OSA

OPTIMIZATION SYSTEMS ASSOCIATES INC. CASE STUDY

J.W. Bandler

OSA-95-OS-25-V

October 16, 1995

Optimization Systems Associates Inc.

Dundas, Ontario, Canada

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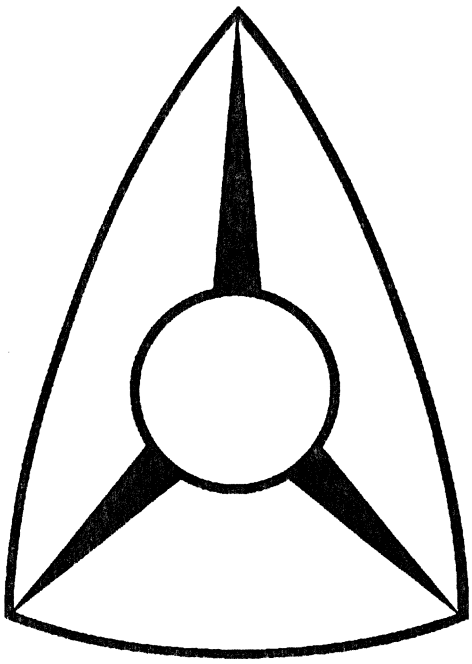


presented at

Micronet Workshop on Commercialization of Microelectronics University Research
Toronto, October 16, 1995

Optimization Systems Associates Inc.

PIONEERS IN

yield and tolerance optimization

circuit performance optimization

parametric design centering

statistical device modeling

robust parameter extraction

harmonic balance simulation

physics based design

EM based design

large-scale optimization

benchmark CAD technology

software architecture for IC design

Areas of Expertise

RF/microwave circuit simulation, design and optimization

harmonic balance simulation techniques

robust and statistical modeling of active and passive devices

automated processing of DC, RF and spectrum data

device modeling, statistical estimation of production yield

powerful performance and yield optimization algorithms

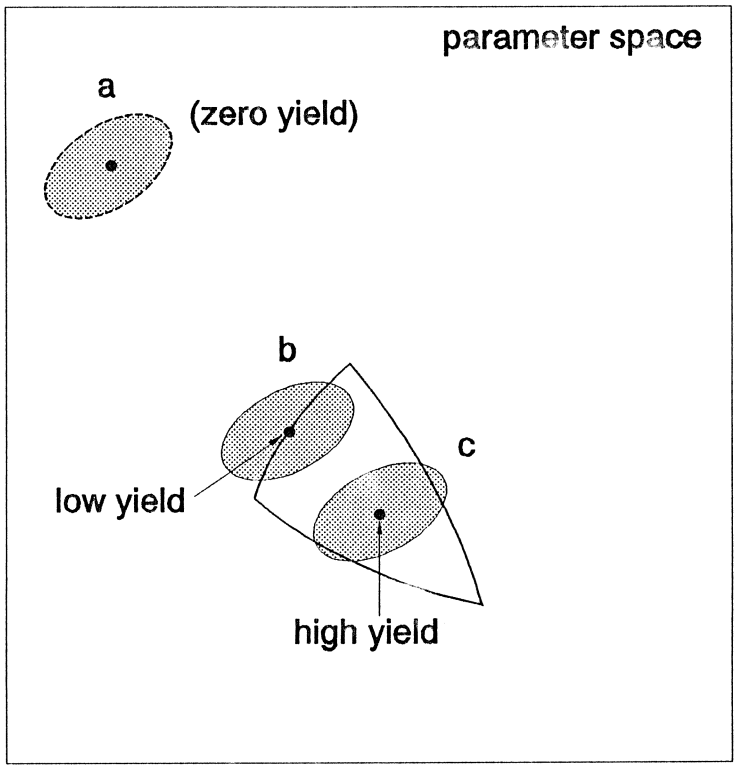
manufacturing tolerance assignment and cost minimization

customized optimizers for large-scale problems

computer optimization of linear and nonlinear networks

algorithms for automated production alignment and tuning

software architectures for integrated approach to design



Yield interpretation in the parameter space

1994-95 Technical Milestones

EM design of HTS microwave filters (1994)

CDF approach to statistical modeling (1994)

Space Mapping™ - a fundamental new theory for design with CPU intensive simulators (1994)

"CAD review: the 7 GHz doubler circuit" by MEE (1994)

optimization of structures with arbitrary geometry (1994)

breakthrough Geometry Capture™ (1995)

aggressive Space Mapping™ for EM design (1995)

cost-driven physics-based large-signal simultaneous device and circuit design (1995)

integrated harmonic balance and EM optimization (1995)

novel heterogeneous parallel yield-driven EM CAD (1995)

mixed-domain multi-simulator statistical parameter extraction and yield-driven design (1995)

1994-95 Technical Milestones (cont'd)

full-day MTT-S workshop on Automated Circuit Design Using Electromagnetic Simulators (Arndt, Bandler, Chen, Hoefer, Jain, Jansen, Pavio, Pucel, Sorrentino, Swanson, 1995)

explosion of development and use of optimization-based technology for automated circuit design with EM simulators (1994, 1995)

Network Datapipe™ connection of OSA90/hope™ with Hoefer's TLM electromagnetic field simulators on massively parallel computers (1995)

Datapipe™ connections of OSA90/hope™ with Sorrentino's mode-matching electromagnetic field simulators with adjoint sensitivities (1995)

Datapipe™ connection of OSA90/hope™ with Arndt's waveguide component library (1995)

Empipe™ Version 3.1

powerful and friendly software system for automated EM design optimization

driving Sonnet's *em*™ field simulator

employing the sophisticated optimizers of OSA90™

breakthrough Geometry Capture™ allows you to designate geometrical and material parameters as variables for optimization

any arbitrary structures that can be simulated by *em*™ can be optimized using Empipe™

automatic off-grid interpolation integrated with intelligent database management

intuitive and extremely user-friendly

a significant step towards the required integrated approach for interprocessing circuit/field/measurement data

OSA90/hope™ Version 3.1

general nonlinear circuit simulation and optimization

analytically unified DC, small-signal and large-signal harmonic balance analysis

statistical analysis and yield optimization

comprehensive optimization/nonlinear modeling

interconnects external simulators

Empipe™ merges *em*™, even for arbitrary geometry!

Spicepipe™ merges SPICE

Space Mapping breakthrough in EM optimization

3D visualization

HarPE™ Version 2.0

device characterization, simulation and optimization

FET, bipolar, HEMT, HBT, thermal modeling

parameter extraction

cold measurement processing

statistical modeling, Monte Carlo analysis

Huber optimization

cumulative probability distribution fitting

can be invoked from OSA90/hope™ as a child process

Selected Users of OSA Technology

Alcatel	AMTEL
Alenia	BNR
British Telecom	ComDev
Compact Software	COMSAT
CRC	Daimler Benz
EEsof	France Telecom
GE	Hughes
IMST	M/A-COM
MIT Lincoln Labs	NAWC
Raytheon	Rockwell
Schrack Aerospace	Siemens
Telettra	TRW
Watkins-Johnson	

Licensing

purpose: to protect the company's rights, ownership, intellectual property, etc.

poorly regulated

very few court rulings and precedences

may require significant administrative and legal costs

lengthy negotiations with large corporations and government bureaucracies - their internal cost may easily be of the same order of magnitude as the license fee

one may face unreasonable demands to accept the terms of large corporations or government bureaucracies

Software Protection

protect yourself - others may not care

typical means

- executable files only
- hardware keys
- software keys
- node-locked
- display-locked
- limited number of simultaneous users
- flexible network licensing
- time limit
  - expiry date
  - limited uninterrupted runs of demos
- self-destructing codes: significant user resistance
- license agreement

Research

research carried out in universities is in the public domain

curiosity-driven

results must be published in full

research carried out at OSA

proprietary

commercially driven

highly original and state of the art

Typical Support of University Research

McMaster University

the SOS Lab
the CRL

Micronet researchers

Carleton University

TRIO researchers

Queen's University

cooperating researchers worldwide, e.g.,

Hoefer, University of Victoria
Arndt, University of Bremen
Sorrentino, University of Perugia