Query Optimization using Multiple Techniques

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ABSTRACT
Query optimization is the overall process of choosing the most efficient means of executing a SQL statement. The optimizer attempts to generate the best execution plan for a SQL statement. The best execution plan is defined as the plan with the lowest cost among all considered candidate plans. SQL is a nonprocedural language, so the optimizer is free to merge, reorganize, and process in any order. The cost is a number that represents the estimated resource usage for an execution plan. The cost computation accounts for factors of query execution such as I/O, CPU, and communication. To implement query optimization methods such as Heuristic Greedy based optimization, Iterative Improvement based cost optimization and Ant Colony optimization algorithms. Show Comparison of cost, execution time and response time between Heuristic Greedy based optimization; Ant Colony Optimization and Iterative Improvement based cost optimization algorithms.

Keywords
Query Optimization, Heuristic-based optimizers, Ant-Colony

1. INTRODUCTION
Query processing denotes to the range of activities elaborate in retrieve data from databases. The activities involve translation of queries in high-level database languages into looks that can be used at the objective level of the file system, a range of query-optimizing changes, and actual evaluation of queries [4].

Query process is the method by which the query results are retrieved from a high-level query like SQL or OQL. Generally, the query optimizer can't be accessed directly by any users, after queries are accepted to database server, and construed by the parser, then passed to the query optimizer where optimization happens.

There are three parts that a query passes over during the DBMS' processing of that query:

- Parsing and translation
- Optimization
- Evaluation

2. LITERATURE REVIEW
Duy-Hung Phan et al. [1] they worked on methodology to the overall problem of optimizing of multiple groups by queries, so filling the gap left by current proposals can scale within the variety of synchronic queries or the quantity of attributes every query can handle. they need shown, each through an experiment and on paper, that our rule incurs in extraordinarily tiny latencies, compared to different algorithms, once producing optimized query plans.

Vishal P. Patel et al. [2] described Reduce intermediate result size ultimately reduces the execution time. Experiment result expressions association of Heuristic and Greedy approach keeps improved performance for optimization of large join query. Optimization only on select-project-join queries too requirements to handle complex queries.

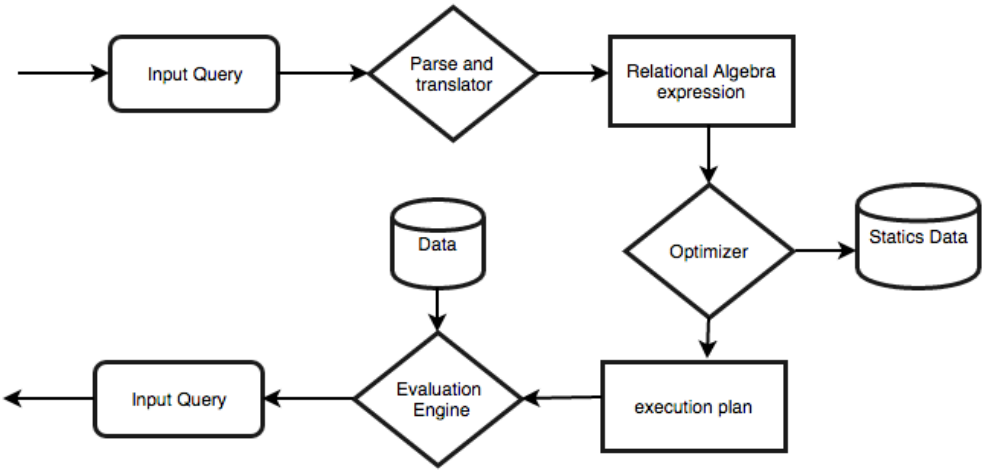

Figure 1: Query Processing

Myungcheol Lee, Miyoung Lee et al. [3] In this paper, a unique SQL query improvement system supported JIT compilation. Our planned system can generate economical machine language for OLTP, OLAP, stored Procedure workloads by applying selective, artificial improvement techniques, and also the generated machine codes area unit adjective to runtime status of heterogeneous environments.

Table 1: Paper details, which used in literature survey

Paper Title	Author	Work Done	Limitation
Ant Colony-Based Approach for Query Optimization	Hany A. Hanafy(&) and Ahmed M. Gadallah	They used Ant Colony optimization process with parallel search thread to optimize query.	In this paper they focus on physical optimizer in place of logical .
Heuristic Based Query Optimization	Vishal Hatmode, Prof. Sonali Rangdale	In this paper, they enlist the process of SQL query optimization based on Heuristic approach.	Some of the basic techniques of query processing and optimization will be presented in this project.
Introduction to Query Processing and Optimization	Dr. G. R. Bamnote,Prof. S. S. Agrawal	A great deal of research and resources is spent on creating smarter, highly efficient query optimization engines. Some of the basic techniques of query processing and optimization have been presented in this paper.	The experiments performed are not related to the techniques mentioned in the paper.

3. QUERY OPTIMIZATION METHODS

3.1 Heuristic Greedy based optimization:

Heuristic optimization transforms the query-tree b using a set of rules that typically (but not in all cases) improves execution performance.

1. Perform selection early (reduces the number of tuples)

2. Perform projection early (reduces the number of attributes)

3. Perform most restrictive selection and join operations (i.e. with smallest result size) before other similar operations.

Heuristic Greedy based optimization Algorithms steps,

1. First the parsed query must pass the query transformer inside the optimizer the query transformer rewrite the query using heuristic [2]
2. Achieve selection and projection as early as feasible
3. Predicate pushdown
4. Sub query nesting

3.2 Ant Colony based optimization:

Ant Colony Optimization is based on artificial System. Ant colony Optimization system based of real Ant Colonies. Using Ant Colony Optimizer to solve discrete optimization problem.

Naturally Observed Ant Behavior is shown in below Figures. Ant Colony Query optimization algorithms steps: The ability of ant colonies to select shortest paths can be understood as the result of the synergistic interaction among a number of elements such as:

1. A population (colony) of foraging ants,
2. Forward-backward path following,
3. Step-by-step laying and sensing of pheromone,
4. Sequence of stochastic decisions biased by local pheromone intensity,
5. Positive feedback,
6. Implicit path evaluation,
7. Iteration over time.

3.3 Genetic Algorithm

Genetic algorithms area unit supported choice, crossover and mutation. It evolves a population of chromosomes representing potential problem solutions encoded into appropriate knowledge structures. Using Genetic algorithm to finds query optimization problem. To solve Query Optimization problem using Genetic algorithm step are

- Select random population of solutions. It is called chromosomes.
- Genetic factor hold collection value for optimization.
- To calculate factor value using fittest method and exchange best chromosome data.

4. COMPARISON BETWEEN QUERY OPTIMIZATION METHODS

Table 2: Comparison between Query optimization Methods

	Replication	**Parameters**	**Methods**	**Flexibility**
Heuristic Greedy based optimization	Not Restricted	No. Of joins	Selection a projection	Not Flexible
Ant Colony based optimization	Not Restricted	.Number of ants Number of iterations Pheromone evaporation rate Pheromone reward factor.	Pheromone trails	Not Flexible
Genetic Algorithm	Restricted	Population size No of generations Crossover rate Mutation rate.	selection, crossover mutation	Not Flexible

5. CONCLUSION

We compare query optimization methods such as Heuristic Greedy based optimization; Iterative Improvement based cost optimization and Ant Colony optimization algorithms. Show Comparison of cost, execution time and response time between Heuristic Greedy based optimization; Ant Colony Optimization and Iterative Improvement based cost optimization algorithms.

6. REFERENCES

[1] Duy-Hung Phan et al.“A Novel, Low-latency Algorithm for Multiple Group-By Query Optimization” ICDE 2016 Conference ,IEEE , 978-1-5090-2020-1/16 2016 IEEE.

[2] Vishal P. Patel, Hardik R. Kadiya “Optimization of Large Join Query using Heuristic Greedy Algorithm ” IJCAT - International Journal of Computing and Technology Volume 1, Issue 1, February 2014 www.IJCAT.org

[3] Myungcheol Lee et al. “A JIT Compilation-based Unified SQL Query Optimization System” 978-1-5090-3765-0/16/ ©2016 IEEE

[4] Saurabh gupta ,Gopal Singh Tandel ,Umashankar Pandey , “A Survey on Query Processing and Optimization in Relational Database Management System ”, International Journal of Latest Trends in Engineering and Technology (IJLTET) ,Vol. 5 Issue 1 January 2015 , ISSN: 2278-621X

[5] Dr. G. R. Bamnote Professor & Head Dept. of CSE, PRMITR, Badnera, India ,Prof. S. S. Agrawal ,Asst. Prof Dept. of CSE, COE & T, Akola, India ,” Introduction to Query Processing and Optimization ”, International Journal of Advanced Research in Computer Science and Software Engineering , Volume 3, Issue 7, July 2013 ISSN: 2277 128X

[6] A. K. Giri and R. Kumar, “Distributed query processing plan generation using iterative mprovement and simulated annealing,” 2013 IEEE 3rd International Advance Computing Conference, pp. 757-762, Feb. 2013.

[7] T. Kumar, V. Singh and A. K. Verma, “Distributed query processing plans generation using genetic algorithm,” International Journal of Computer Theory and Engineering, pp. 38-45, 2011.

[8] Melanie Mitchell, “An introduction to Genetic Algorithms”, Prentice Hall of India, 2004

[9] Hsiung Sam, Matthews James, “An introduction to Genetic Algorithms”, 2000 http://www.generation5.org/content/2000/ga.asp

[10]http://en.wikipedia.org/wiki/Category:Optimization_algorithms.

[11]http://iridia.ulb.ac.be/~mdorigo/ACO/about.htm