Design and Implementation of Digital Signal Processing Application Builder

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ABSTRACT

In general, the process of design and implementation of digital signal processing application system is very complex and the cost is very expensive. Therefore, it is an important problem that how should we do to simplify the complexity. In this study, we design an Integrated Develop Environment (IDE). It is based on the software-hardware co-design method. And it could shorten the drop of development between conceptual system and physical system using by CAD tools and programmable components. The IDE can integrate all of ASIC, FPGA, DSP and RISC components and sets up a high efficient programmable hardware module. We integrate the hardware compiler and the programmable hardware module to execute a series of transformation from conceptual system down to programmable hardware module. Further, the IDE could complete all computing works with the advantage of convenience of traditional computer and high efficiency of hardware structure. Blackboard system is involved in the IDE. It can integrate all knowledge of compiling from conceptual level to physical level and reduces the drop of development between conceptual system and physical system. And we can carry out the work by strengthening the adaptability of knowledge and promoting the reasoning efficiency.

Keywords : Integrated Develop Environment ; software-hardware co-design ; blackboard system

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REFERENCES

[1] J. C. Ferreira and J. S. Matos, “A Prototype System for Rapid Application Development Using Dynamically Reconfigurable Hardware,” Proceedings. IEEE Symposium on FPGAs for Custom Computing Machines, pp. 280-281, 1998.

[2] A. Y. Wu, K. J. Liu, and A. Raghupathy, “System Architecture of an Adaptive reconfigurable DSP Computing Engine,” IEEE Trans. On Circuits and systems for Video Technology, vol. 8, no. 1, pp. 54-73, Feb. 1998.

[3] T. Yamauchi, S. Nakaya, and N. Kajihara, “SOP: A Reconfigurable Massively Parallel System and Its Control- Data-Flow Based Compiling Method,” Proceedings of IEEE Symposium on FPGAs for Custom Computing Machines, pp. 148- 156, 1996.

[4] E. Waingold, M. Taylor, D. Srikrishna, V. Sarkar, W. Lee, V. Lee, J. Kim, M. Frank, P. Finch, R. Barus, J. Babb, S. Amarasinghe, and A. Agarwal, “Baring It All to Software: Raw Machines,” IEEE Computer, vol. 30, no. 9, pp.86-93, Sept. 1997.

[5] C. R. Rupp, M. Landguth, T. Garverick, E. Gomersall, H. Holt, J. M. Arnold, M. Gokhale, K. L. Pocek and J. M. Arnold, “The NAPA Adaptive Processing Architecture,” Proceedings of IEEE Symposium on FPGAs for Custom Computing Machines, pp. 28-37, 1998.

[6] V. K. Madisetti and T. W. Egolf, “Virtual Prototyping of Embedded Microcontroller-Based DSP Systems,” IEEE Micro, vol. 15 no. 5, Oct. 1995, pp. 9 —21.

[7] P. Banerjee, N. Shenoy, A. Choudhary, S. Hauck, C. Bachmann, M. Haldar, P. Joisha, A. Jones, A. Kanhare, A. Nayak, S. Periyacheri, M. Walkden, and D. Zaretsky, “A MATLAB Compiler for Distributed, Heterogeneous, Reconfigurable Computing Systems,” Proceedings of the

2000 IEEE Symposium on Field-Programmable Custom Computing Machines, pp. 39—48.
[8] Garbergs B. and Sohlberg B., “ Specialised hardware for state space control of a dynamic process, ” TENCON ''96. Proceedings. 1996 IEEE TENCON. Digital Signal Processing Applications, Volume: 2, 26-29 Nov 1996, pp.895 —899.
[9] Cucinotta F., Lavagno L., Reynari L. M., Serra A., “ A hardware/software co-design flow and IP library based of SimulinkTM, ” Design Automation Conference, 2001, Proceedings, 2001, pp.593 —598.
[10] Molson P., “ Accelerating intellectual property design flow using Simulink Lt for system on a programmable chip, ” Signals, Systems and Computers, 2001. Conference Record of the Thirty-Fifth Asilomar Conference on , Volume: 1 , 2001, pp. 454 -457 vol.1.
[11] Garbergs B. and Sohlberg B., “ Implementation of a state space controller in a FPGA. ” Electrotechnical Conference, 1998. MELECON 98., 9th Mediterranean , Volume: 1 , 18-20 May 1998, pp. 566 -569 vol.1 [12] Ho K., Shiu S.C.K., Tsang E.C.C., Wang X.Z., “ Case-base reduction using learned local feature weights, ” IFSA World Congress and 20th NAFIPS International Conference, 2001. Joint 9th , 25-28 July 2001, pp. 2965 -2970 vol.5.
[13] Dang Huu Hung, Drake J.T., Nguyen Hoang Phuong, Prasad N.R., “ Approach to combining case based reasoning with rule based reasoning for lung disease diagnosis, ” IFSA World Congress and 20th NAFIPS International Conference, 2001. Joint 9th , Volume: 2 , 25-28 July 2001, pp. 883 - 888 vol.2.
[14] Chi R.T., Kiang M.Y., Whinston A.B., “ Case based reasoning to model building, ” System Sciences, 1993, Proceeding of the Twenty-Sixth Hawaii International Conference on , Volume: iii , 5-8 Jan 1993, pp. 324 -332 vol.3.
[15] Ando S., Yamazaki K., “ A case-based parallel programming system, ” Software Engineering for Parallel and Distributed Systems, 1998. Proceedings. International Symposium on, 20-21 Apr 1998, pp. 238 —245.
[16] Cheng-Seen Ho, “ Development of a meta-blackboard shell, ” Tools for Artificial Intelligence, 1990, Proceedings of the 2nd International IEEE Conference on , 6-9 Nov 1990, pp. 544 —550.
[17] Hou P. K., Lin L. J. and Shi X. Z., “ Generic blackboard based architecture for data fusion, ” Industrial Electronics Society, 2000. IECON 2000, 26th Annual Confjerence of the IEEE , Volume: 2 , 2000, pp. 864 -869 vol.2.
[18] Stetter F. and Weiss M., “ A hierarchical blackboard architecture for distributed AI systems, ” Software Engineering and Knowledge Engineering, 1992, Proceedings, Fourth International Conference on , 15-20 Jun 1992, pp.349 —355.
[19] Davis G.C., Jie Cheng, Nanxin Wang, Staley S.M., “ Rapid integration of CAE analysis programs using a blackboard approach, ” Artificial Intelligence for Applications, 1994., Proceedings of the Tenth Conference on , 1-4 Mar 1994, pp. 495 —496.
[20] Naaman M., Zaks A., “ Fractal blackboard framework, ” Computer Systems and Software Engineering, 1997., Proceedings of the Eighth Israeli Conference on , 18-19 Jun 1997, pp. 23 —29.
[21] Blackboard Technology Group, Inc. “ GBB Reference, ” Version 2.1, 1992.
[22] Michael Schumacher, “ Objective Coordination in Multi- Agent System Engineering Design and Implementation, ” Springer, 2001.
[24] Janet Kolodner, “ Case-Based Reanoning, ” Morgan Kaufmann Publisher, Inc. 1993.
[25] Mario Lenz, Brigitte Bartsch-Sporl, Hans Burkhard and Stefan Wess, “ Case-Based Reasoning Technology From Foundations to Applications, ” Springer, 1998.
[23] Borland, “ Borland C++ Builder 6 Developer's Guide, ” 2001.
[26] The Mathworks, 2002. See http://www.mathworks.com./ [27] The Xilinx, 2002. See http://www.xilinx.com/ [28] 黃其泮, 劉仁俊, 陳木松, ” 數位式波束形成器之調適型計算系 統, ” 1999年海峽兩岸無線通訊研討會, pp.372-377, Oct. 18-19, 1999.
[29] 黃其泮, ” 以黑板系統為基礎的軟體無線電開放式系統架構, ” 第 五屆人工智慧與應用研討會, pp.722-727, Nov. 17, 2000.
[30] 黃其泮, 蔣志雄, “ 數位訊號處理實體應用系統產生器的設計與實 作, ” 2001年兩岸三地無線科技研討會, pp.138-142, Nov. 30~Dec. 3, 2001.