Techniques based on sharing data and computation among queries have been an active research topic in big data management systems. While work in this area developed algorithms and systems that are shown to be effective, there is a lack of logical foundation for query processing and optimization. In this research, we present PsiDB, a system model for processing a large number of database queries in a batch. The key idea is to generate a single query expression that returns a global relation containing all the data needed for individual queries. For that, we propose the use of a type of relational operators called $\psi$-operators in combining the individual queries into the global expression.

We tackle the algebraic optimization problem in PsiDB by developing equivalence rules to transform concurrent queries with the purpose of revealing query optimization opportunities. Centering around the $\psi$-operator, our rules not only covered many optimization techniques adopted in existing batch processing systems but also revealed new optimization opportunities. We also sketch our vision on the development of a query optimizer following the PsiDB strategy and highlight the key challenges in PsiDB system implementation. Experiments conducted on an early prototype of PsiDB show a significant performance improvement over a mainstream commercial DBMS.

Exhibiting Committee
Sisinnio Concas, Ph.D., Chairperson
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Xinming Ou, Ph.D.
Sriram Chellappan, Ph.D.
Mingyang Li, Ph.D.
Ming Ji, Ph.D.

Friday, December 6, 2019
11:00 AM
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THE PUBLIC IS INVITED

Publications

Robert Bishop, Ph.D.
Dean, College of Engineering

Dwayne Smith, Ph.D.
Dean, Office of Graduate Studies

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