Improved Free-Form Database Query Language for Mobile Phones

Shiramshetty Gouthami[1], Pulluri Srinivas Rao[2] and Jayadev Gyani[3]

Computer Science Engineering,JNTUH, Jayamukhi Institute of Technological Sciences
Narsampet,Warangal, Andhrapradesh-506332, India

Abstract

This paper explains that it is possible to develop a database query formulation system for mobile phones which accepts unplanned queries, by allowing imprecise inputs. Since cell phones are poor in terms of resources as compared to other devices, the success of implementing such a method on them would mean it is applicable to the other devices. Imprecise query method in the form of free-form language can provide a much simpler interface for users to formulate queries. The method can also help in reducing the number of query inputs, especially in cases where joins of relations are needed. Since the majority of queries which might be issued are of this type, providing such a method would benefit users of resource-poor devices. The language which is used as the query formulation method in a database query system prototype for WAP- enabled mobile phones has been found to be effective based on results from usability tests.

Keywords—*Mobile phone, database query language, free form queries, unplanned queries.*

1. Introduction

The objective of this paper is to explain the method of generating the query at the client side. The client should be able to generate his own query according to his own request. There will be no predefined queries behind the screen. The system does not impulse any limitations. The end user who is using this mobile application will be able to retrieve and work with data in any sort. Hence the project produces the application which is to generate all sorts of queries at the client end. The Wireless Application Protocol (WAP) is the mechanism used here in case of integration of client (Mobile) and Server (Web Server). Apache Tomcat is the web server used for the interaction with Database Server. The Wireless Application Protocol (WAP) is the mechanism used here in case of integration of client (Mobile) and Server (Web Server). Apache Tomcat is the web server used for the interaction with Database Server. Here we have tested with MySQL.

1.1 Interface Design

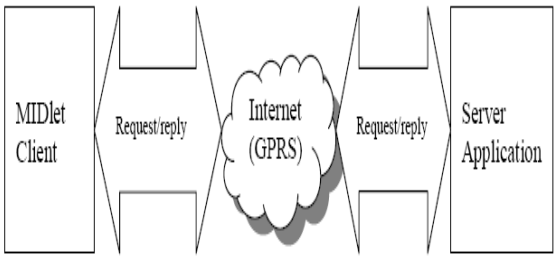

Fig.1 Communication between server and MIDlet

The structure of the system divided into two components:
The client-side MIDlet application which resides on the mobile device, e.g., mobile phone. The server-side JSP/MySQL based application.

2. Previous Work

The main objective of the system is to support unplanned queries. The end user should be able to communicate with the database in whatever option he wishes. The Programmer is not giving any limitations to the user. Since the query is generated in the client side itself, he is able to request any sort of data. The User is independent in accessing the data. When creating application upon Query Generating Systems, the main intention of the system should be to convince all the five types of classifications of queries which are Projection, Selection, Set Difference, Join and Union. In this system pull-down list contain all query terms, fields, tables, and other schema information.

3. Present Work

It is possible to develop a generic database query system for mobile phones which accepts different types of queries as well as unplanned queries, by allowing imprecise inputs. Since mobile phones are poor in terms of resources as compared to other mobile devices, the success of

implementing such a method on them would mean it is applicable to the other devices. Free-form language can provide a much simpler interface for users to formulate queries. The language helps in reducing the number of query inputs especially in cases where joins of relations are needed. Since the majority of queries which might be issued are of this type, providing such a method would benefit users of resource-poor devices. Usability tests on the prototype have also shown that the language is effective even when used by novice users. We plan to integrate recommender systems into our work so that lesser and only relevant query terms will be presented to users for selection on the pull-down list.

Modules:

i. Server Module
ii. Connection Module.
iii. Design of the Application
iv. Query Generation Module

Modules Description:

i. Server Module:

In our project, we are using MySQL as the data server and Apache Tomcat 5.0 as the web server. These two are the main core of the server side programming. Our application has been deployed in the Apache Tomcat so that all kind of Http Requests and response can be handled easily. All the parameters passed from the request can be retrieved using the getParameter() method of HttpRequest Object.

ii. Connection Module:

The Connection between the Client (i.e. J2ME application in mobile) and the Web Server is maintained by the object HttpConnectionin javax. Microedition.io. HttpConnection. Using this connection module we could retrieve the database information by passing the Http Request. The requesting attributes is sent as the parameters of the url built for HttpConnection.

iii. Design of the Application:

According to the request sent by the client, the server processes the data and it is responded to the client, which is further received by the help of openDataInputStream() in HttpConnection Object. So the client application is designed according to the Field information of the tables retrieved from the server. We would be using ChoiceGroup from the above figure. We can choose any of the radio button for composing a query. For example, get radio button for Select, remove for deleting, new for inserting and edit for updating the table.

Object for designing Radio Buttons, Check Boxes and Dropdown list boxes.

iv. Query Generation Module:

The design of the application is done by the data types which we used in the database. The choice which we are about to use, according the query will be generated behind the screen. After the complete operation of selecting the choices we are supposed to execute the query by passing it as the parameter to the server through Http Request.

4. System Prototype for Mobile Phones

In order to show that our language can support its intended capabilities, a prototype was developed. This prototype consists of a J2ME midlet for the interface on the Java phone emulator, and several Java servlets for the execution of queries. The interface developed follows the general guidelines given for mobile interfaces. J2ME such as those of Mahmoud [15] suggested that an interface for small devices should be simple and use as many as possible high-level APIs. Figure 2 below shows a screen-shot of our prototype's interface for composing free-form queries. A pull-down list is used to present all tables. These tables are presented as a linear list.

Fig 2. Interface for Composing a Query

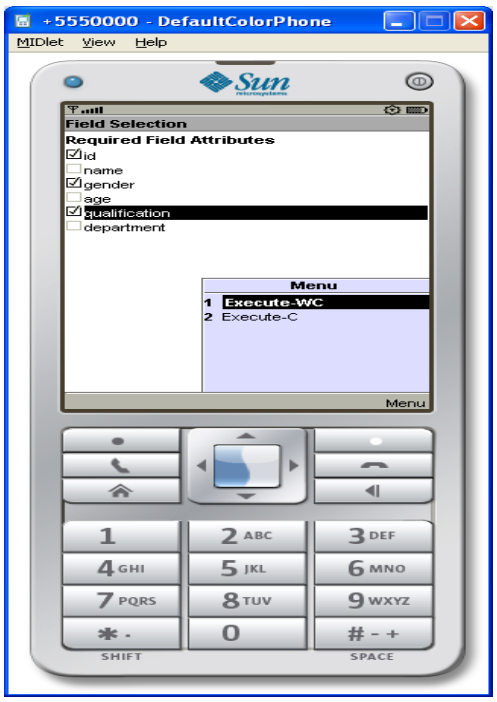

Fig 3.Interface for selecting the fields of the Contacts table

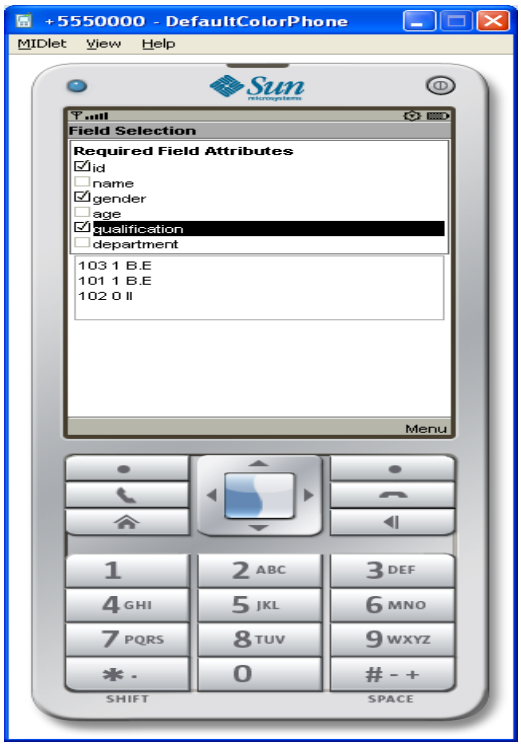

Fig 4.Interface for displaying the selected fields of the Contacts table

5. Usability Test

In order to ensure that the language is effective in supporting different query types as well as unplanned queries, usability tests were conducted on the system prototype.

Observation setup: A notebook was used as both the application and database servers for the usability tests. A Java phone emulator and a real phone, Nokia 6681, which were loaded with the interface of the prototype, were used as possible accessing devices. Besides the prototype, a test database on a university domain was used for the first two groups, and a database on asporting event was used for the third. The server was connected to the Internet for networking environment. The correctness of the query outputs expected by the observer, and the rating on the scale of 1 to 3 which was given by test subject depicting his/her acceptance of the query outputs. Allocation of credits were then determined as in Table 1 below.

Table 1. Credit allocation for measuring prototype's effectiveness

Observer's Evaluation	Participant's Ratings	Credit
Correct	3	1
	2	0.75
	1	0.5
Incorrect	3	0.70
	2	0.30
	1	0

6. Conclusions and Future Work

We conclude that it is possible to develop a database query formulation system for mobile phones which accepts unplanned queries, by allowing free-form inputs. As cell phones are poor in terms of resources as compared to other mobile devices, the successfulness of implementing such a method on them would mean it is applicable to the other devices. Indefinite query method in the form of free-form language can provide a much simpler interface for users to formulate queries. The method can also helpful in reducing the number of query inputs, particularly in cases where joins of relations are needed. Since most of queries which might be issued are of this type (as seen by the queries given by respondents), providing such a method would benefit users of resource-poor devices. In the future work, we will be trying to implement more complex queries like

aggregate functions, grouping etc.for creating and accessing database tables through the mobile phones.

Acknowledgments

We extremely thank our Principal and the management for their continuous support in Research and Development. We are also very grateful to our faculty members for their valuable suggestions and their ever ending support. Especially, we thank our college Principal and management for their financial support for receiving the sponsorship.

References

[1] R. Alonso, and H. F. Korth, "Database system issues in nomadic computing", in *Proc. 1993 SIGMOD Conference*, Washington D.C., 1993, pp. 388-392.

[2] K.Hung, and Y-T. Zhang, "Implementation of a WAP-Based telemedicine system for patient monitoring," *IEEE Transactions on Information Technology in Biomedicine*, Vol. 7, No. 2, June 2003, pp. 101-107.

[3] A. Koyama, N. Takayama, L. Barolli, Z. Cheng, and N. Kamibayashi, "An agent based campus information providing system for cellular phone," in *Proc. 1st International Symposium on Cyber Worlds*, Tokyo,2002, pp. 339-345.

[4] P. Boonsrimuang, H. Kobayashi, and T. Paungma, "Mobile Internet navigation system," in *Proc. 5th IEEE International Conference on High Speed Networks and Multimedia Communications*, Jeju Island, 2002, pp.325-328.

[5] A. Bergstrom, P. Jaksetic, and P. Nordin, "Enhancing information retrieval by automatic acquisition of textual relations using Genetic programming," in Proc IUI 2000, New Orlean, 2000, pp. 29-32.

[6] H-M. Lee, S-K. Lin, and C-W. Huang, "Interactive query expansion based on fuzzy association thesaurus for web information retrieval, " in Proc. IEEE International Fuzzy Systems Conference, Melbourne, 2001,pp. 724-727.

[7] S. Agrawal, S. Chaudhuri, and G. Das, "DBXplorer: A system for keyword-based search over relational databases," in Proc. IEEE 18th International Conference on Data Engineering (ICDE'02), San Jose, 2002, pp. 5-16.

[8] P. Calado, A.S. da Silva, A.H.F. Laender, B.A. Ribeiro-Neto, and R.C.Viera, "A Bayesian network approach to searching web databases through keyword-based queries, " Information Processing and Management, Vol. 40, No. 5, September 2004, pp. 773-790.

[9] R. Ramakrishnan, J. Gehrke, Database Management Systems. McGraw-Hill, New York, 2000.

[10] A. Chandra, "Theory of database queries," in Proc. 7th ACM Symposium on Principles of Database Systems, Texas, USA, 1988, pp. 1-9.

[11] S. Polyviou, G. Samaras, and P. Evripidou, "A relationally complete visual query language for heterogeneous data sources and pervasive querying," in Proc. 21st International Conference on Data Engineering (ICDE 2005), Tokyo, 2005, pp. 471-482.

[12] E. Chang, F. Seide, H.M. Meng, Z. Chen, Y. Shi, and Y.C. Li, "A system for spoken query information retrieval on mobile devices," IEEE Transactions on Speech and Audio Processing, Vol. 10, No. 8,November 2002, pp. 531-541.

[13] B. R. Bai, C.L. Chen, L.F. Chien, and L.S. Lee, "Intelligent retrieval of dynamic networked information from mobile terminals using spoken natural language queries," IEEE Transactions on Consumer Electronics,Vol. 44, No. 1, February 1998, pp. 62-72.

[14] R. Ahmad, S. Abdul-Kareem, "A free-form database query language for mobile phones," in Proc. International Conference on Communications and Mobile Computing, Kunming, 2009, pp. 279-284.

[15] Q. Mahmoud, *Wireless Java*, O'Reilly, 2002. [E -book]. Available: O'Reilly e-book

First Author *Shiramshetty Gouthami* is presently working as Asst.Prof in Computer Science Engineering Department at Jayamukhi Institute of Technological Sciences,Warangal for the past 5 years.She received her M.Tech Degree from JNTU Hyderabad,(A.P, India) in 2011.

Second Author *Pulluri Srinivas Rao* is presently working as Assoc. Professor and Head for the Department of Information Technology at Jayamukhi Institute of Technological Sciences, Warangal.A.P (INDIA).He received his M.Tech Degree in 2006 from University of Allahabad (U.P, India).Presently he is a Ph.D scholar at R.U (A.P, India).

Third Author *Dr.Jayadev Gyani* is presently working as Head and Professor of Computer Science Engineering Department at Jayamukhi Institute of Technological Sciences, Warangal.A.P (INDIA).He received Ph.D. in Computer Science, from Hyderabad Central University, Hyderabad (A.P, India) in 2009.He had 18 years of Teaching Experience in the field of computer science.