

A Cache Operation in Mobile Database Using Genetic Algorithm

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Abstract— There are many issues concerning the effective use of mobile systems, both in respect of the current technology and those likely to become available in the near future. For mobile databases the most important of these issues are:

- The relative unreliability of connections (and the variability of bandwidth when connected),
- The limitations on storage capacity, and
- The security and privacy issues created when a computer is in a mobile environment.

One of methods of prevention of transaction aborts prediction and sending. Applying additional information for mobile system in order to prevention of transaction aborts during disconnection of mobile system with wireless network until connection with the next wireless network during mobilization. The goal of this work is presentation of solution for prediction information for sending mobile system in order to use cache operation with usage Genetic algorithms.

Index Terms— Mobile Database; Cache Operation; Genetic Algorithm; Objective Function; Chromosome.

I. INTRODUCTION

A mobile database [5] is a database than can be connected to by a mobile computing device over a mobile network. The client and server have wireless connections. A cache is maintained to hold frequent data and transactions so that they are not lost due to connection failure. A database is a structured way to organize information [10]. This might be a list of customers, sales figures or even how far it drove to meet with a client.

The use of laptops, mobiles and PDAs is increasing and likely to increase in the future with more and more applications residing in the mobile systems. While those same analysts can't tell exactly which applications will be the most popular, it is clear that a large percentage will require the use of a database of some sort. Many applications such as databases would require the ability to download information from an information repository and operate on this information [2] even when out of range or disconnected.

There are some disadvantages in this kind of service such as limitation in nurture sources for mobile networks high expenses and limitation of band-width in mobile networks which causes disconnection between mobile network and the mobile service station (MSS). The

disconnection rebound transaction abort and mobile systems have to redo transaction from start. This needs extra expenses such as connection to network and additional time. One method of preventing of transactions the mobile service station as receives he mobile networks request predicts the additional data and sends them to the mobile network.

The mobile networks save the additional data in its memory (cache) and in the case or emerging appealing data [4]. In local memory through applying of the transaction on next ones makes use of them so there in not any need for connecting and sending request for data. This prevents transaction abort due to disconnection [8]. Therefore it is helpful in reducing expenses and improving responding to the user of mobile system. The mossy important factor in this technique is exact prediction of data for sending which needs data excavating in database. Here the genetic algorithm to do this.

Along with advantages in wireless connection technology and portable computing Systems called mobile computing user are table to access to data and services regardless to their physical positions and movements. In fact emerging of computer networks specially internet as well as inventing mobile computing such as pocket computers and pads. And also users needs for accessions to the internet from any place and in any time is the main reason to emerge of wireless network [11]. Millions of user desire for wireless networks and portable computer and their user maintain the connection through displacement in such a system regarding to wireless surrounding and nature and mobile users the environment is posed in a new way.

II. CACHE OPERATION

Cache operation in Database systems can have a vital role in decreasing connection with service reinders/receivers and increasing auto Macy of MU's in order to adopt the local transaction. In a mobile processing environment data are saved on MSS. Data control and any operation on data are studied by MSS and registered in Database as they confirmed. In Cache operatic the data is transferred between MSS and MU. MU's can decrial connection expenses between MSS and MU. MU's can apply the cache operation in their

Database that is like MSS Database. Through this access to needed data is done faster and request amount is decreased as a Mobile unit gives a request if the data are available it will use it and send the result to the service rendered. In condition that the data are not available or part of it is accessible MU will send the request service rendered for more study.

III. GENETIC ALGORITHM

Genetic algorithm (GA) is a method for an affection search in a vast area which at last creates a way to get a best answer. The advantage of hat is codes are able to convert continual areas to disconnected ones. One of the differences between GA with preview ones is that in GA the dead; with a population or set of points at once. It means that GA can cover a lot of designs at once another point is that GA is based on accidental processing. Generally in using GA, three important issues should be clarified [6].

- Definition of aim function or expense function.
- Definition and implementation of genetic area.
- Definition and implementation of GA operations.

As long as these three parts are well defined GA will work correctly and over all system efficiency can be improved by doing source changes GA is designed on the base of best species survival and best kind's reproduction. First the algorithm [3] starts by a set of accidental responses (chromosomes) which called population. These responses population method propulsion .these responses are used or build method for choosing the new population are depend on their stability so the best ones have more chance to reproduce. This continues to come to the final criteria (access to the best solution).

A. Definition

- 1) *Population*: All the agents in MSS connected to Fixed or mobile network.
- 2) *Chromosome*: It considers each agent as a chromosome.
- 3) *Gene*: The records on each agent's table. Its features are like index structure.
- 4) *Crossover*: Finding one of the best data (records) for predicting and sending to MU.
- 5) *Objective function*: A function to help to choose the records

B. Prediction with Genetic Algorithm

- 1) Choosing some chromosomes between all for preliminary population.
- 2) Appointing selection function witch is computed through commutation of Votes.
- 3) Producing new chromosome by:
- 4) Choosing two chromosomes from population and according to Objective function for Crossover.
- 5) Merging two parental chromosomes with one possibility in order to get the new generation.
- 6) Using the new population for reaccomplishment.

- 7) If there is not final condition (ceasing improvement).

IV. APPLIED GENETIC ALGORITHM

A genetic algorithm is a stochastic, biologically inspired search method suitable for finding (near) optimal solutions in complex search spaces [4, 5, 7].

A. Solution Representation

Each solution (index configuration) is represented in the form of a matrix, where the matrix columns are table columns sorted in the lexical order and grouped by tables in the configuration. The matrix rows are index representations with the sequential number of the column in the index or empty value if the column is not part of the index, as it is shown in Figure 1.

	[T1.C1 T1.C2 ... T1.Ci ... T1.Cn] ... [Tn.C1 Tn.C2 ... Tn.Ci ... Tn.Cn]
1	1 2 ... 1
.	
i	1 2 3 ... 2 1
.	
n	1 2 ...

Fig 1: Representation of an index configuration

Each table in the index configuration has a data statistics structure which contains all parameters used in the creation of a new index set. The number of different values is one of the column parameters used in the evaluation of the probability that the column will be used in the index. Previously used columns are not used in the subsequent steps of search for the next index column, and the probability of the unused columns increases.

The propagation of good genetic material (usable indexes) among index configurations is part of the evolution mechanism. It is performed by two genetic operators: recombination and mutation. When genetic operators are applied to an index configuration, the fitness value of a new or changed configuration is re-evaluated. The usability of indexes is also checked and all unusable indexes are removed from the configuration.

B. Mutation

There are two kinds of mutation used in our genetic algorithm. One adds a new column to the existing index, and the other one adds a new index to the existing index configuration (if the number of table indexes < Δt). The mutation operator is illustrated in Figure 2.

	[T1.C1 T1.C2 ... T1.Ci ... T1.Cn] ... [Tn.C1 Tn.C2 ... Tn.Ci ... Tn.Cn]
1	1 2 ... 1
.	
i	1 2 3 ... 2 1
.	
n	1 2 ...

Figure 2: The mutation operator

C. Recombination

Individuals are chosen for recombination from a mating pool with uniform probability not depending on fitness. Parents simply add their index configurations, checking for possible equality of indexes. Each equal index is added only once. The recombination operator is shown in detail in Figure 3.

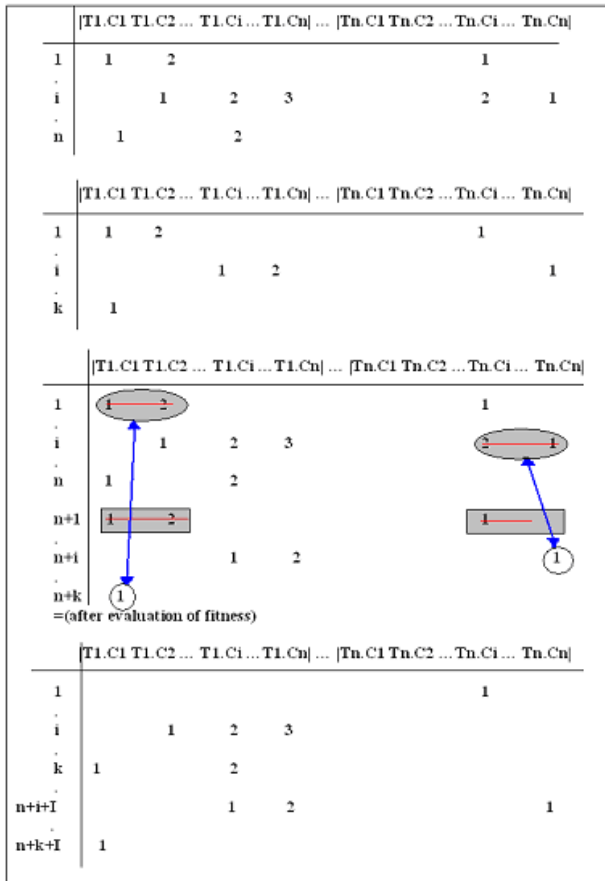


Figure 3: The recombination operator

D. Selection

After the execution of genetic operators, the new population members are added to the mating pool. Furthermore, the fitness is evaluated for all new population members and the members are sorted by their fitness values. The first N individuals, where N is the population size, are then chosen for the next step of the evolution process.

V. CONCLUSION

Development of database management systems nowadays often involves processes and tools that make use of human knowledge and judgment. However, in this specific area of information technologies, there is still a lot of space for implementing various computational intelligence techniques. This paper describes one of them – a genetic algorithm approach to the database index selection problem.

VI. FUTURE WORK

Future work on this tool will include tuning of the genetic algorithm to achieve the best possible performance, systematic tests on real databases under various query workloads, and evaluation of the obtained index configurations, particularly in comparison with human-defined solutions.

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