

Accepted Manuscript

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PII: S0020-0255(16)31109-4
DOI: [10.1016/j.ins.2018.04.030](https://doi.org/10.1016/j.ins.2018.04.030)
Reference: INS 13573



To appear in: *Information Sciences*

Received date: 11 October 2016
Revised date: 20 October 2017
Accepted date: 7 April 2018

Please cite this article as: Marcos Roberto Ribeiro, Maria Camila N. Barioni, Sandra de Amo, Claudia Roncancio, Cyril Labbé, Incremental Evaluation of Continuous Preference Queries, *Information Sciences* (2018), doi: [10.1016/j.ins.2018.04.030](https://doi.org/10.1016/j.ins.2018.04.030)

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Incremental Evaluation of Continuous Preference Queries

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Abstract

Over recent decades, several studies regarding the incorporation of preferences into query languages have been developed in the database research field. The enthusiasm and interest in this research topic is due to its use in important practical applications such as e-commerce and social networks. An example of a solid work in this research field for relational databases is the CPrefSQL language that allows for the execution of queries with conditional preferences. More recently, due to the broad spectrum of new data stream applications, the interest in *continuous* query processing by the database community has shown a notable increase. The evaluation of preferences in continuous queries poses additional challenges, since data change rapidly in data stream scenarios. In order to aid in dealing with these issues, we proposed an incremental and efficient method for evaluating continuous CPrefSQL queries. We revisited the state of the art algorithms for the evaluation of continuous CPrefSQL queries and compared these with our new approach. We conducted a detailed complexity analysis and an extensive set of experiments with synthetic and real datasets, which shows that our proposed algorithm has considerably superior performance.

Keywords: Query Evaluation, Conditional Preferences, Data Streams

1. Introduction

Preference queries play a fundamental role in applications that require personalized searches. While the traditional query model employs *hard constraints* to select the tuples that compose the query result, in the preference query model the preferences are used as *soft constraints* with the aim of establishing a preference order over the tuples. Therefore, *preference queries* can select the most preferred tuples from a list of tuples ordered according to a given preference degree [16, 9, 28].

Despite of the existence of many research studies based on preference queries dedicated to *skyline queries*, they are, in fact, not suitable for many practical situations. In a *skyline query*, the user specifies independent preferences for minimum or maximum values over attributes [2, 10]. However, many domain applications requires the users to express conditional preferences. The *conditional preference queries*, *cp-queries*, were introduced in [12, 25]. This query approach allows for establishing of preferences for an attribute according to the values of other attributes. For instance, suppose that a stock market investor wants to buy stocks according to some preferences. The cp-query approach allows this investor to express preferences such as: “if the stock sector is B, I prefer stocks from USA than those from Brazil”. This kind of preference cannot be expressed in skyline queries.

Recently, the growing emergence of new applications, where the data change rapidly, has increased the interest in research related to continuous preference queries (i.e., preferences queries over data streams) [31, 23, 30, 19, 20]. The evaluation of continuous preference queries has additional challenges, mainly related to performance and efficiency. Usually, this research uses incremental query evaluation in order to avoid delays caused by expensive recalculations. Example 1 illustrates an interesting application of continuous preference queries considering the stock market context.

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