

Paper Title *TODO edit*

1st Given Name Surname
Faculty of Computer Science and Mathematics
OTH Regensburg
Regensburg, Germany
name.surname@st.oth-regensburg.de

Abstract—text
Index Terms—keyword1, keyword2

I. INTRODUCTION

- A. Overview
- B. Motivation
- C. Goal

II. BACKGROUND

- A. Instruction Set Architectures
- B. RISC
- C. ARM
text
- D. RISC-V
text

III. CONCEPT AND METHODS

- A. Business Models

Who develops the CPU cores, how can you get access to them? Who supports chip manufacturers in designing a chip with that CPU core?

- B. Complexity

How many instructions are there? How complex does that make the implementation of a core?

- C. Performance

What are the differences in code size? Can we accurately compare the execution speed of both ISAs?

- D. Extensibility

What instruction set extensions are there for both ISAs? Who can develop new extensions?

- E. Ecosystem

Which compilers support ARM and RISC-V? Which operating systems and libraries?

IV. DISCUSSION

- A. ARM

What are the advantages of ARM compared to RISC-V?

- B. RISC-V

What are the advantages of RISC-V compared to ARM?

- C. Future directions and challenges

How can we more accurately measure performance differences between ARM and RISC-V and how do ISA extensions affect performance?

V. CONCLUSION AND OUTLOOK

- A. Summary of results
- B. Accuracy of results
- C. Future directions

VI. OVERVIEW OF LITERATURE

Alexander Schmid [1] [2] [3] [4] [5] [6] [7] [8] [9]
Florian Henneke [8] [10] [3] [11] [12] [13] [14] [12]
Michael Schneider [15] [16] [17] [18] [19] [20] [21]

REFERENCES

- [1] A. Akram, "A Study on the Impact of Instruction Set Architectures on Processor's Performance," Ph.D. dissertation, Western Michigan University, 08 2017.
- [2] *Arm® Architecture Reference Manual. Armv8, for Armv8-A architecture profile*, Issue F.c ed., ARM, Jul. 2020.
- [3] K. Asanović and D. A. Patterson, "Instruction Sets Should Be Free: The Case For RISC-V," University of California, Berkeley, Tech. Rep. UCB/EECS-2014-146, 2014.
- [4] Heui Lee, P. Beckett, and B. Appelbe, "High-performance extendable instruction set computing," in *Proceedings 6th Australasian Computer Systems Architecture Conference. ACSAC 2001*, 2001, pp. 89–94.
- [5] D. Patterson, J. Bennett, P. Dabbelt, C. Garlati, and O. Shinaar, "Initial Evaluation of Multiple RISC ISAs using the Embench™ Benchmark Suite," Dec. 2019, accessed on 2020-10-24. [Online]. Available: <https://riscv.org/wp-content/uploads/2019/12/12.10-12.50a-Code-Size-of-RISC-V-versus-ARM-using-the-Embench%E2%84%A2-0.5-Benchmark-Suite-What-is-the-Cost-of-ISA-Simplicity.pdf>
- [6] M. Perotti, P. D. Schiavone, G. Tagliavini, D. Rossi, T. Kurd, M. Hill, L. Yingying, and L. Benini, "HW/SW Approaches for RISC-V Code Size Reduction," in *Workshop on Computer Architecture Research with RISC-V. CARRV 2020*, 2020.
- [7] C. Shore, *Armv8-A Architecture Overview*, ARM Limited, Sep. 2015.
- [8] A. S. Waterman, "Design of the RISC-V Instruction Set Architecture," Ph.D. dissertation, University of California, Berkeley, 2016.
- [9] X. H. Xu, S. R. Jones, and C. T. Clarke, "ARM/THUMB code compression for embedded systems," in *Proceedings of the 12th IEEE International Conference on Fuzzy Systems (Cat. No.03CH37442)*, 2003, pp. 32–35.
- [10] L. Ryzhyk, "The ARM Architecture," Tech. Rep., 2006.
- [11] S. Furber, *ARM System-on-Chip Architecture*, 2000, no. a.
- [12] Microsoft, "Windows 10 on ARM," 2020. [Online]. Available: <https://docs.microsoft.com/en-us/windows/uwp/porting/apps-on-arm>
- [13] Greenwaves Technologies, "Arm® Mbed™ OS Porting Manual for GAP8," accessed on 2020-10-28. [Online]. Available: <https://greenwaves-technologies.com/manuals/BUILD/MBED-OS/html/index.html>

- [14] Amazon Web Services, "Using FreeRTOS on RISC-V Microcontrollers," accessed on 2020-10-28. [Online]. Available: <https://www.freertos.org/Using-FreeRTOS-on-RISC-V.html>
- [15] G. David Patterson and U. Berkeley, "50 years of computer architecture," 2018.
- [16] J. Hennessy, *Computer architecture : a quantitative approach*. Waltham, MA: Morgan Kaufmann, 2012.
- [17] R. D. Vladimir Herdt, Daniel Große, *Enhanced virtual prototyping featuring risc-v case studies*. S.I: SPRINGER NATURE, 2020.
- [18] M. D. H. of Wisconsin-Madison; Dave Christie; David Patterson; Joshua J. Yi; Derek Chiou; Resit Sendag, "Proprietary versus open instruction sets," *IEEE Micro*, 2016.
- [19] S. Higginbotham, "The Rise of RISC," *IEEE Spectrum*, 2018.
- [20] R. Dirvin, "The arm ecosystem: More than just an ecosystem, it's oxygen for soc design teams," April 2019. [Online]. Available: <https://www.arm.com/company/news/2019/04/the-arm-ecosystem-more-than-just-an-ecosystem>
- [21] Z. Bandic, IEEE Computing Society, March 2019. [Online]. Available: <http://www.hsafoundation.com/the-inherent-freedom-of-heterogeneous-systems/>