SIMON BERKOVICH, Ph.D.

The George Washington University
School of Engineering & Applied Science
Department of Computer Science
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EDUCATION

1975 Institute of Control Sciences, Moscow, Russia

POSTDOCTORAL STUDIES

Dissertation: "Investigation of Innovative Methods for Hardware and Software Design of Associative Memory Systems"

1964 Institute of Precision Mechanics and Computer Technology, USSR Academy of Sciences, Moscow, Russia

Ph.D. in COMPUTER SCIENCE

Specialty: Research of Computer Systems and Devices
Dissertation: "Theoretical Investigations of Superconductor Computer Circuitry and Components"

1960 Moscow Physical-Technical Institute, Moscow, Russia
Department of Physics, headed by P.L.Kapitsa
(Nobel Prize Winner 1978)

M.S. in APPLIED PHYSICS

PUBLICATIONS AND INVENTIONS

Have more than 100 publications and 30 inventions
(16 USSR and 14 US Patents)
(Please see the list of principal works)

EXPERIENCE

1980
Jan. to pres. The George Washington University
Dept. of Computer Science
Washington, D.C. 20052
PROFESSOR OF ENGINEERING AND APPLIED SCIENCE
Teaching courses and supervising students research in algorithms, data structures, computer organization, and information systems
32 doctoral students defended their dissertations under my directorship

1982 - 1993
Jan. Dec. Allied-Signal Aerospace Technology Center
(simultaneously) Columbia, MD 21045
SENIOR MEMBER OF THE TECHNICAL STAFF (part-time)
Scientific research in computer communication systems
Invented two new communication techniques:
Content-Induced Transaction Overlap (CITO) protocol and combinatorial interconnections for Object-Oriented Systems

1979
June - October University of Maryland
Department of Information Systems Management
College Park, MD 20742
VISITING ASSOCIATE PROFESSOR
Scientific research in distributed information systems
Investigated the lexical subsystem concept

1968 - 1978 Institute of Control Sciences, Moscow, Russia
SENIOR RESEARCH SCIENTIST
Scientific research in information systems, file management, and associative processing
Responsible for the general design of INES - INformation Economic System for planning national economy

1965 - 1968 Scientific Center for Microelectronics, Moscow, Russia
CHIEF PROJECT LEADER
Research and development in the VLSI circuitry for superconductive associative memory

1960 - 1978 Institute for Scientific Information, Moscow, Russia
FREE-LANCE SCIENTIFIC WRITER
Read scientific papers on a wide range of topics in English, French, and German and wrote abstracts in Russian for publication

RESEARCH GRANTS AND ENTERPRISES

On-the-fly processing of information flows (DARPA)	1989-1990
Retrieval with fuzzy criteria (MatchWare Technologies)	1995-1996
Associative access to textual files (Heitmann Company)	1997-1998
Searching engine enhancements (SER Systems Engineering)	2000-2001
Information system for nuclear physics (NSF)	2002-2004
Our US Patent, number 5,619,680, entitled "Methods and Apparatus for Concurrent Execution of Serial Computing Instructions Using Combinatorial Architecture for Program Partitoning" was licensed to SNAPP Technologies	2005-2010
Open Innovation Network, LLC purchases this patent	2012

HONORS

1971	Awarded the title of Senior Research Fellow by the USSR Academy of Sciences for outstanding achievements in computer science, particularly, for the invention of a new method for dynamic file construction that become known as B-tree and dynamic hashing
1983	Bendix Advanced Technology Center Award: "Best Invention of the Last 12 months"
2002	Elected a member of the European Academy of Sciences "for an outstanding contribution to computer science and the development of fundamental computational algorithms"

Principal Works

SELECTED PUBLICATIONS

USSR (1960-1978)

1. "Effect of Joule Heat on Quenching of Superconductivity by a Current",
   Soviet Physics JETP, V. 17, No. 4, pp. 896-897, 1963 (co-author G. Lapir)

2. "Stability and Current Switching in a Superconducting Memory Device",
   Radio Engineering and Electronic Physics, No. 2, pp. 224-228, 1963

3. "Self-Oscillations in a Superconductor, Shunted with a Normal Conductor",
   Radio Engineering and Electronic Physics, No. 4, pp. 625-628, 1965

4. "Concerning the Destruction of Superconductivity with Direct Current",
   Soviet Physics JETP, Letters to the Editor, V.1, No. 4, pp. 108-109, 1965
   (with co-authors)

5. "Superconductor Model of Nerve Impulse Behavior",
   Radio Engineering and Electronic Physics, No. 2, pp. 293-295, 1966

6. "Information Retrieval by Means of Associative Memory",
   Automation and Remote Control, V.32, pp. 2020-2022, 1971
   (with co-authors)

7. "Estimates of reliability functions for systems with redundancy",
   Automation and Remote Control, V. 33, No. 6, part 2, pp. 1039-1046, 1972

8. "Associative Memory",
   Publishing house "Znanie", Moscow, 1976 (in Russian)
   (co-author Y. Kochin)

9. "The Organization of an Information System for Problems in Economics - INES",
   Proceedings of the Joint US - USSR Seminar on Database Management Systems, pp. 120-128, Moscow, 1977
   (co-author Y. Ivanov)

10.*) **) "Machine Organization of a Growing Search Tree",
Soviet Physics - Doklady, V. 17, No. 1, pp. 20-21, 1972

11.*) ***) "Identifier Dictionary Organization in an Expanding Information System",
Automation and Remote Control, V. 33, No. 4, pp. 653-656, 1972
(with co-authors)

12.*) "Search for Numbers that are Nearest to a Given Number",
Automation and Remote Control, V. 36, No. 2, pp. 343-345, 1975
(co-author Y. Kochin)

13.*) "Principle of the Organization of a Virtual Memory of the
Associative Type",
Programming and Computer Software, V. 2, No. 6, pp. 455-463, 1976
(with co-authors).

14.*) "An Information System for Economic Planning Problems",
Institute of Control Sciences, Moscow, 1975 (with co-authors)

15.*) "A Language for Communication with Information System for Economic
Planning Problems",
Institute of Control Sciences, Moscow, 1975 (with co-authors)

16.*) "The Dimensionality of the Informational Structures in the Space of Perception",
Biophysics, Vol. 21, No 4, pp. 945-947, 1976

17.*) "Principles of Organizing Software for Economic Management Systems",
"Problems of Cybernetics", Issue 21, Moscow, 1977 (co-author Y. Ivanov)

18. "Mechanism for Controlling Development in Biological Systems",
Automation and Remote Control, V. 38, No. 2, pp. 945-947, 1977

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*) Translated in English by the Institute for Computing Science and Computer Applications, The University of Texas at Austin.

Translation work supported by the National Science Foundation under Grant No: NSF - MC577-17655.

**) quoted from:
A.G.Dale, "Database Management Systems Development in the USSR",
ACM Computing Surveys, Vol. 11, No 3, Sept. 1979, page 223

" S.Ya.Berkovich published a first Soviet paper describing B-tree concepts in 1972 [Berk72] essentially simultaneously with the well-known paper by Bayer and McCreight [Baye72] "

***) Introduced a novel file construction technique called dynamic hashing

USA (1979-present)

19. "Lexical Problems in Large Distributed Information Systems",
Information Processing and Management, V. 16, pp. 259-267, 1980
(co-author B. Shneiderman)

20. "A Computer Communication Technique Using Content Induced Transaction Overlap",
ACM Transactions on Computer Systems, V. 2, No 1, pp. 60-77, Feb. 1984
(co-author C.Wilson)

21. "Probability of Monozygotic Twinning as a Reflection of the Genetic Control of Cell Development",
Mechanisms of Ageing and Development, 31(1985), pp. 147-154
(co-author S. Bloom)

22. "A High Performance Computer Communication System Using the CITO Protocol",
First International Conference on Supercomputing Systems, IEEE Computer Society, St. Petersburg, Florida, Dec. 1985, pp. 95-103 (with co-authors) -
INVITED PRESENTATION

23. "Informational Structure of the Developmental Tree of Multi-Cellular Organisms",
Proceedings of the Thirty Fourth Brookhaven Symposium in Biology, pp. 22-33, Plenum Publishing Corporation, New York, 1987 - **INVITED PRESENTATION**

24. "Spacetime and matter in a cellular automaton framework",
Nuclear Physics B (Proc. Suppl.) **6**, 452-454 (1989)

25. "A possible explanation of quantum mechanics behavior by a classical cellular automaton construction", in M. Kafatos(ed.), *Bell's Theorem, Quantum Theory, and Conceptions of the Universe*, pp. 163-165, Kluwer Academic Publishers, 1989

26. "On-the-fly processing of continuous data streams with a pipeline of microprocessors",
PARBASE-90, International Conference on Databases, Parallel Architectures, and Their Applications, IEEE Computer Society, Los Alamitos, CA, pp. 472-474, 1990
(co-authors Z. Kitov and A. Meltzer)

27. "The Compression Effects of the Binary Tree Overlapping Method on Digital Imagery",
IEEE Transactions on Communications, Vol. 38, No 8, August 1990, pp. 1260-1265
(co-author L. DiMento)

28. "A New Computational Model for Massive Parallelism",
A keynote talk delivered at the Fourth ISMM/IASTED International Conference: "Parallel and Distributed Computing and Systems", Washington, D.C., October 1991, pp. 60-67 - **INVITED PRESENTATION**

29. "Cellular automata as a model of reality: search for new representations of physical and informational processes",
Moscow University Press, Moscow, Russia, 1993 (in Russian)

30. "An Overlaying Technique for Solving Linear Equations in Real-Time Computing",
IEEE Transactions on Computers, v. 42, No. 5, pp. 513-517, May 1993

31. "On the Information Processing Capabilities of the Brain: Shifting the Paradigm",
Nanobiology, v. 2, pp. 99-107, August 1993

32. "Hash Coding", an article in **Encyclopedia of Software Engineering,**
Volume 1, pp. 536-538, John Wiley & Sons, New York, 1994

33. "Multiprocessor Interconnection Network Using Pairwise Balanced Combinatorial Designs",
Information Processing Letters, 50, pp. 217-224, 1994

34. "A New View of Goldbach's Conjecture",
Pi Mu Epsilon Journal, Volume 10, No. 2, p.121, Spring 1995
(short note in an undergraduate mathematics journal,
used for a programming assignment in teaching FORTRAN)

35. "A Multiprocessor Network Arranging Replicated Objects in Pairwise Balanced Combinatorial Designs",
Journal of Circuits, Systems, and Computers, Vol. 6, No 1, pp. 85-91, 1996
(co-author Lin-ching Chang)

36. "A Combinatorial Architecture for Instruction-Level Parallelism",
Microprocessors and Microsystems, Vol. 22, pp. 23-31,1998
(co-author E. Berkovich)

37. "On the difference between dead and living matter: making sense of pseudo-random sequences of DNA nucleotides",
The Noetic Journal, 2, pp. 42-51, 1999

38. "Probing the architecture of the brain in experimentation with afterimages",
Proceedings of the IJCNN'99, IEEE, Washington, DC, Volume 1, pp. 69-73, 1999

39. "Reversing the error-correction scheme for a fault-tolerant indexing",
The Computer Journal, Vol. 43, No 1, pp. 54-64, February 2000
(co-author Eyas El-Qawasmeh)

40. "A bit-counting algorithm using the frequency division principle",
Software - Practice And Experience, Vol. 30, Issue 14, pp. 1531-1540, 2000
(co-authors G. Lapir and M. Mack)

41. "Reminiscences of superconductive associative memory research in the former Soviet Union",
IEEE Annals of the History of Computing, Vol. 25, No. 1, pp. 72-75, January – March 2003

42. "On the remote interaction of biological objects with close genetic structures", ***Annals of the European Academy of Sciences***, pp. 111-130, 2003

43. "On the 'barcode' interpretation of DNA, or the Phenomenon of Life in the Physical Universe", **Dorrance Publishing Co**, Pittsburgh, PA, 2003

44. "Application of Lebesgue Space Filling Curve in Progressive Image Transmission" Proceedings of the 3rd IASTED International Conference: Visualization, Imaging, and Image Processing, September 8-10, 2003, Benalmadena, Spain, pp. 467-471 (co-author Ahmed Alhosni)

45. "MESM and the Beginning of the Computer Era in the Soviet Union", ***IEEE Annals of the History of Computing***, Vol. 28, No. 3, pp. 4 - 16, July – September 2006 (co-authors A. Fttzpatrick and T. Kazakova)

46. "Router Architectures Using Combinatorial Designs", ***WSEAS Transaction on Computers,*** Issue 12, Volume 5, pp. 2956-2961, December 2006 (co-author A. Kuznetsov)

47. "Increasing the efficiency of bit-counting", ***International Journal of Computer and Applications***, Vol. 29, No. 1, pp. 51-58, 2007 (co-authors Eyas El-Qawasmeh, M. Strauss, and M. Mack)

48. "Constructive Approach to Fundamental Science", **University Publishers,** San Diego, CA, 2010 (co-author Hanan Al Shargi)

49. "Biological Information Processing as Cloud Computing", Second International Conference on the Applications of Digital Information and Web Technologies, pp. 417-422, London, 2009 (co-author Hanan Al Shargi)

50. "Generation of clean energy by applying parametric resonance to quantum nonlocality clocking", Technical Proceedings of the 2011 CTSI Clean Technology and Sustainable Industries Conference and Expo, June 13-16, 2011, Boston, MA, pages 212-215 Also published in **Nanotech** 2011 Vol. 1, pp.771-774

51. "Golay Code Clustering for Mobility Behavior Similarity Classification in Pocket Switched Networks", ***Journal of Communication and Computer,*** Vol. 9, No 4, pp. 466-472, April, 2012 (co-authors Hongjun Yu, Tao Jing, and Dechang Chen)

52. "On clusterization of "big data" streams", COM.Geo '12 Proceedings of the 3rd International Conference on Computing for Geospatial Research and Applications, ACM, New York, 2012 (co-author Duoduo Liao)

US PATENTS

1. US PATENT No 4868814: “Content-Induced Transaction Overlap (CITO) Communication Channel”, Date issued - January 8, 1985 (co-authors C.Walter and C. Wilson)

2. US PATENT No 4598411: "On-the-fly Data Compression System" Date issued - July 1, 1986 (co-authors C. Wilson and C. Walter)

3. US PATENT No 4855997: "Priority Queuing Technique for Content Induced Transaction Overlap Communication System", Date issued - August 8, 1989 (co-authors C.Wilson and R.Burne)

4. US PATENT No 4868814: "Multilevel Concurrent Architecture for Multiprocessor Computer Systems", Date issued - September 19, 1989 (co-authors H.Yee and C.Walter)

5. US PATENT No 5095481: "Technique for Active Synchronization of the CITO Communication Channel", Date issued - March 10, 1992

6. US PATENT No 5099476: "Computer System with Distributed Content-Addressable Memory", Date issued - March 24, 1992

7. US PATENT No 5146456: "Computer System with Distributed Content-Addressable Memory Modules Compatible with CITO Transmission", Date issued - September 8, 1992

8. US PATENT No 5255380: “Computer System with Distributed RAM Memory Modules Designed for CITO Transmission”, Date issued - October 19, 1993

9. US PATENT No 5295257: "Distributed Multiple Clock System and a Method for the Synchronization of a Distributed Multiple System", Date issued - March 15, 1994 (co-authors S. Haaser, C. Walter, and H.Yee)

10. US PATENT No 5369755: “Computer Communication Bus System Using Multiple Content Induced Transaction Overlap (CITO) Communication Channels, Date issued - November 29, 1994

11. US PATENT No 5392291: "Fault-tolerant CITO Communication System", Date issued - February 21, 1995 (co-authors C.Walter and H.Yee)

12. US PATENT No 5428773: “Retrieval of Information from Lattice-structured Content- addressable Memories by Concurrently Searching in Opposing Directions”, Date issued - June 27, 1995

13. US PATENT No 5,619,680: "Method and Apparatus for Concurrent Execution of Serial Computing Instructions Using Combinatorial Architecture for Program Partitioning", Date issued - April 8, 1997 (co-author E. Berkovich)

14. US PATENT No. 6,145,071: "Multi-Layer Multi-Processor Information Conveyor with Periodic Transferring of Processor's States for On-The-Fly Transformation of Continuous Information Flows and Operating Method Therefor", Date issued - November 7, 2000 (co-authors E. Berkovich and M. Loew)