State of the ART: An Index Structure for Main Memory Databases

JONAS FRITSCH, Technische Universtität München

With recent trends in hardware, main memory capacities have grown to an extent where most traditional DBMS can fit entirely into main memory. These changes introduced a new shift of the performance bottleneck from disk-based I/O to Main-Memory access.

While previous Index-Structure like the B-Tree were optimized for minimizing disk access, the adaptive radix tree (ART) is a trie-based index structure designed explicitly for in-memory usage. It utilizes newer architecture features like SIMD and caching effectively and compresses its structure dynamically, both horizontal and vertical. With these measures, ART achieves a performance that beats other state-of-the-art order-preserving index structures in both insertion and single-lookup time.

1 INTRODUCTION

The architecture of DBMS has constantly been evolving due to advances in hardware. Over the last few decades, main memory capacities increased from several megabytes up to thousands of gigabytes, such that nowadays, databases can fit entirely into main memory. This change significantly impacted the general architecture of DBMS, which resulted in performance improvements by several factors [1], [2].

The design of index structures used to query a set of data more efficiently was heavily influenced by the main performance bottleneck of disk I/O in traditional disk-based DBMS.

2 ADAPTIVE RADIX TREE

Lorem ipsum.

3 CONSTRUCTING BINARY-COMPARABLE KEYS

Lorem ipsum.

4 EVALUATION

Lorem ipsum.

5 RELATED WORK

Lorem ipsum.

6 CONCLUSION AND FUTURE WORK

Lorem ipsum.

REFERENCES

[1] Stavros Harizopoulos, Daniel J Abadi, Samuel Madden, and Michael Stonebraker. 2018. OLTP through the looking glass, and what we found there. In *Making Databases Work: the Pragmatic Wisdom of Michael Stonebraker*. 409–439.

[2] Hao Zhang, Gang Chen, Beng Chin Ooi, Kian-Lee Tan, and Meihui Zhang. 2015. In-memory big data management and processing: A survey. *IEEE Transactions on Knowledge and Data Engineering* 27, 7 (2015), 1920–1948.

Author's address: Jonas Fritsch, Technische Universtität München, Fakultät für Informatik, fritsch@in.tum.de.