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RESEARCH ARTICLE

DESIGN AND DEVELOPMENT OF FUZZY TEXT PARSER FOR QUERYING HARDWARE AND SOFTWARE INFORMATION IN A LOCAL AREA NETWORK

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ABSTRACT

Every educational organization from medium size to large size hosts Local Area Network (LAN) equipped with machines of different brands with disparate softwares installed on each of them and connected to different hardware devices. It becomes extremely challenging for the lab technician to keep track of hardware and software configuration details of LAN and their working condition. On many occasions the softwares which are rarely used are installed only on few machines of LAN. Thus, for an end user it becomes difficult to search softwares by virtually attending every machine connected to LAN. In the current paper, the authors have designed and developed a model for obtaining information of all computers connected to a workgroup or a domain controller. The hardware and software information on each machine is queried and stored in a centralized relational database management system. The stored information can be queried using Hardware Query Language (HQL) and Software Query Language (SOQL) designed by the authors. Further, to render the queries more user friendly and close to human language fuzzy text parser is designed and implemented which takes care of synonyms and superfluous words with implied meaning into account. The parse tree is developed and parser is tested for few HQL statements.

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INTRODUCTION

In this digital era, it is virtually impossible to find a single educational institute or a business premise that does not have a local area network in place. Further the size of the network is growing as the cost of the hardware is becoming affordable by any medium sized organization or institute. In all educational institutes a computer lab contains LAN which has variety of softwares installed on different machines and various hardware devices such as printers, scanners etc., connected to specific machines in a network. The various nodes connected to the network contain many configured softwares. Sometimes due to limited user licenses only few computers in the network may have some costly softwares installed. Knowledge of all the softwares installed on various nodes of a network and the information of all hardware devices connected to LAN is an extremely invaluable information to any user in general and a lab technician in particular. It becomes a nightmare to a lab technician to keep track of this information. The important information which needs to be kept update and regularly upgraded is the total number of machines connected to LAN, machine brands, softwares installed on various machines connected to LAN, software versions etc. along with their working conditions. Hence it is advisable on the part of lab technician to have a proactive approach to the network disorders rather than react to the end user complaints. Also, another task which requires automation is to periodically check which softwares on which nodes are in a working condition which is a time consuming task and is often required for lab preparation during practical examination phase. On many occasions, any minor error such as IP conflicts on the LAN requires the LAB technician to check virtually every computer connected to LAN manually which is again extremely time consuming process and is very difficult to probe. The challenge is further increased as new software is required to be installed on the network, wherein the technician is required to install the software on every machine connected to LAN. Further the whole scenario can be rendered user-friendly through Human–computer interaction (HCI) researches the design and use of computer technology, focusing particularly on the interfaces between end users and computers. Researchers in the field of HCI both *observe* the ways in which humans interact with computers and *design* technologies that

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lets humans interact with computers in novel ways. HCI is further boosted by National Language Processing. Natural language processing (NLP) is a field of computer science, artificial intelligence, and computational linguistics concerned with the interactions between computers and human (natural) languages. As such, NLP is related to the area of human–computer interaction. Many challenges in NLP involve natural language understanding, that is, enabling computers to derive meaning from human or natural language input, and others involve natural language generation. Natural Language Parsers are normally developed to bridge the gap between human language and a machine language. The challenging aspect of parsing human queries is attributed primarily to the fuzziness in the query where there is no single unique method of constructing a sentence. Multiple sentences which are sementically equivalent to the given sentence can be derived all of which can be mapped to the same response.

Currently, the authors are working on a project of designing and developing an interface for LAN which accepts the queries pertaining to hardware and software installed in LAN in natural language (NL) which is parsed using Text/NLP parser which will be developed by us which is mapped to an SQL query and instantly provides a required information to an end user. The information pertaining to the machine, hardware and software information will be stored in a persistent Relational Data Base Management System (RDBMS) which is dynamic and will instantly be updated as the new hardware is connected to LAN or a new software is installed. The end user instead of querying the database directly will use the natural language, termed as Hardware Query Language (HQL) and Software Query Language (SOQL) designed by the authors, which will be interfaced with RDBMS using prolog. To implement HQL and SQL, we have defined a finite set of symbols, words and language rules, HQL and SOQL grammar. The parse tree is constructed based on the grammar specified. The NLP query will be parsed using NLP parser designed by us and the queries which are successfully parsed is evaluated by mapping them to the corresponding prolog query using Java interface to Prolog (JPL). Prolog rules will be stored in the corresponding prolog knowledge bases. NLP offers most flexible way to implement grammar which can be readily extended with least efforts and as such offers an efficient way of implementing rules in dynamically changing scenarios. In this paper the authors present the design and development of fuzzy text parser which takes care of couple of rules. The rule set can be extended further to render the parser more realistic and close to human language.

Significance of the study

The Artificial Intelligence offers a number of advantages over conventional approaches. It helps in imparting human like intelligence to machines. Our interface can increase speed of query execution, enables extension of time and also minimize human intervention. Our research mainly targets the following issues.

- Design and development of Graphical User Interface (GUI) which help lab technicians in solving hardware and software queries related to LAN.
- To store and manage all hardware and software information of devices connected to LAN in a centralized database in MySQL.
- To detect and avoid IP conflicts common in networks
- Performing Bandwidth Management
- Monitoring speed of internet and pattern recognition to search anomalies.
- Authentication modules for different levels of network users.

Objectives of the study

The main objective of the study is to Design and Develop NLP Interface for querying hardware and software configuration information in local area network for selected education institute.

- To dynamically discover the LAN architecture and list various computers in a workgroup and domain controller.
- To dynamically discover the various hardwares connected to LAN and softwares installed on various machines and store the same persistently in a centralized database.
- To design and develop NLP interface that displays queried information of all hardware and software in LAN.
- To design and develop NLP parser which helps in evaluating a query issued by an end user in a human language and mapping it to a SQL query.
- To detect IP conflicts in a network.
- To continuously monitor the speed of Internet and analyze the data for detecting patterns and solving network bottlenecks.

Purpose for the construction of interface for querying of information in lan

After reviewing previous research papers on NLP and LAN is to be Implemented for the following reasons:

- Storing all information of hardware and software present in LAN.
- Searching required software and hardware present in LAN.
- Showing various reports related to LAN.
- Providing multiple interfaces for both thick and thin clients focusing on web based interface and mobile interface to an end user.
- To design Hardware and Software Query Language which enables the end user to query the database in a human language without worrying about tedious SQL syntax. No formal knowledge of SQL is desirable. It provides a layer on top of SQL to render the query language end user friendly. The architecture is depicted in Figure 1.

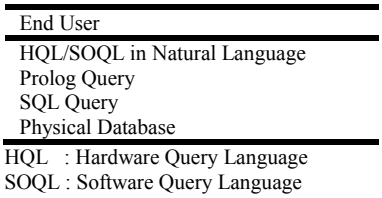

Figure 1. Application Architecture

Literature Review

Analysis of the Combination of Natural Language Processing and Search Engine Technology.

1) Wei Wang
2) Huankai Shi

This research paper introduces current situation and process of natural language processing (NLP) and the effect of natural language processing in search engine. In terms of concepts and classifications, traditional search engine has many deficiencies that can not completely satisfy the requirements of users. The key technology of intelligent search engine and the development trend of the combination of natural language processing and search engine technology in the future are discussed.

Survivable LANs for distributed control systems

JE Cooling

In this paper author discusses the need for, and methods of achieving, survivability in distributed control system networks. It is applicable to areas such as avionics, marine systems and industrial plants. Basic survival strategies are discussed in the context of specific network topologies, with emphasis on system design aspects. The strengths and weaknesses of the various approaches are discussed, together with the requirements and constraints of practical systems. Based on these, a general template for a survivable LAN is defined, accompanied by a set of recommendations for implementing specific survivability features.

A Subcategory-based Parser Directed to Generating Representations for Text Understanding

Yukiko Sasaki Alam

This paper describes a parser in progress which is directed to generating representations for text understanding. For the purpose of reducing the proliferation of unwanted parse trees, and collecting information necessary for generating the semantic representations, the parser uses rules based on phrasal and lexical subcategories. These designs alleviate parsing problems such as PP attachment and coordination attachment, while capable of displaying the dependency of various types of phrases and clauses, thus facilitating the writing of grammar.

Conceptual Framework

For querying hardware and software information, four distinct models have been proposed.

Model 1: It is based on manual execution and consists of the following phases.

Phase 1: Retrieving requisite hardware and software information by execution of batch file.

The batch file GetHardwareSoftwareInfo.bat containing the following commands is executed on every client of a local area network.

```
psinfo -s > software.txt
wmiccsproduct get vendor, version> vendor.txt
wmiclogicaldisk get size, freespace, caption >harddisk.txt
ipconfig> ip.txt
wmicdesktopmonitor> monitor.txt
wmicdesktopmonitor get screenheight, screenwidth> monitorsize.txt
net view > workgroups.txt
netview /DOMAIN:siber1.com
```

Phase 2: Installation of MySQL server.

MySQL server is installed on a centralized database server and a database with the name softwares is created with consists of the tables shown in Figure 1.

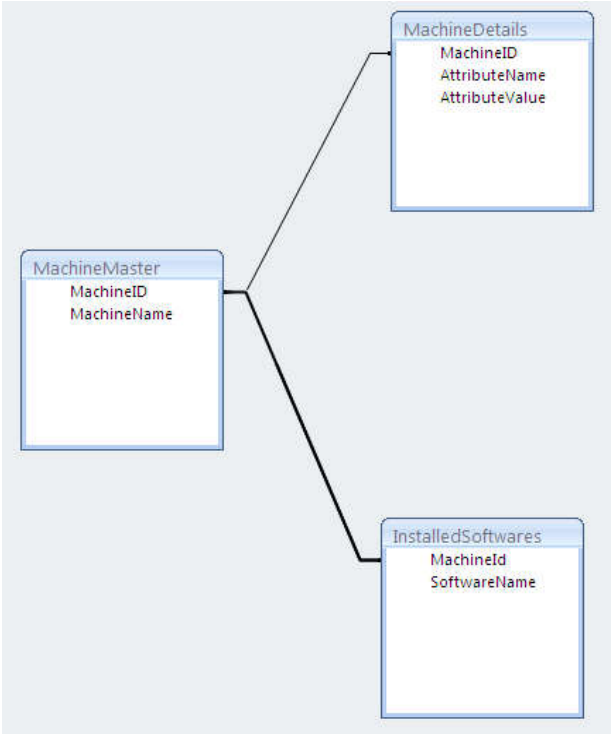

Figure 1. Structure of Database

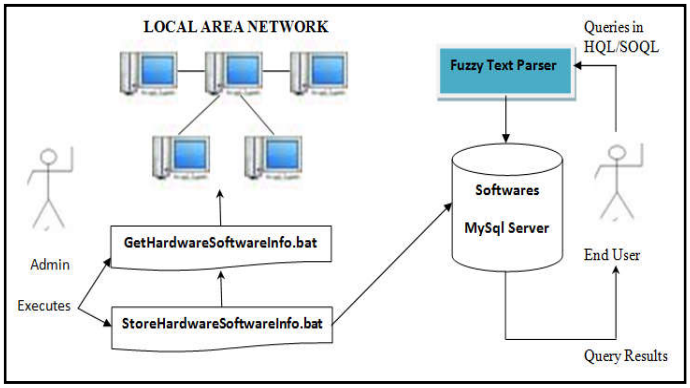

Figure 2. Model1 Application Architecture

Phase 3

Storing hardware and software information in MySQL database. The batch file HardwareSoftwareInfo.bat containing the following commands is executed on each client of local area network which stores the hardware information retrieved by the batch file GetHardwareSoftwareInformation.bat in a centralized MySQL database.

```
set path=C:\Program Files\Java\jdk1.5.0\bin
set classpath=MySQL-connector-java-5.1.15-bin.jar;.
javac SearchSoftwares.java
java SearchSoftwares
Pause
```

Phase 4: Querying Hardware/Software information using HQL/SOQL. The hardware/software configuration details of any machine can be queried by an end user by connecting to the MySQL database server by issuing a human query language which is parsed using both crisp and fuzzy text parsers. Figure 2. depicts the Model 1 Application Architecture.

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