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Experience

- Research Assistant at CAIP Center, Rutgers University, NJ, USA, 1999 - present
- Teaching Assistant in the Computer Science Department, "Babes-Bolyai" University, Cluj-Napoca, Romania, 1998 - 1999

Education

- Ph.D. in Computer Engineering; Rutgers University, NJ, USA. Expected graduation May 2004
- MS Computer Science, concentration in Computer Graphics; GPA: 9.80/10.00, "Babes-Bolyai" University, Cluj-Napoca, Romania
- BS Computer Science, concentration in Distributed Computing and Database Systems GPA 9.89/10.00; 2nd GPA in the year; "Babes-Bolyai" University, Cluj-Napoca, Romania

Selected Course Work

- Parallel and Distributed Systems
- Data Structures and Algorithms
- Computer Architecture I & II
- Virtual Reality Technology
- Operating Systems Theory
- Visualization and Advanced Computer Graphics

Research Interests

Distributed systems, distributed virtual environments, real-time network communication, rehabilitation robotics, mechanical systems control

Research and Development Activity

Participated in the development of a distributed Virtual Reality-based rehabilitation system as software designer and developer. The system provided robotic devices and VR applications for patient rehabilitation (hand, ankle and gait), applications for remote monitoring and interaction with the rehabilitation software and a web portal for patient data access. The connection between the applications was provided by proxy servers that handled real-time data transfer for remote monitoring purposes, large data transfers for database storage and distributed synchronization mechanisms for remote concurrent access to application parameters and data. The system was deployed at different geographical locations on fifteen computers and tested on patients while therapists used the monitoring service to watch the rehabilitation sessions remotely. Physical therapy researchers used the web portal to access and analyze the data collected during the rehabilitation sessions. The main components of the system were:

- Real-time monitoring service distributed over multiple nodes. The data is multicasted from each source (patient rehabilitation site) over the network in real-time making it available to the patient monitoring sites. The multicast trees are optimized for bandwidth and transfer delay.Technologies involved: C/C++, BSD sockets
- Real-time web-based monitoring applet for remote therapist access to on-going rehabilitation session. The client applet connects to a number of active nodes and measures the transfer delay between itself and each of them. Then requires data streaming from the best available. Technologies involved: Java, Java3D, Java Applet, Java Servlet
- Oracle database for patient data storage. Large amount of data resulting from a 50Hz sampling frequency. Optimized for fast access to low-level data and evaluated performance data. Technologies involved: Oracle PL/SQL, Oracle ProC/C++
- Web portal for therapist data access. Simple chart specification language. Data retrieved from the database and displayed as graphs, Excel files, HTML or plain text. Technologies involved: Java, Java Servlet, JServ, JDBC, Sitraka JClass, Perl, PL/SQL.
- VR-based tele-rehabilitation exercises for hand, ankle and walking with real-time data collection, evaluation and storage. The exercises are engaging game-like simulations that motivate the patient and

reduce the perception of the inherent monotony of the rehabilitation process. The simulations communicate with the monitoring service through either shared memory if the server runs on the same host or through BSD sockets. Technologies involved: C/C++, Sense8 WorldToolKit, BSD sockets.

- Rutgers MEGA Ankle robot. Hexapod robotic device based on the Stewart platform architecture and actuated by air pressure. Can provide 6 DOF forces to the user's foot and can measure 6 DOF positions and forces. Used for gait rehabilitation. Technologies used: AutoCAD, Mechanical Desktop
- Servo-controller for the Rutgers Ankle and Rutgers MEGA Ankle. Pulse-width modulation air pressure control using on solenoid valves. PID position and force control. Low-level hardware programming. Technologies used: C/C++, ASM
- Haptic simulations of walking on surfaces of various types: flat, uneven, sloped, icy, wet, muddy or gravel. Technologies used: C/C++
- Serial device drivers and communication protocols for interaction between the PC host and the forcefeedback devices. Protocols designed to optimize the data transfer rates. Technologies used: C/C++

Technology Skills

Programming Languages

C/C++, Java, SQL, PL/SQL, Perl, Matlab, Scheme, ASM

Programming Technologies

Sockets - C/C++, Java
Threads - Windows, POSIX, Solaris, Java
Database - SQL, JDBC, Oracle PL/SQL, Oracle ProC/C++
2D/3D Graphics - Sense8 WorldToolKit C/C++ Library, Java3D, Xlib
Web Applications - Java Servlet, Java Applet, CGI, JavaScript, Sitraka JClass
Low-level interrupt handlers - C/C++, ASM
System Scripting - Perl, Bash, Sh, Windows Batch
Scientific - Matlab, Maple
CAD - AutoCad, Mechanical Desktop, Eagle

Database Systems

Oracle, SAPDB, MySQL, PostgreSQL

Operating Systems

Microsoft Windows, Solaris, Linux

Publications

1. Adamovich S.V., Merians A., Boian R, Tremaine M., Burdea G., Recce M., and Poizner H. A virtual reality based exercise system for hand rehabilitation post-stroke. In Proceedings of the international Workshop on Virtual Rehabilitation, pages 74-81, September 2003.
2. Whitworth E., J. A. Lewis, R. Boian, M. Tremaine, G. Burdea, and J. Deutsch. Formative evaluation of a virtual reality telerehabilitation system for the lower extremity. In Proceedings of the International Workshop on Virtual Rehabilitation, pages 13-20, September 2003.
3. R. F. Boian, H. Kourtev, K. M. Erickson, J.E. Deutsch, J.A. Lewis, and G.C. Burdea. Dual stewart-platform gait rehabilitation system for individuals post-stroke. In Proceedings of the International Workshop on Virtual Rehabilitation, page 92, September 2003.
4. R.F. Boian, J.E.Deutsch, C.S. Lee, G.C. Burdea, and J. Lewis. Haptic effects for virtual reality-based post-stroke rehabilitation. In Proceedings of the Eleventh Symposium on Haptic Interfaces For Virtual Environment And Teleoperator Systems, pages 247-253, Los Angeles, CA, March 2003.
5. J. Lewis, R.F. Boian, G.C. Burdea, and J.E.Deutsch. Real-time web-based telerehabilitation monitoring. In Proceeding of Medicine Meets Virtual Reality, pages 190-192, Newport Beach, CA, January 2003.
6. Deutsch JE, Merians AS, Burdea G, Boian R, Adamovich S., and Poinzer H., Haptics and virtual reality used to increase strength and improve function in chronic patients post-stroke: Two case reports. *Neurology Report*,26(2):78-85, 2002.
7. R.F. Boian, C.S. Lee, J.E. Deutsch, G. Burdea, and J.A. Lewis. Virtual reality-based system for ankle rehabilitation post stroke. In Proceedings of the International Workshop on Virtual Reality Rehabilitation (Mental Health, Neurological, Physical, Vocational) VRMHR, pages 77-86, Lausanne, Switzerland, November 2002.
8. Alma S. Merians, David Jack, Rares Boian, Marilyn Tremaine, and Grigore C. Burdea. Virtual reality-augmented rehabilitation for patients following stroke. *Physical Therapy*, 82(9):898-915, September 2002.
9. M. Bouzit, G. Burdea, G. Popescu, and R. Boian. The Rutgers Master II-New design force-feedback glove. *IEEE/ASME Transactions on Mechatronics*, 7(2):256-263, June 2002.
10. M. Bouzit, G. Popescu, G. Burdea, , and R. Boian. The Rutgers Master II-ND force feedback glove. In

Proceedings of IEEE VR Haptics Symposium, pages 145-152, Orlando FL, March 2002.

11. R. Boian, A. Sharma, C. Han, A. Merians, G. Burdea, S. Adamovich, M. Recce, M. Tremaine, and H. Poizner. Virtual reality-based post stroke rehabilitation. In Proceedings of Medicine Meets Virtual Reality, pages 64-70, Newport Beach, CA, January 2002.
12. G.V. Popescu, G. Burdea, and R. Boian. Shared virtual environments for telerehabilitation. In Proceedings of Medicine Meets Virtual Reality, pages 362-368, Newport Beach CA, January 2002.
13. D. Jack, R. Boian, A. Merians, S. Adamovich, M. Tremaine, M. Recce, G. Burdea, and H. Poizner. Virtual reality-enhanced stroke rehabilitation. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 9(3):308-318, September 2001.
14. J. E. Deutsch, J. Latonio, G. Burdea, and R. Boian. Post-stroke rehabilitation with the Rutgers Ankle system - a case study. *Presence*, volume 10, pages 416-430. MIT Press, August 2001.
15. J. E. Deutsch, J. Latonio, G. Burdea, and R. Boian. Rehabilitation of musculoskeletal injuries using the Rutgers Ankle haptic interface: Three case reports. In Proceedings of Eurohaptics Conference, pages 11-16, Birmingham, UK, July 2001.
16. Rares F. Boian and Grigore C. Burdea. Worldtoolkit vs. Java3d: A performance comparison. Technical Report CAIP-TR-259, CAIP Center, Rutgers University, April 2001.
17. D. Jack, R. Boian, A. Merians, S. Adamovich, M. Tremaine, M. Recce, G. Burdea, and H. Poizner. A virtual reality-based exercise program for stroke rehabilitation. In Proceedings of ASSETS 2000: Fourth ACM SIGCAPH Conference on Assistive Technologies, pages 56-63, November 2000.