

# Curriculum Vitae

## Robert W. Horst, Ph.D.

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### Expertise

- Computer design and architecture
  - Fault tolerant computing
  - CPU, cache and memory design
  - I/O and storage subsystems
  - High speed networks
  - Performance evaluation
  - Hardware testing
  - Patents and intellectual property
  - Robotics and motor control
  - Power electronics
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### Professional Summary

From: 2018 University of Illinois at Urbana-Champaign

To: Present

Position: Adjunct Research Professor

- Department of Electrical and Computer Engineering
- Participate in research projects

From: 2001 HT Consulting

To: Present San Jose, CA

Position: Independent consultant

- Worked with startups, VC firms, established companies and law firms on architectural definition of new products, design reviews, technical due diligence on potential investments, identification and protection of intellectual property and litigation support.
- Testified as an expert witness in patent and technology litigation.

From: 2013 AlterG

To: 2015 Fremont, CA

Position: Chief Technology Officer, Robotics

- Continued the development of the AlterG Bionic Leg after Tibion was acquired by AlterG in April, 2013.
- Designed power systems, control electronics, and embedded firmware of AlterG Anti-Gravity treadmills.

From: 2001 Tibion Corporation

To: 2013 Sunnyvale, CA

Position: Founder / VP of R&D / CTO

- Inventor of the Tibion Bionic Leg, the first wearable robotic device for assistance and rehabilitation of those with impaired mobility.

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- Developed electronics, control algorithms, software and mechanics from conception through production of 100+ units.
- Formulated and executed IP strategy.

From: 2002 Network Appliance, Inc.  
To: 2003 Sunnyvale, CA  
Position: Technical Director

- Investigated processor and interconnect options for future generations of network-attached storage subsystems.
- Represented Network Appliance in the PCI Express Advanced Switching working group.

From: 1999 3ware, Inc.  
To: 2001 Mountain View, CA  
Position: Vice President, Research & Technology

- Initiated and lead a project that resulted in industry's first Ethernet Storage Area Network storage subsystem. Enhanced the company's patent position with 10 new patent applications.
- Developed a novel disk mirroring architecture and helped the company to grow from 15 to over 100 people. Participated in fund raising activities and prototype development.

From: 1980 Tandem Computers / Compaq Computers  
To: 1999 Cupertino, CA  
Position: Technical Director

- Created new fault-tolerant system architectures and designed several generations of fault-tolerant mainframes used in banking, stock exchanges, and commerce.
- Co-founded Tandem Labs. Initiated internal projects and started several joint research projects with universities.
- Lead the architecture of the ServerNet System Area Network. Wrote technical papers and made numerous presentations to technical audiences and customers.
- Conceived of the architecture and lead the design of the NonStop Cyclone superscalar processor. Filed applications resulting in the industry's first superscalar patents.
- Lead the development of the NonStop TXP fault-tolerant CPU.

From: 1976 Hewlett-Packard Co.  
To: 1980 Cupertino, CA  
Position: Development Engineer

- Designed the micro-sequencer and cache of the HP3000 Series 64 processor.
- Designed a test system using scan and signature analysis.

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### Litigation Support Experience

Served as a testifying and consulting expert witness on patent cases related to systems, processors and storage. Served as a consulting expert on class-action and defective product cases. Further details furnished on request.

### Patents

| #  | PAT. NO.  | TITLE   |
|----|-----------|---|
| 82 | 9,893,604 | Circuit with low DC bias storage capacitors for high density power conversion                           |
| 81 | 9,889,058 | Orthotic device drive system and method   |
| 80 | 9,474,673 | Methods and devices for deep vein thrombosis prevention   |
| 79 | 9,131,873 | Foot pad device and method of obtaining weight data   |
| 78 | 8,679,040 | Intention-based therapy device and method   |
| 77 | 8,639,455 | Foot pad device and method of obtaining weight data   |
| 76 | 8,353,854 | Methods and devices for moving a body joint   |
| 75 | 8,274,244 | Actuator system and method for extending a joint  |
| 74 | 8,058,823 | Actuator system with a multi-motor assembly for extending and flexing a joint                           |
| 73 | 7,811,189 | Deflector Assembly  |
| 72 | 7,648,436 | Rotary Actuator   |
| 71 | 7,537,573 | Active muscle assistance device and method  |
| 70 | 7,521,836 | Electrostatic actuator with fault tolerant electrode structure  |
| 69 | 7,484,038 | Method and apparatus to manage storage devices  |
| 68 | 7,468,982 | Method and apparatus for cluster interconnection using multi-port nodes and multiple routing fabrics    |
| 67 | 7,365,463 | High torque motor   |
| 66 | 7,239,065 | Electrostatic actuator with fault tolerant electrode structure  |
| 65 | 6,966,882 | Active muscle assistance device and method  |
| 64 | 6,950,428 | System and method for configuring adaptive sets of links between routers in a system area network (SAN) |
| 63 | 6,924,780 | Spatial display of disk drive activity data   |
| 62 | 6,775,794 | Use of activity bins to increase the performance of disk arrays   |
| 61 | 6,753,878 | Parallel pipelined merge engines  |
| 60 | 6,751,757 | Disk drive data protection using clusters containing error detection sectors                            |
| 59 | 6,650,533 | Pluggable drive carrier assembly  |
| 58 | 6,646,984 | Network topology with asymmetric fabrics  |
| 57 | 6,631,131 | Transpose table biased arbitration scheme   |
| 56 | 6,591,339 | Methods and systems for selecting block sizes for use with disk arrays                                  |
| 55 | 6,591,338 | Methods and systems for mirrored disk arrays  |
| 54 | 6,567,892 | Use of activity bins to increase the performance of disk arrays   |

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- 53 6,549,977 Use of deferred write completion interrupts to increase the performance of disk operations
- 52 6,516,032 First-order difference compression for interleaved image data in a high-speed image compositor
- 51 6,496,940 Multiple processor system with standby sparing
- 50 6,487,633 Methods and systems for accessing disks using forward and reverse seeks
- 49 6,484,235 Methods and systems for dynamically distributing disk array data accesses
- 48 6,424,655 Transpose table-biased arbitration
- 47 6,424,523 Pluggable drive carrier assembly
- 46 6,266,765 Computer architecture capable of execution of general purpose multiple instructions
- 45 6,233,702 Self-checked, lock step processor pairs
- 44 6,157,967 Method of data communication flow control in a data processing system using busy/ready commands
- 43 6,092,177 Computer architecture capable of execution of general purpose multiple instructions
- 42 6,009,506 Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions
- 41 5,964,835 Storage access validation to data messages using partial storage address data indexed entries containing permissible address range validation for message source
- 40 5,930,275 Clock error detection circuit
- 39 5,918,032 Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions
- 38 5,914,953 Network message routing using routing table information and supplemental enable information for deadlock prevention
- 37 5,890,003 Interrupts between asynchronously operating CPUs in fault tolerant computer system
- 36 5,867,501 Encoding for communicating data and commands
- 35 5,838,894 Logical, fail-functional, dual central processor units formed from three processor units
- 34 5,765,007 Microinstruction sequencer having multiple control stores for loading different rank registers in parallel
- 33 5,758,113 Refresh control for dynamic memory in multiple processor system
- 32 5,752,064 Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions
- 31 5,751,932 Fail-fast, fail-functional, fault-tolerant multiprocessor system
- 30 5,742,135 System for maintaining polarity synchronization during AMI data transfer
- 29 5,710,549 Routing arbitration for shared resources
- 28 5,694,121 Latency reduction and routing arbitration for network message routers
- 27 5,675,579 Method for verifying responses to messages using a barrier message

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| 26 | 5,628,024 | Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions  |
| 25 | 5,574,941 | Computer architecture capable of concurrent issuance and execution of general purpose multiple instruction   |
| 24 | 5,574,933 | Task flow computer architecture  |
| 23 | 5,404,550 | Method and apparatus for executing tasks by following a linked list of memory packets  |
| 22 | 5,390,355 | Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions  |
| 21 | 5,384,906 | Method and apparatus for synchronizing a plurality of processors   |
| 20 | 5,353,436 | Method and apparatus for synchronizing a plurality of processors   |
| 19 | 5,329,629 | Apparatus and method for reading, writing, and refreshing memory with direct virtual or physical access  |
| 18 | 5,317,726 | Multiple-processor computer system with asynchronous execution of identical code streams   |
| 17 | 5,287,472 | Memory system using linear array wafer scale integration architecture  |
| 16 | 5,239,641 | Method and apparatus for synchronizing a plurality of processors   |
| 15 | 5,203,005 | Cell structure for linear array wafer scale integration architecture with capability to open boundary I/O bus without neighbor acknowledgement                                 |
| 14 | 5,193,175 | Fault-tolerant computer with three independently clocked processors asynchronously executing identical code that are synchronized upon each voted access to two memory modules |
| 13 | 5,146,589 | Refresh control for dynamic memory in multiple processor system  |
| 12 | 5,075,844 | Paired instruction processor precise exception handling mechanism  |
| 11 | 5,072,364 | Method and apparatus for recovering from an incorrect branch prediction in a processor that executes a family of instructions in parallel                                      |
| 10 | 5,034,964 | N:1 time-voltage matrix encoded I/O transmission system  |
| 9  | 5,016,208 | Deferred comparison multiplier checker   |
| 8  | 4,872,109 | Enhanced CPU return address stack  |
| 7  | 4,823,252 | Overlapped control store   |
| 6  | 4,800,486 | Multiple data patch CPU architecture   |
| 5  | 4,754,396 | Overlapped control store   |
| 4  | 4,636,943 | Enhanced CPU microbranching architecture   |
| 3  | 4,618,956 | Method of operating enhanced alu test hardware   |
| 2  | 4,574,344 | Entry control store for enhanced CPU pipeline performance  |
| 1  | 4,571,673 | Enhanced CPU microbranching architecture   |

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