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MICHAEL DRUMHELLER

OVERVIEW OF SKILLS

→ Applied Mathematics, especially Computational Geometry, with numerical optimization, machine learning, robotics, computer vision, and CAD.
→ Software engineering, architecture, and program management. Unix/Windows, Python, C++, C#, SQL, Lisp.
→ Public speaking and technical writing.
→ Data visualization.
→ Professional opera singing. Performed with numerous regional opera companies and orchestras; *Naxos* Label recording artist.

EDUCATION

- **Massachusetts Institute of Technology** 1989 M.S. Brain and Cognitive Science. Thesis title: *Learning a Motion Detector from Examples* (machine learning in a computational-vision context).
- **Massachusetts Institute of Technology** 1984 B.S. Mechanical Engineering. Thesis title: *Mobile Robot Localizaton Using Sonar* (journal version has nearly 400 citations on Google Scholar).
- **Boston University** 1992 Master of Music in Voice Performance. Classical and operatic singing, baritone voice.

PROFESSIONAL EXPERIENCE

Oct. 2012–present **Boeing Commercial Airplanes** Everett, WA
Advanced Technologist – Product Development Innovation Center

- Technical Lead of the *Scripted Process Engineering* (SPE) group. SPE's charter is to save money, speed up innovation, and increase quality by using cutting-edge geometry and optimization tools to transform manual, expensive engineering processes into *optimal, repeatable,* and *hands-off* computing services. Current emphasis is on automating and optimizing the NC programming for advanced composites manufacturing.
- Providing technical leadership and mentoring in software engineering, including processes, documentation, programming tools, techniques, and best practices.
- Gathering, interpreting, and defining requirements based on close interaction with manufacturing engineers and other business stakeholders.
- Establishing formal procedures and developing tools for engineering data management, making all data-artifacts (such as NC programs) *traceable* and *secure*.
- Developing efficient mathematical algorithms for optimizing and automating advanced manufacturing and design processes. Current focus is on composite wings.

Jan. 2010–Aug. 2012 **INRIX, Inc.** Kirkland, WA

INRIX is the leading provider of real-time traffic information. INRIX gathers road-speed and incident data from GPS and other sensors and processes it with machine learning and optimal estimation techniques to deliver current and predictive traffic conditions over Web services to customers including Ford, Audi, and BMW. INRIX also makes the MacWorld Best-of-Show app *INRIX Traffic!*.

Technical Account Manager

- Technical oversight of a multi-million–dollar subcontract to England's Highways Agency. Drove specifications, plans, and schedule. Simultaneously managed engineering development and customer relationship.
- In charge of technical customer-relationships for all public-sector deals.

Program Manager

- Managed a team of six developers and testers to deliver 4 releases of INRIX's traffic-data platform.
- Wrote and managed specifications and schedules, coordinating with Operations and Product Management. Reported directly to VP of Engineering.
- Worked with VP of Product Management to develop new products and algorithms for "map-independent traffic data" enabling new multi-million–dollar deals with leading car companies.
- Oversaw several-fold expansion of INRIX's raw-traffic-data aggregation capacity.
- Created and oversaw development of internal software tools to increase productivity of operations staff and improve accuracy and quantity of *road-closure reports*—a critical market differentiator.
- Mentored and encouraged junior developers.

Jul. 2009–Dec. 2009 **Symform, Inc.** Seattle, WA

Senior Software Engineer

Symform makes the Symform *Cloud Storage Network* for disaster protection for businesses. It transforms customer-donated local disk resources into a globally distributed, secure, virtual store.

- Delivered multiple releases of Symform's complex pure–cloud-based Web service.
- Owner of the S*ync Service*, a multi-master synchronization engine.
- Developed extensively in C#, Python, and SQL/stored procedures.
- Co-wrote and edited marketing and instructional materials.
- Provided customer service.

2007–2009 **Tableau Software, Inc.** Seattle, WA

Senior Software Engineer

Tableau makes Visual Analytics software for databases.

- Shipped 3 releases of *Tableau Desktop* and 3 of HVE (OEM for Oracle products). Cumulative income from HVE alone exceeded $10 million.
- Led the design, implementation, and delivery of Tableau's *Data Mining Interface*, allowing rapid visual formulation of machine learning and data mining problems for a key OEM partner.
- Developed in C++, features ranging from complex, polished UX to OLEDB-based protocols for MDX OLAP read-back, in a million-line codebase with CppUnit tests.
- Co-developed *Tableau for GIS* (map projections and inverses).

- Co-developed *Visual Totals* for Essbase, overcoming the absence of a customer-critical feature in the underlying database product.
- Prototyped numerous statistical and data-mining features, many of which are now standard Tableau features:
  — Box-and-whisker plots;
  — Interactive tunable regularized splines;
  — Graphical confidence bands for linear regression;
  — Heat maps ("trend surfaces") for sparse irregular 2-D data.
- Wrote internal white papers on visualization semantics, mapping, and data mining.
- Cultivated effective working relationship with key OEM partner Oracle, Inc.
- Gave seminar on statistics at Customer Conference.
- Mentored new employees, taught colleagues on multidimensional data analysis, data mining, statistics, MDX, Python, and C++.
- Wrote documentation for some of the company's most complex algorithms.
- Automated procedures for receiving rapid-fire software upgrades from OEM partner; solved numerous other process-management and testing problems with Python and Perl.

1996–2007 **The Boeing Company** Seattle, WA

Associate Technical Fellow (ATF) – The Math Group

ATFs are technical thought-leaders chosen through an objective company-wide review process based on leadership, influence, mentoring, international recognition, and financial impact.

- Architect and development-team leader for the math kernel of next-generation composite tool-path planning CAD software.
- Invented patented mathematical methods for high-speed composites manufacturing. Contri-butions recognized internally as integral to the success of Boeing's newest airplane programs.

Advanced Computing Technologist – Computer Science Group

- Invented the *Super Router* (SR), a patented CAD algorithm for tubing design (e.g. aircraft hydraulics). The SR automatically compiles *visual descriptions* of tubing design constraints into mixed-variable optimization problems.
- Developed neural-net based methods for interpreting signals from a flush-air data system (FADS) on an unmanned combat aerial vehicle (UCAV).
- Project Manager and software developer for an internal *generative design* CAD system.
- Invented and developed a file-processing tool called *Spots* widely used for automating Design of Experiments and optimization.
- Contributed mathematical and software consulting to numerous other projects across the Company.

1984–1996 **Thinking Machines Corporation** Cambridge, MA

Senior Software Engineer

- Developed C & assembly message-passing system called CMMD (a key precursor of modern MPI and map/reduce) for the *Connection Machine CM-5* parallel supercomputer.
- Project Manager for CMMD. Oversaw its entire software life cycle.
- Primary author of CMMD Reference Manual and User's Guide.
- Designed and built comprehensive test suites and test harnesses.

- Lead developer on Naval Research Laboratory project to network the CM-5 to a Sun workstation cluster, at kernel level.

Researcher

- Developed widely known algorithm for sonar-based robot navigation.
- Designed, built, and demonstrated a complete stereo machine-vision system for terrain elevation mapping on the *Connection Machine CM-2* massively parallel computer.
- Co-invented and co-implemented massively parallel visual object recognition system.

PUBLICATIONS

Spots: A Powerful File Manipulator for MDO and Other Engineering Software Automation Tasks, Proceedings of the 41st AIAA Aerospace Sciences Meeting and Exhibition, Reno, NV, Jan.7, 2003.

Constraint-Based Design of Optimal Transport Elements, ASME Journal of Computational & Information Sciences in Engineering (JCISE), Special Issue on Solid Modeling (showcasing the best papers of SM '02, see next), Vol. 2, No. 4, pp. 302-311, Dec. 2002.

Constraint-Based Design of Optimal Transport Elements (SM '02 conference-proceedings version) Proceedings of the 7th ACM Symposium on Solid Modeling and Applications (SM '02), Saabrücken, Germany, June 2002.

The Vision Machine (With Tomaso Poggio, James Little, et al.), In *Artificial Intelligence at MIT: Expanding Frontiers* Vol. II, P.H.Winston and S.A.Shellard (eds.), MIT Press, Cambridge, MA, pp. 492-529, 1990.

Model-Based Objection Recognition Using the Connection Machine, Proceedings of SPIE – The International Society for Optical Engineering, Vol. 848, pp. 214-219, 1987.

On Parallel Stereo (With Tomaso Poggio), Proceedings of the IEEE International Conference on Robotics & Automation, pp. 1439-48, April 1986.

Connection Machine Stereomatching, Proceedings of the 5th National Conference on Artificial Intelligence, AAAI-86, Philadelphia, PA, pp. 748-753, 1986.

Mobile Robot Localization Using Sonar, IEEE Transactions on Pattern Analysis and Machine Intelligence, V.9 No. 2, Mar 1987 (also MIT AI Memo 826, Jan 1985). Author R. Murphy writes, in Introduction to AI Robotics (MIT Press 2002, p.254): **"[T]he first serious analysis [of mobile sonar]…was done by an undergraduate at MIT…Drumheller's paper…became a classic."**

PATENTS AND PATENTS PENDING

Constraint-based Method of Designing a Route for a Transport Element (the "Super Router") and related US and Foreign patents:

- US Patent No. 7,444,269
- US Patent No. 7,647,211
- US Patent No. 7,668,700, with Charles E. Erignac
- French Patent No. FR2835941, grant date 2006-05-05 (BOPI 2006-18)
- US patents pending:
  - US 20030101029
  - US 20060212276
  - US 20070088530, with Charles E. Erignac

Tape Course Generation Meth. and App. for Programming a Composite Tape Lamination Machine and related patents:

- US Patent No. 7,643,970, with Alan K. Jones and Frederick W. Klein
- US Patent No. 7,869,982 " "

- US patents pending:
  — US 20070106407 " "
  — US 20090312993 " "

Virtual Processor Techniques in a SIMD Multiprocessor Array

- US Patent No. 4,827,403, with Guy L. Steele, W. Danny Hillis, et al.

CONSULTING WORK

2001 Applied Minds, Inc. – image processing, Python and C++.
2000 Craic Computing, LLC – DNA sequence compression, Perl and C.
1988 Istituto per la Ricerca Scientifica e Tecnologica (IRST) Trento, Italy – computer vision.

ORCHESTRAS AND OPERA COMPANIES

Baritone soloist in operas, oratorios, and recitals.

Naxos Label recording artist, with conductor Gerard Schwarz (enter *Krasa: Brundibar/Laitman: I Never Saw Another Butterfly* on Amazon.com)

Appeared as soloist with Seattle Symphony, Tacoma Opera, Skagit Opera, Boston Lyric Opera, Cleveland Orchestra, Philadelphia Philharmonic, Orchestra Seattle, Seattle Opera Previews, and many other organizations.

FOREIGN LANGUAGES

Proficient in Italian

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