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FUZZY QUERY PROCESSING ON RELATIONAL DATABASE SYSTEMS FOR TARGETED ADVERTISING

Abstract. *The given paper is dedicated to fuzzy queries processing on relational databases. A feature of the work is that a methodology has been developed based on the Theory of Fuzzy Sets and Logic, which allows you to make database queries that are written completely in natural language.*

The aim of the project is to develop an effective methodology and application for processing fuzzy queries with the aim of introducing a natural language into the process of setting up targeted advertising using fuzzy logic.

A distinctive advantage of the developed system is that it allows you to make a request in a natural language, without the need to follow the standard rules for querying. In addition, this methodology can easily be integrated into the system from any field in which the target selection may have fuzzy conditions.

As a result, a methodology was created for processing fuzzy requests in a natural language, as well as a system from the field of targeted direct marketing, in which a target selection based on the proposed method takes place

Keywords: *fuzzy query, fuzzy sets and logic, target selection, natural language processing.*

Targeted marketing involves dividing a market into segments and then concentrating your marketing efforts on one or a few key segments consisting of the clients whose needs and desires most closely match your products or services. It is an efficient way to attract new business, increase sales, and make your business a success. An important data mining problem from the world of direct marketing is target selection [1]. Fuzzy models for target selection are suitable solutions as they can be used to obtain results from both numerical and linguistic input parameters. Just the same, queries to the database composed by a person often have some degree of fuzziness. Fuzzy principles are the core of this project since fuzzy logic is a very efficient solution for complex problems involving natural language, perception, etc.

In this project we present a framework for fuzzy (natural) query processing and examine the possibility of using the concept of Computing with Words (CW) in it. An important use of the Computing with Words (CW) methodology, which is in the heart of fuzzy logic, is its application to decision making [2].

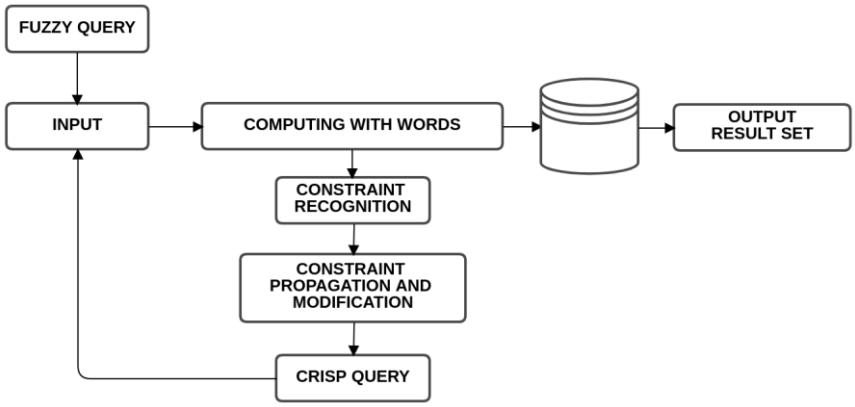

Figure 1 – Methodology for processing natural queries for target selection

In a word, our fuzzy query processing methodology includes: constructing the membership function and defining fuzzy sets for fields, defining hedges, creating crisp query from the given fuzzy query, executing a query and displaying the result set.

One of the primary points of the target selection model is determining the customers' features which will be explanatory variables in the model. In this project, as the example, we deal with the customers database with the key parameters like gender, age, marital status, income and education, with all the features except gender and marital status being fuzzy variables.

The past and new conceptual structure of the model is illustrated below:

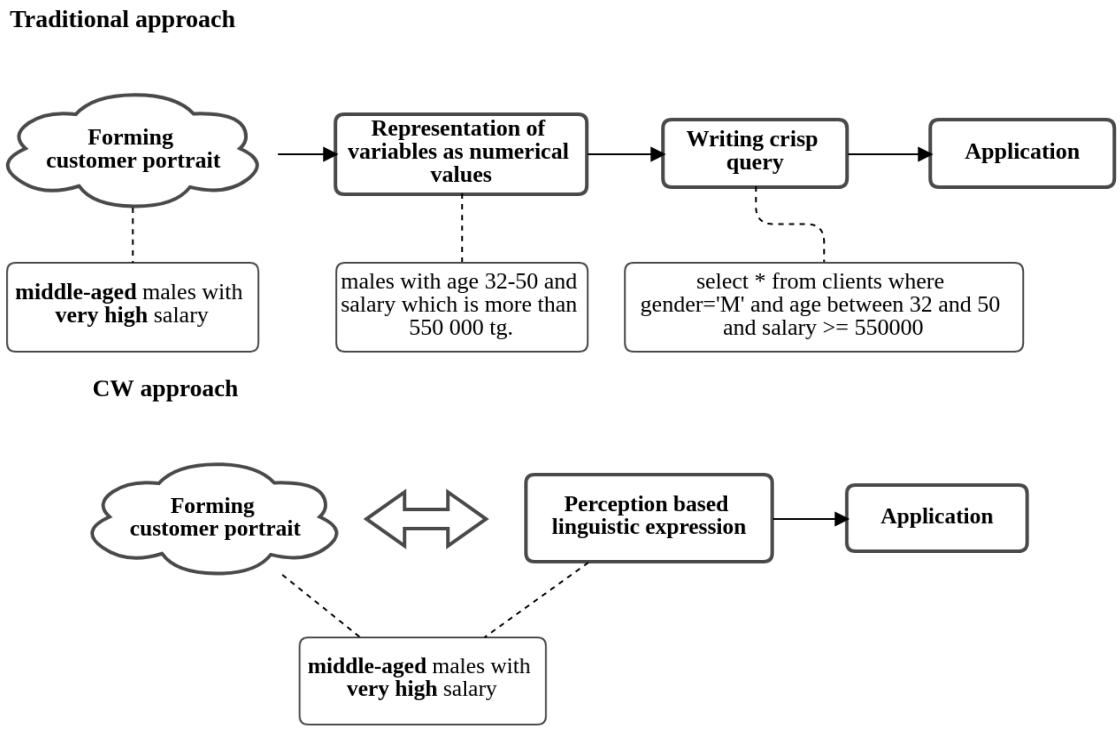

Figure 2 – The past and new conceptual structure of the model

Example query: *very young not married women with not low income.* [Threshold value: 0.6] Here we have two crisp criteria - status is not married, gender is female. Also, there are two fuzzy criteria – age is *very young* and income is not low. So, we have:

YOUNG[Age; very; μTotal = 0.6] ∩ MARRIED[Status; ; μTotal = 0]
∩ FEMALE[Gender; ; μTotal = 1] ∩ LOW[Income; not; μTotal = 0.6]
= YOUNG[Age; ; μTotal ≈ 0.8] ∩ MARRIED[Status; ; μTotal = 0]
∩ FEMALE[Gender; ; μTotal = 1] ∩ LOW[Income; ; μTotal = 0.4]

After that the system finds the values of age and income that correspond to the thresholds obtained and gives us the result fully satisfying the query.

The distinguishing feature and main advantage of the proposed methodology is that the query for target selection is done in a natural language, which is impossible using a standard query mechanism. Besides this, our method is easily adaptable and can be applied in any field where target selection of information has vague conditions.

The result of this research is a flexible methodology for fuzzy query processing as well as the prototype application performing target selection of clients for targeted advertising services based on this methodology.

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Таргеттелген жарнамаға арналған реляциялық деректер базасына анық емес сұраныстарды өңдеу

Аңдатпа. Бұл жоба реляциялық деректер базасында анық емес сұраныстарды өңдеуге арналған. Жұмыстың ерекшелігі - анық емес жиындар теория мен логикаға негізделген толығымен табиғи тілде жазылған деректер қорына сұраныс жасауға мүмкіндік беретін әдістемені жасау және оны дамыту.

Жобаның мақсаты анық емес логиканы пайдалана отырып, таргеттелген жарнама жасау процесіне табиғи тілді енгізу мақсатында анық емес сұраныстарды өңдеу үшін тиімді методология мен қосымшаны әзірлеу болып табылады.

Әзірленген жүйенің айрықша артықшылығы - сұраныстың стандартты ережелерін сақтамай толығымен табиғи тілде жасалуы, бұл пайдаланушының жұмысын жеңілдетеді, сондай-ақ, оны шарттарды нақты көрсету қажеттілігінен босатады. Сонымен қатар, бұл әдістеме әртүрлі жүйелерге оңай біріктірілуі мүмкін, оларда мақсатты таңдау анық емес болуы мүмкін.

Нәтижесінде, анық емес сұраныстарды табиғи тілде өңдеудің әдістемесі мен ұсынылған әдіс негізінде мақсатты таңдау жасалатын тікелей маркетинг саласындағы жүйесі жасалынды.

Кілт сөздер: анық емес сұраныс, айқын емес жиын және логика, директ маркетинг, табиғи тілді процестеу.

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Обработка нечетных запросов к системам реляционных баз данных для таргетированной рекламы

Аннотация. Данный проект посвящен обработке нечетких запросов к реляционным базам данных. Особенностью работы является то, что была разработана методология, основанная на Теории Нечетких Множеств и Логики, позволяющая совершать запросы к базе данных, полностью написанные естественном языке.

Цель проекта - разработать эффективную методологию и приложение для обработки нечетких запросов с целью внедрения естественного языка в процесс настройки целевой рекламы с использованием нечеткой логики.

Отличительным преимуществом разработанной системы является то, что запрос совершается полностью на естественном языке, без необходимости следования стандартным правилам совершения запросов, что упрощает работу пользователя, освобождает его от необходимости четко указывать условия. Помимо этого, данная методология с легкостью может быть интегрирована в различные системы, в которых целевая выборка может иметь нечеткие условия.

В результате была создана методология для обработки нечетких запросов на естественном языке, а также система из области целевого прямого маркетинга, в которой происходит целевая выборка на основе предложенного метода.

Ключевые слова: нечеткий запрос, нечеткие множества и логика, целевая выборка клиентов, обработка естественного языка.

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ПРИМЕНЕНИЕ SAS ДЛЯ ИССЛЕДОВАНИЯ И РАЗРАБОТКИ МЕТОДИК ЗАЩИТЫ ДАННЫХ CRM-СИСТЕМЫ ПРЕДПРИЯТИЯ

***Аннотация**. В статье представлена основная концепция разработки методик защиты данных CRM-системы предприятия. Приведены основные требования и характеристики пользовательского интерфейса, защиты данных, а также описана непосредственная процедура разработки на примере готовой CRM-системы. В качестве примера приводится база хранилища данных предприятия “ТОО Study&Work”. Исследованные методики созданы для анализа эффективности защиты данных.*

***Ключевые слова:** SAS, Customer Service and Support, CRM, нечеткая математика, инструменты создания, эффективные управленческие решения.*