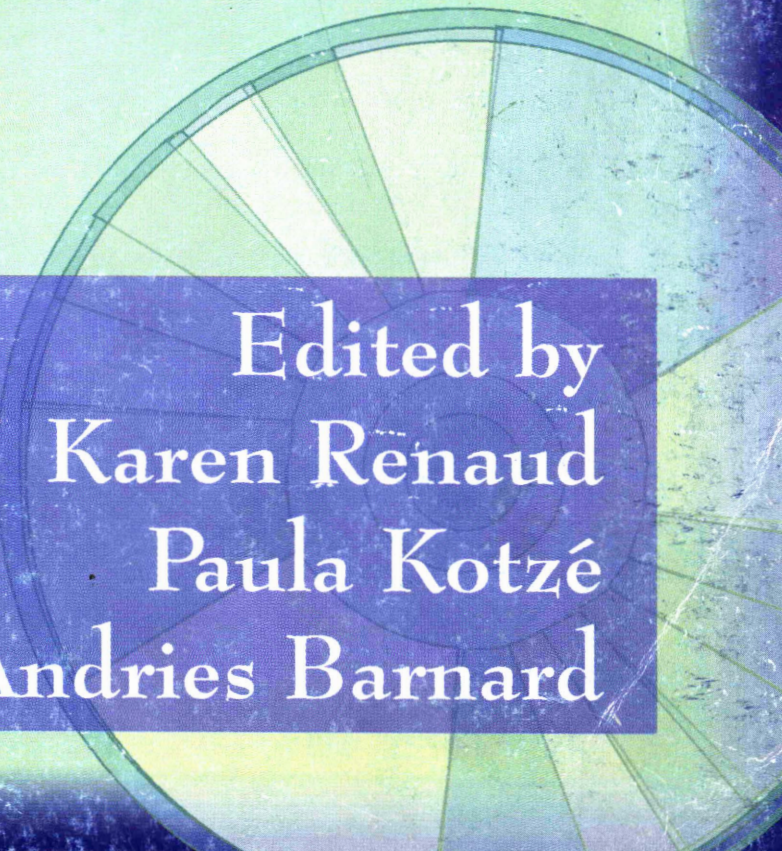
# HARDWARE, SOFTWARE AND PEOPLEWARE



UNISA



## SAICSIT 2001

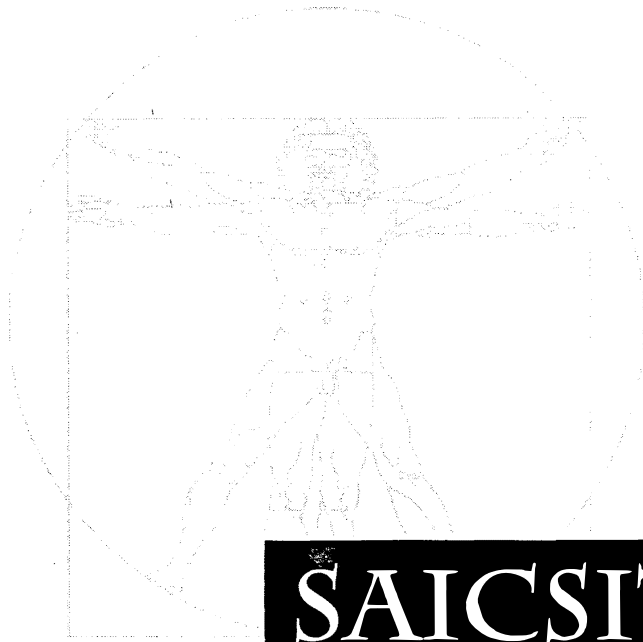


Edited by  
Karen Renaud  
Paula Kotzé  
Andries Barnard



# HARDWARE, SOFTWARE AND PEOPLEWARE

**South African Institute of Computer  
Scientists and Information Technologists**  
**Annual Conference**  
*25 – 28 September 2001*  
*Pretoria, South Africa*



**SAICSIT 2001**



*Edited by Karen Renaud, Paula Kotzé & Andries Barnard*  
*University of South Africa, Pretoria*

# Proceedings of the Annual Conference of the South African Institute of Computer Scientists and Information Technologists

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# Message from the SAICSIT President

The South African Institute of Computer Scientists and Information Technologists (SAICSIT) was formed in 1982 and focuses on research and development in all fields of computing and information technology in South Africa. Now in the 20th year of its existence, SAICSIT has come of age, and through its flagship series of annual conferences provides a showcase of not only the best research from the Southern-African region, but also of international research, attracting contributions from far afield. SAICSIT does, however, not exist or operate in isolation.

More than 50 years have passed since the first electronic computer appeared in our society. In the intervening years technological development has been exponential. Over the last 20 years there has been a vast growth and pervasiveness of computing and information technology throughout the world. This has led into the expansion and consolidation of research into a diversity of new technologies and applications in diverse cultural environments. During this period huge strides have also been made in the development of computing devices. The processing speed of computers has increased thousand-fold and memory capacity from megabytes to gigabytes in the last decade alone. The Southern African region did not miss out on these developments.

It is hardly possible for such quantitative expansion not to bring a change in quality. Initially computers had been developed mainly for purposes such as automation for the improvement of processing, labour-reduction in production and automation control of machinery, with artificial intelligence, which made great strides in the 1980s, seen as the ultimate field to which computers could be applied. As we moved into the 1990s it was recognized that such an automation route was not the only direction in the improvement of computers. The expansion of processing power has enabled image data to be incorporated into computer systems, mainly for the purpose of improving human utilisation. For most computer technologies of the 1990s, including the Internet and virtual reality, automation was not the ultimate purpose. Humans were increasingly actively involved in the information-processing loop. This involvement has gradually increased as we move into the 21<sup>st</sup> century. Development of computer technology based not on automation, but on interaction, is now fully established.

The method of interaction has significantly changed as well. The expansion of computer ability means that the same function can be performed far more cheaply and on smaller computers than ever before. The advent of portable and mobile computers and pervasive computing devices is ample evidence of this. The need for users to be at the same location as a computer in order to reap the benefits of software installed on that computer is becoming an obsolete notion. Time and space are no longer constraints. One of the most discussed impacts of computing and information technology is *communication* and the easy accessibility of information. This changes the emphasis for research and development – issues such as cultural, political, and economic differences must, for example, be accommodated in ways that researchers have not previously considered. Our goal should be to enable users to benefit from technological advances, hence matching the skills, needs, and expectations of users of available technologies to their immense possibilities.



The conference theme for the SAICSIT 2001 Conference – *Hardware, Software and Peopleware: The Reality in the Real Millennium* – aims to reflect technological developments in all aspects related to computerised systems or computing devices, and especially reflect the fact that each influences the others.

Not only has SAICSIT come of age in the 21<sup>st</sup> century, but so has the research and development community in Southern Africa. The outstanding quality of papers submitted to SAICSIT 2001, of which only a small selection is published in this collection, illustrates both the exciting and developing nature of the field in our region. I hope that you will enjoy SAICSIT 2001 and that it will provide opportunities to cultivate and grow the seeds of discussion on innovative and new developments in computing and information technology.

Paula Kotzé  
SAICSIT President

# Message from the Chairs

Running this conference has been rewarding, exciting and exhausting. The response to the call for papers we sent out in March was overwhelming. We received 64 paper submissions for our main conference and twelve for the postgraduate symposium. We had a panel of internationally recognized reviewers, both local and international. The response from the reviewers was impressive – accepting a variety of papers and *mostly* returning the reviews long before the due date. We were struck, once again, by the sheer magnanimity of academia – as busy as we all are, we still manage to contribute fully to a conference such as SAICSIT.

After an exhaustive review process, where each paper was reviewed by at least three reviewers, the program committee accepted 26 full research papers and 14 electronic papers. Five papers were referred to the postgraduate symposium, since they represented work in progress – not yet ready for presentation to a full conference but which nevertheless represented sound and relevant research. The papers published in this volume therefore represent research of an internationally high standard and we are proud to publish it. Full electronic papers will be available on the conference web site (<http://www.cs.unisa.ac.za/saicsit2001/>).

Computer Science and Information Systems academics in South Africa labour under difficult circumstances. *The popularity of IT courses stems from the fact that IT qualifications are in high demand in industry, which leads in turn to a shortage of IT academic staff to teach the courses, even when posts are available. The net result is that fewer people teach more courses to more students. IT departments thus rake in ever-increasing amounts of state subsidy for their universities. These profits, euphemistically labelled “contribution to overhead costs”, are deployed in various ways: cross-subsidization of non-profitable departments; maintenance of general facilities; salaries for administrative personnel, etc. Sweeteners of generous physical resources for the IT departments may be provided. We have yet to hear of a University in South Africa where significant concessions have been made in terms of industry-related remuneration. At best, small subventions are provided. As a result, shortages of quality staff remain acute in most IT departments – especially at senior teaching levels. What is even worse is that academics in these departments have to motivate the value of their conference contributions and other IT outputs to selection committees, often dominated by sceptical academic power-brokers from the more traditional departments whose continued survival is underwritten by IT’s contribution to overhead costs.*<sup>1</sup>

The papers published in this volume are conclusive evidence of the indefatigability and pertinacity of Computer Science and Information Systems academics and technologists in South Africa. We are proud to be part of such a prestigious and innovative group of people.

In conclusion, we would like to thank the conference chair, Prof Paula Kotzé, for her support. We also specially thank Prof Derrick Kourie for his substantial contribution. Finally, to all of you, contributors, presenters, reviewers and organisers – a big thank you – without you this conference could not be successful.

Enjoy the Conference!  
Karen Renaud & Andries Barnard

---

<sup>1</sup> This taken almost verbatim from Professor Derrick Kourie’s SACLA 2001 paper titled: “*The Benefits of Bad Teaching*”.

# Conference Organisation

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Theda Thomas – Port Elizabeth Technikon  
Herna Viktor – University of Pretoria, South Africa  
Bruce Watson – Universities of Pretoria and Eindhoven  
Janet Wesson – University of Port Elizabeth

# Referees

Molla Alemayehu	Klarissa Engelbrecht	Pekka Pihlajasaari
Trish Alexander	David Forsyth	Nelisha Pillay
Adi Attar	John Galletly	Laurette Pretorius
Bob Baber	Vashti Galpin	Karen Renaud
Andries Barnard	Wayne Goddard	Ingrid Rewitzky
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Arina Britz	Tersia Hörne	Justin Schoeman
Andy Bytheway	Chris Johnson	Martie Schoeman
André Calitz	Bob Jolliffe	Elsje Scott
Charmain Cilliers	Paula Kotzé	Derek Smith
Elsabe Cloete	Derrick Kourie	Elmé Smith
Gordon Cooper	Les Labuschagne	Adrie Stander
Richard Cooper	Paul Licker	Harold Thimbleby
Annemieke Craig	Philip Machanick	Theda Thomas
Thad Crews	Anthony Maeder	Judy Van Biljon
Quintin Cutts	David Manlove	Alta Van der Merwe
Michael Dales	Gary Marsden	André van der Poll
Carina de Villiers	Thomas Meyer	Tobias Van Dyk
Alan Dix	Elsa Naudé	Lynette van Zijl
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Elize Ehlers	Don Petkov	Herna Viktor
Jan Eloff		Bruce Watson
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## Conference

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## **Keynote Abstracts**



## Finding Adjacencies in Non-Overlapping Polygons

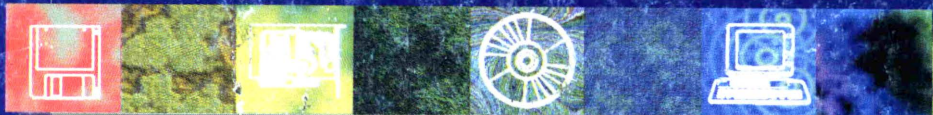
J Adler      GD Christelis      JA Deneys      GD Konidaris      G Lewis      AG Lipson  
RL Phillips      DK Scott-Dawkins      DA Shell      BV Strydom      WM Trakman  
LD Van Gool

### Abstract

Two polygons are adjacent if they have edges which share a common edge segment. In this paper we consider the problem of finding adjacencies in a set of  $n$  non-overlapping polygons. Using the fact that adjacent edges must lie on the same line, an algorithm with time complexity  $\Theta(z \log z)$  (where  $z$  is the total number of edges) is derived. Thereafter, we consider the particular case where the polygons are convex, as this has practical applications. Using the properties of convex polygons, we derive a more efficient algorithm with time complexity  $\Theta(z \log n)$ . Both algorithms are proved to be correct and their optimality is discussed.







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