Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 04, pp.14405-14411, April, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

MATHEMATICAL MODEL OF THE SYSTEM OF INTELLECTUAL INTERACTIVE SERVICE IN THE CONTENT OF INFORMATION ENVIRONMENTS

***,[1]Nishanov Akhram Khasanovich, [2]Kalimbetov Nietbay Iskenderovich and [3]Babadjanov Elmurad Satimbaevich**

[1]Department of Information Technologies and Software, Tashkent University of Information Technologies
[2]Department of Natural and General Professional subjects of Nukus Branch of TUIT
[3]Department of Computer Sciences and Information Technologies of Nukus Branch of TUIT

ARTICLE INFO

Article History:
Received 17th January, 2015
Received in revised form
25th February, 2015
Accepted 28th March, 2015
Published online 28th April, 2015

Key words:
Intellectual interactive service,
Natural Expressed Texts, SQL

ABSTRACT

This article is devoted to the building mathematical models of the system of intellectual interactive services (IIS) in information environment for satisfying user demands.

INTRODUCTION

Here is given some information about general concepts, putting the problem, general survey of working process of model of IIS software. Interactive services (IS) in information systems are formed by elements of database (DB). In other words, IS system is the complex of softwares created to organize the appealing on elements of DB. For example, students' attendances in higher educational institutions (HEI) and programm module supplying with these reports. To form necessary datas in information environments user has to own special knowledge, practice and ability. But, the users are not allowed by administrator and programmers to work directly with DB to keep security and integrity of DB. Formed questionnaires are automatically got their answers according to users' everyday, natural demands-necessities. This automatic process means that the results of organizing and managing are connected with realizing intellectual services, and this process is considered one of the actual problem of nowadays – the system of "Electronic government".

Putting the problem

Let's assume we have been given initial data expressed by the text of the questionnaires created in natural language, it's demanded to create mathematical model, algorithms and software of IIS which helps to satisfy demands given from information environment.

To realize this purpose morphological, syntactic and semantic analyses on the given text are lead to change (translate) from Natural Expressed Texts (NET) into computer language. Computer linguistics, which operates these kinds of problems, have achieved a lot of success, as a result, there have been created translator programms. To lead analyses of NET every natural language owns specific approaches – "base of knowledge", and "dictionary" in all of them is considered essentially.

Scientists achieved some results on translating automatically in SQL query the appeals by NET into database [Siasar djahantighi and Norouzifard, 2008; Imran Sarwar Bajwa and Shahzad Mumtaz, 2008; Nishanov *et al.,* 2013; Bessarabov and Tischenko, 2010]. In these sources analyse of NET is explored in English and Russian languages, their basis – "dictionary of words" and "base of knowledge", which expresses the structure of the text.

Solution of the problem

The solution depends on creating the layer of the system of IIS which helps to satisfy the demands given by information environment, in its turn, it demands to express general model in sequence and structure of demanded software as following:

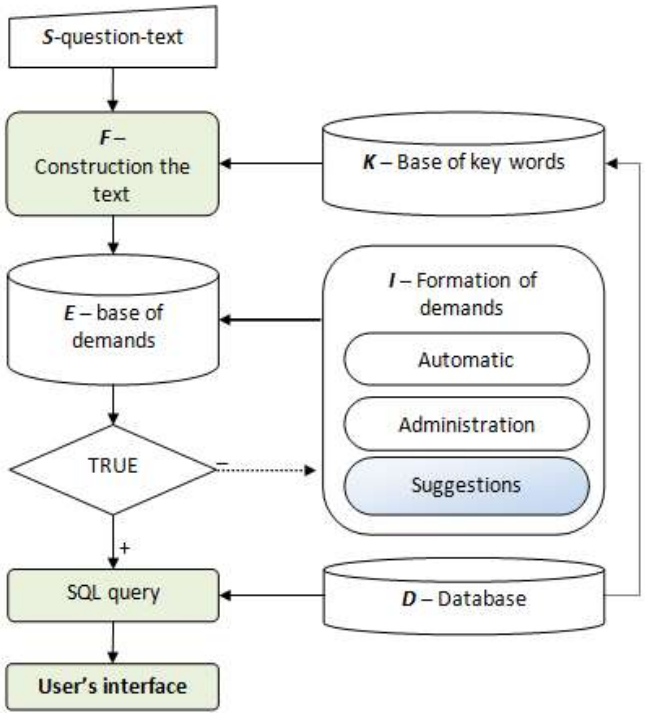
Corresponding author: Nishanov Akhram Khasanovich,
Department of Information Technologies and Software, Tashkent University of Information Technologies

1) to input necessary markings, rules and special bases; 2) to formalize the text, or to form the query as "person-computer"; 3) to form the base of demands (formal and informal base of demands). General model of the structure of assumed software can be expressed as following.

$$S \xrightarrow{F} E \xrightarrow{I} D$$

Here *S*– text of the query, *E*– base of demands, *D*– database, *F* – operator of formalizing text, *I* – operator of forming services. Operator – is a base of knowledge which contains the rules, algorithms, forms, templates, methods and softwares.

Working process of this model of software is shown in the following outline:



Now, we will discuss in detail every element of this model and its process.

1. Necessary concepts, assignments and special bases

In this item are about concepts, datas, their mathematical formulas and their procedure of IIS, DB, base of keywords (BKW), rules of structure of the text in natural language natural language, base of demands (BD).

Characterization

Intellectual interactive servises are services that provide getting automated answers between real time which has been input by the user with the help of datas in information environment.

1.1. Database

In the recourses [Siasar djahantighi and Norouzifard, 2008; Imran Sarwar Bajwa and Shahzad Mumtaz, 2008; Neelu Nihalani *et al.,* 2011; Nishanov *et al.,* 2013] has been explored problem of building the DB, information environment expressed with *D*, there X_j is classified on the basis of parameters of data, then general information environment is expressed as in the following:

$$D = \bigcup_{i=1}^{n} X_i,\ i = \overline{1,n},\quad X_i = \left\{\Delta_{i_j}^{k_l},\ j = \overline{1,n_j},\ k \neq i\right\},$$

here *D* complex consists X_j classes, $\Delta_{i_j}^{k_l}$ - element of the class (range of the table), i_j-indices of the element, k_i indices of the element of another class, it determines the connection between classes. If $i_j$element of X_j class does not connect with the $k_i$element of X_l class, then $k_i=0$ becomes in $\Delta_{i_j}^{k_l}$. We use these marks in our research.

1.2. Base of keywords

One of the main problems in formation, creating and its managing of intellectual interactive services is considered the problem of initial datas, or formalizing natural expressed datas. The easiest way of solving this problem is to create a dictionary of terms by forming the base of keywords (BKW) and compare them. General structure of BKW is as following

$$K = \{SO, ST,\ SL\}$$

Here the aim of formation of BKW is to divide the text into layers. It expresses structural peculiarities of DB by three $(SO, ST,\ SL)$ logic classes. This logic classes can be expressed as following:

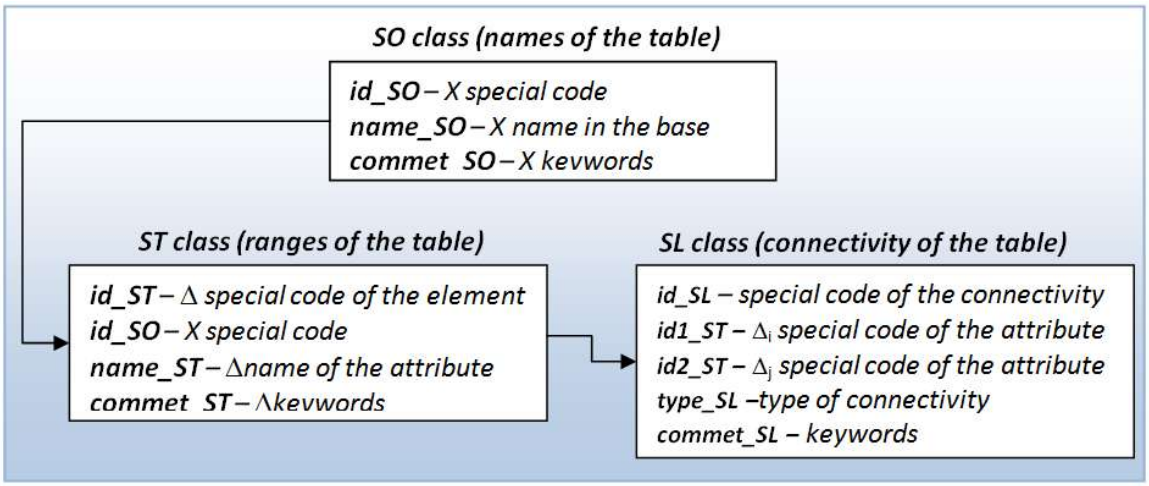
1 – class. Tables – describes general peculiarities of $X_j$classes in *D*.
2 – class. Ranges – peculiarities of the elements in X_j classes.
3 – class. Connectivity – reflects connection between X_j and X_k classes.

e.g. Students' table (1-class), their telephone numbers in students' table (2-class), logical connectivity between the students' table and other tables (3-class).

Random information environment can be expressed by above mentioned three classes and its infological structure is as following:

1.3. Rules of the structure of the text in natural language

Alphabet of the language and semantic expressive rules of every natural language are used when analysing the being input text into the system if it is logically right and meaningful. Alphabet of the language is the same for most of the natural languages, but the rules of semantic structure are different. Most scientists explored the problem of formalizing the query text in the given natural language and elaborating automatic system queries in DB of information systems [Imran Sarwar Bajwa, Shahzad Mumtaz, 2008; Naikhanova and Evdokimova, 2004].



For instance, L.V.Naykhanova used triple principle of "linguistic model – is the basis mechanism of rearranging the text – associated procedure" in model of translating the text from Russian language into SQL queries language. Here, when analyzing texts dictionary of the words in Russian language, the base is shown as cases, wordformations, tenses and divided into persons, and formulated from the point of mathematics lexical, morphological, semantic analyses on the text. According to the substance of the query texts, on condition, we input the "rules of sentence structure" for information technologies. The rules of special system are as followings:

Rule 1: Text of the query consists of two parts – **quantifier** and **determined**.
Rule 2: If in the text there is an object that has quantity it is considered as **quantifier,** vice versa if the object has no quantity – it is considered as **determined**.
Rule 3: in the texts in Turkish language a quantities come before object in determination.
Rule 4: Objects are defined by keywords.
Rule 5: In the text of query there can be more than one determination and determined.
Rule 6: Permitation of determination and determined in the text does not change the meaning of the text.
$F(x_1, y_1, \ldots, x_n, y_n,) \rightarrow Y(z_1, \ldots, z_m)$
Y- determined, z - determined objects, m - number
F- determination, x- determinating object, y-object quantity, n-number.

1.4. Base of Demands

It's clear that though demands for information environment are various, they can be periodic and to satisfy each demand considering most of applies are lead, a base of formalized demands should be formed. Data in base of demands are completed according to BKW with the rules of forming a sentence as above mentioned. By arranging base of formalized demands, declination of number of fulfilling assignments satisfies the demands and it gives opportunity not only to analyze the demands but to form SQL queries automatically. In general, base of demands can be adjusted as following:

$$E = \left\{ A^j \left\langle a^j_{num}, a^j_{text} \right\rangle, B^j \left\langle b^j_{num}, b^j_{text} \right\rangle, T^j,\ j \in N \right\}$$

Here $A^j \left\langle a^j_{num}, a^j_{text} \right\rangle$ - are **determination** (number and encoded texts), $B^j \left\langle b^j_{num}, b^j_{text} \right\rangle$ - are **determined** (number and encoded texts), $E^j_{T_j}$ - disappeared connectivity of objects in the text of query. "Encoded texts" – encoded view of recognized text of the query.

Thus, on the basis of aforcited various special bases and rules, we discuss in detail about managing process in model and its algorithms. In the following we discuss about formalizing the text and delaminating it.

2. Formalizing and delaminating the text

In this part there is given problems of formalizing and delaminating datas in the naturally expressed text and mechanisms and algorithms of realizing them.

2.1. Problems of formalizing

Formalizing is to processing the text systematically in natural language, in other words correlating information to the base of system with the way of separating to types of information on the basis of exactly principles. Consequently, when correlating initial information to the base of demands, we suggest target tasks as in the following: 1) to determine correlative degree of the text to BKW; 2) to subdivide text to layers (initial, termination, determined, determination); 3) to determinate remarks between parts of sentence; 4) to subdivide names, abbreviations, datas with numbers and dates in text. Such kind of tasks should be solved.

We determine the correlative degree of text for BKW [Nishanov *et al.,* 2013] by the algorithm shown in the operation. As there is suggested method of selecting scripts in BKW on the basis of exact criterias *X* text is divided into words, we do not need to observe it.

2.2. Problem of delaminating

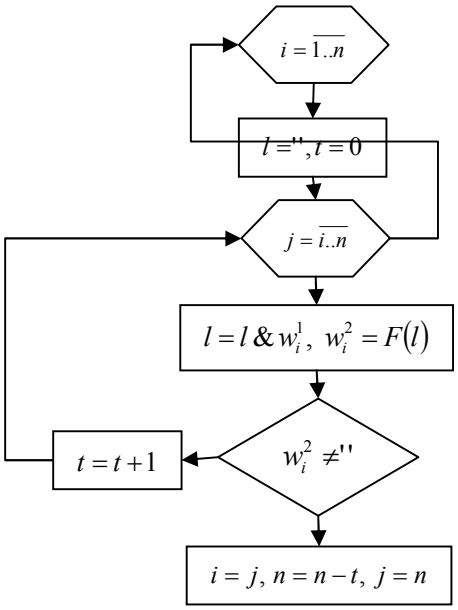
Now, we see the problem of **delaminating** *S* query with the help of the rules of arranging input text on the basis of above mentioned requirements.

Here is meant to divide the text of the query into 3 layers, or: determination, determined and correlation between them. Base of BKW is considered significant to process input information.
It's known that, given *S* text is consists of consistently. Here words mean complex of separated symbols by space bar (free space). If there are signs in the text which should be opened and closed double quotes, then it is considered as one word among this sign.

To solve the problem of delaminating according to the number of words in text $W^l = \{0 \mid s_i : i = \overline{1..n}\}\,(l = 1..3)$ should be input vector with zero quantity. These lines of vector are completed text of the query sequentially in delaminating steps. At first $W^1 = \{w_i^1\}$ elements of first line of the vector are expressed by words in text *S*, or words of the text are chosen separately and expressed as parameters of the vector. It is important to separate the text to 2 and 3 layers. They are chosen consequently. We observe the following two methods in delaminating:

1) algorithm of automatic delaminating;
2) method of intellectual template to input text.

In *algorithm of automatic* delaminating the text 2-elements of layer are chosen the following base of algorithm from 1-layer according to correlation with BKW.



Here *F(l)* function determines correlation parts of the text to BKW in special way. As a result, determined $W^2 = \{w_i^2 : i = 1..n^*,\ n^* \le n\}$ vector consists of datas in BKW and is a part complex of the given text, or, $W^2 \subseteq S$. Furthermore, w_i^2 is in a complex form, its each element consists of some parameters, or

$$w_i^2 = \{so_i^k : i = \overline{1..4}, k \le n\}$$

here so_i^k expresses parameters in result of searching, *k* – number of objects found in BKW, *i* is parameter of object, or here *i=1* is arranging indices of found keyword in text S, *i=2* is name of the correlating object to the found keyword and etc.. During the process of algorithm if it is considered that s_i elements can be combined, then number of s_i elements decreases and reindicised. In its turn, it reacts to w_i^l. According to result, correlating quantity will be transmitted to the found correlative indiceses for elements $w_i^l = so_1^k$.

If w_i^2 any of elements of the vector does not differ from zero by above mentioned algorithm, then it means that the text of the query is wrong or BKW is incomplete.
To determine the 3-layer w_i^3 is the same as mentioned previously. Therefore, according to the rules of forming text of the query, we adduce the following specifies:
1) determinating quantities of objects concerned elements for w_i^1;
2) elements w_i^2 are determining and determined objects;
3). If there is no quantity w_{i-1}^1 of the object w_i^2, then it is considered determined object, otherwise, we consider as determining object.

If there is no free quantity among indices of vector w_i^1, next element is combined with the previous one, or, $w_i^1 = w_i^1 \,\&\, w_{i+1}^1$ and all indiceses of vector are delayed w_i^l from right to the left. But, this process is not used for 2 and 3 layers. So, according to the results of combinations $w_i^l\ (l = 0..3,\ i = 1..n^*)$ it is indicesed again.

Example: Second-year students of the specialty of Economy of enterprise of the faculty of Economy

According to previously mentioned specifies the result of delaminating text is as following:

i	*1*	*2*	*3*	*4*	*5*	*6*	*7*
w_i^1	*Economy*		*Economy of enterprise*		*2*		
w_i^2		*faculty*		*specialty*		*course*	*student*
w_i^3							

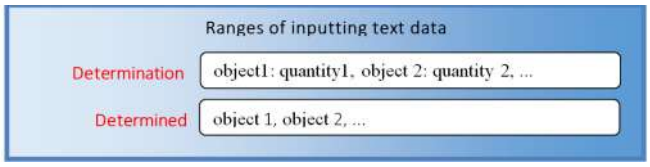
Up to the 2nd rule of the base of rules, text is divided into determiner and determined. There *W* is determiner of vector (1-6) and its (1-2) (3-4) (5-6) are parts of determiner, (7) consists of determined.Determined parts of sentence layers of vector *W* transfers to one layered of vector *U* by indicesing again.

Peculiarity of indicesing is that, it accepts positive quantities by the number of determinations, and negative quantities by the number of determined. Reindicesed *U* vector is called encoded text of given query and this encoded text composes query according to the semantic, lexical and morphological rules.

Encoded text of above mentioned example is as following:

Sentence structure	*determiner*			*determined*
W vector	(1,2)	(3,4)	(5,6)	(7)
indicise	1	2	3	-1
U vector	(u_1^0, u_1^1)	(u_2^0, u_2^1)	(u_3^0, u_3^1)	$(null, u_{-1}^1)$

Intellectual templated method of inputting the text requires from user to input the text on the basis of previously assigned special rules. It helps to accelerate delaminating process of the text. Intellectual templating method fulfills by inputting the ranges of determinations (object and quantity) and determined (objectи) in the text. Here each parts of sentence separated with special symbols (e.g. comma). Before inputting determinations, determinating object is written and put colon and then input quantity of determination.



The process of inputting determinating and determined objects is intellectualized. In other words, names of existent object in BKW are suggested with the help of software. Inputting the quantities of determining objects it is suggested to input special types of data separately. In other words, if quantity of the determination is assigned, it can be possible to state what type of data it belongs by context menu.

Here special type of data is not mentioned as types of data in DB, but it is understood what data means in the text. Special types of data consist of names, time and date, numbers and abbreviations. e.g.:

Name	Date	Abbreviations
Sabirov A.S.	1, July	IT
Sarvar Sabirov	01.07.2012.	Inf.tech.
S.Sabirov	2012 year, 1, July	InT
Sarvar Azatovich	2012-07-01	ITech

3. Formation of demands

In this part recognizing natural expressed data, in the text of the questionnaire is fulfilled the mentioned demand on the basis of the results of formalizing, delaminating according to stated rules and the base of keywords, in other words, formalized text is compared with objects in the base of demands. If there is no new demand in the base of demands, then it needs to solve the problems of completing it with new demands and translating into SQL language automatically. Imagine that may the base of demands have been completed with data. At first, we observe the problem of searching the recognized demands (vector U) from "the base of demands". The first step of searching is to separate the number of determinations and determined in vector *U* correlating parameters of *A_num* and *B_num*. In the second step keeping semantic meanings of determinations and determined of vector *U* is combinational searched from parameters *A_text* and *B_text*. The number of the items of satisfying demands is up to the number of the objects determined in the result of searching. Usually the result is expected to be one object. The main importance of the base of demands is that it does not matter if the user input query in different forms which gives the same meaning.

3.1. Searching from the base of demands

If the searching vector *U* does not exist in the base of demands, then it must be input in the base as a new demand. Input the new demand in the base is fulfilled by searching the correlation between determinations. Searching the correlation between determinations in its turn, it is considered the problem of the private correlation between objects. In this case the problem is expressed as searching the private correlation between the parameters of the objects (table) *A* and *B* mentioned in DB. Here as parameters of the objects *A* and *B* does not adjust directly, their consistent of generalized parameter of the objects C_i must be determined.

For instance, student's **group** and **faculty**. Here "*grup*" (*A*) and "*fakultet*" (*B*) tables are not correlated by general parameters. Therefore, for stated objects *A* and *B* must be searched the table "specialty" (*C*) automatically which installs coherence (bridge). It should be underlined that the number of general correlation objects *C* and mentioning their ramifying a lot, like the problem of transport, we need to offer finding solution with an optimal way and suggesting it. To find the solution for this problem the following rules and algorithms are confirmed.

Rule (to form root object)

As mentioned parameters of vector *U* (encoded text) have been determined objects *SO*and *ST* of the base of keywords mainly expressing DB. If there is u_i^2 which belongs to parameter *ST* of the vector *U* , in this case it is converted to an appropriate *SO* which belongs u_i^1. In other words, generally objects in *ST* are formed appropriately as root objects *SO*.

Determining private correlation of objects

To find correlation of the parameters of two objects mentioned in base *SO* with replaced base of *ST,* the following laws are confirmed.

$$A \to C_{i^j}^j \to B,\ j \in R, j \geq 0,\ i^j \geq 1$$

$$A \neq C_{i^j}^j \neq C_{i^k}^k \neq B,\ k \neq j.$$

It does not matter to choose direction of act in finding correlation between the objects *A* and *B*. So we direct from *A* to *B*. To simplify the process of mentioning algorithm we transfer the quantity *A* to the initial C_1^0. In general algorithm will be as following:

1-step. $i = 0,\ j = 0,\ \ C_1^0 = A$;

2-step. parameters of objects $C_{i^i}^j$ and B are determined from the base of SO by the base of ST, or: $ST(C_{i^j}^j)$ and $ST(B)$;

3-step. From the base SL is determined the correlation of $ST(C_{i^j}^j)$ and $ST(B)$, or $SL(C_{i^j}^j, B)$;

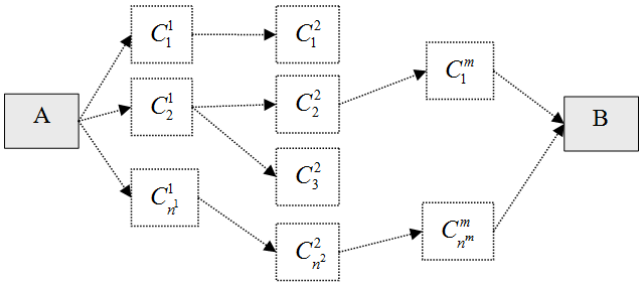
4-step. If there is $SL(C_{i^j}^j, B)$, the process will be finished, otherwise, will go on;

5-step. From the base SL is determined parameters of $ST(C_{i^j}^j)$, or: $ST(C_{i^{j+1}}^{j+1}) = SL*(C_{i^j}^j)$;

6-step. $i = i + 1$

7-step. From the base SO is determined root objects with the help of parameters $SO(C_{i^j}^j)$, or $C_{i^j}^j$. Here the determined new objects are selected which are not equal to previous $C_{i^k}^k$ $k = \overline{1..j-1}$ and are returned back to step 2.

The result of algorithm can be viewed as in the following picture.



To search the private correlation between the objects *A* and *B* determined consistent of acts will be written in vector $Q = \{q_i\}$. Because vector *U* may have more than one determination, e.g.: $A_1, A_2, ..., A_m$. In the above mentioned example by the object *A* and *B* was found private correlation q_1 between determination A_1, A_2. The following process was held on the basis of the same algorithms A_2, A_3, and found q_2. Therefore, number of tasks in the process амаллар is equal to *m-1*. Here the parameters of the vector *Q* accepts the quantities of range – *id_SL* table of correlation – *SL* in the base of keywords.

If all the parameters of the vector *Q* mentioned in the algorithm are determined permanently, it means that the query that the user inputting is right. Otherwise, it is suggested to input query specified. Integrity of encoded vector *Q* in the text of query satisfying demand gives opportunity to create query in SQL language automatically in DB, the base of demands is fixed in the range of "*treaktori*".

3.2. Formation of SQL queries

There are mainly three parameters in the base of demands: determination, determined and encoded texts expressing the private correlation between the objects. Using these parameters there will be opportunity to creat SQL queries automatically to select data from DB. It is clear that the operator Select is considered to select data among the tables and manipulate them according to different requires in SQL language. Syntactically structure of the operator Select is as following [Ryan Steven, 1998]:

SELECT <[ALL | DISTINCT] {*|[name of the column [AS new_name]]} [,...n]> FROM <name of the table [[AS] connecting] [,...n]> [WHERE <conditions of sorts>] [GROUP BY <name of the column [,...n]>] [HAVING <criteria of grouping>] [ORDER BY <name of the column [,...n]>]

By correlating this structure for ourselves, we form the following structure of SQL queries:

SELECT <formula of determinations (U-)>
FROM < formula of table connections (Q)>
WHERE <formula of determination (U+)>

It is necessary to form special algorithmic rule for creating SQL queries completely with the help of the base of demands. SQL queries and a parameter is produced according to the ranges of encoded texts in the base of demands. It can be mentioned as following:

- Range of ***Select*** is the range *B_text* determined the base of demands, e.g. in vector $U(u_i^j)$ of parameter u_i^j is determined the user's demanded ranges of the table according to the given special code of the base *ST*;
- range of ***Where*** is determined like the range of ***Select***, but here the range of *A_text* or in vector $U(u_i^0, u_i^j)$ of parameter u_i^j with the help of the base *ST* parameter u_i^0 is compared with determined ranges of the table;
- range of ***From*** is determined by *treaktori* (correlation) range of the base of demands, or parameters of vector *Q*. Here given quantities of ranges of the table in the base *SL* and according to the types of correlating bases *ST* and *SO* are used together. Types of correlating like *1:1 – Inner Join, 1:M – Right Outer Join, M:1 –Left Outer Join* are used in the process.

To form the full formula of SQL query satisfying demand correlating ranges in the base of queries in SQL are combined in order.

User's interface

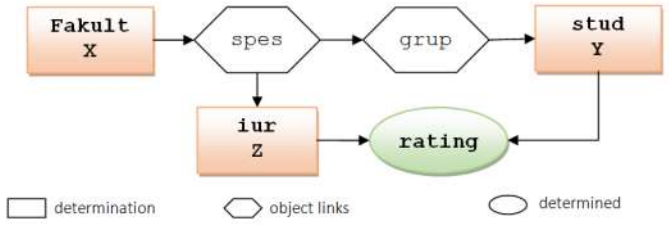
It is known that the result of interactive SQL-query made for database will be in table form. As above mentioned to presentation the result of SQL-query formed by "the base of demands" for user in table, programming languages creating system are widely used to perform. So with the help of opportunities of programm of system, effect templates are input in different kinds and forms beforehand.

As above mentioned, we observed the text of the demand query formalized expressed initial data by text of the questionnaire formed in natural language, forming SQL queries automatically in the DB, IIS software given by information environment which helps satisfying demands, mathematical model, algorithms.

3.4. Paradigm

Main functions of tables in HEI composed by information environment and traditional-functional correlation between them in the work [Sachin Kumar and Ashish Kumar, 2013] was mentioned in detail. By using infological model of these data, as above mentioned, with the help of methods and algorithms we observe a paradigm translating query-texts into SQL queries. Let's assume query-text is given as following:
Fazil Aliev's rating assimilation on the subject of Physics, the student of Economy faculty

1-step. Separating words in the given text from BKW
Fazil Aliev's **rating**rating assimilation on the **subject** of Physics, the **student** of Economy **faculty**
2-step. Separating objects and their quantities from words of the text with the help of BKW
[Economy**]faculty[**Aliev Fazil**] stud[**Physics**]iur[**∞**]rating**
3- step Arranging determined objects from BKW to correlating names of the table
([Economy] **fakultet)(**[Aliev Fazil] **stud)(**[Physics] **iur)(**[∞] **rating)**
4- step Separating determinations with the help of objects
([X], faculty) **([Y]**, stud) **([Z]**, iur) **([null]**, rating)
5- step Separating encoded text to parts of determination and determined
{([X], faculty) ([Y], stud) ([Z], iur)**}{**([null], rating)**}**
6- step Determining correlation between the objects
fakult ∞ stud∞ iur∞ rating



7-step. Formation of SQL queries according to encoded text

SELECT //as a result fakult.name_fakult, spes.name_spes, // *faculty and specialty* grup.name_grup, stud.fio, // *name of the group and name of the student* iur.name_iur, //*name of the subject* rating.* //all parameters of *rates* FROM fakult INNER JOIN **spes** ON (fakult.id=spes.fakult_id) INNER JOIN **grup** ON (spes.id=grup.spes_id) INNER JOIN stud ON (grup.id=stud.grup_id) INNER JOIN iur ON (spes.id=iur.spes_id) INNER JOIN rating ON (iur.id=rating.iur_id AND stud.id=rating.stud_id) WHERE fakult.name_fakult=[**X**]

stud.fio=[**Y**]

iur.name_iur=[**Z**]

Summary

1) Analyzed data based on satisfying user's demands by forming of the system of intellectual interactive services (IIS) in information environments, general concepts, putting the problem - model and their software has been explored.
2) In information environments intellectual interactive services, database, base of keywords, rules of text structure in natural language, ways, methods and algorithms of forming base of demands have been created.
3) Formalizing data in natural expressed text and problems of delaminating and their realizing mechanisms and algorithms have been created.
4) Searching natural expressed data from the base of demands, if there is no new demand in the base of demands, supplying them with new demands and translating into SQL language automatically, such kinds of problems have been solved.
5) Mathematical model of the system of intellectual interactive service satisfying user's demands in information environments has been formed.

REFERENCES

Babadjanov E.S. Conceptual Model of creating the process of educational establishments in higher educational institutions. News of TUIT. 2011 №4;

Bessarabov N.V., Tischenko A.A. Method of Translating Tasks from Natural Language into SQL / Intellectual Systems: In proceedings of IX International Symphosium.– M.:RUSAKI, 2010, P.298...301.

Bolshakova E.I., Klyshinskiy E.S., Lande D.V. Automatic Processing texts into Natural Language and Computer Linguistics: manual/ MIEM, 2011 — p. 272.

Imran Sarwar Bajwa, Shahzad Mumtaz. Database Interfacing using Natural Language Processing. *European Journal of Scientific Research*, Vol.20 No.4 (2008), pp.844-851

Mrs. Neelu Nihalani, Dr. Sanjay Silakari. Natural language Interface for Database: A Brief review. *IJCSI International Journal of Computer Science*, Issues, Vol. 8, Issue 2, March 2011

Naikhanova L.V., Evdokimova I.S., Methods and Algorithms of Translation of Natural Language Queries in Database of SQL Queries: Monograph. –Ulan-Ude: Print. ESSUTM, 2004. – p. 148.;

Nishanov A.K., Babadjanov E.S., Analyses on models of managing the process of automation of educational establishments in higher educational institutions. News of TUIT. 2011 №4;

Nishanov A.K., Kalimbetov N.I., Babadjanov E.S., Methods of searching intellectual data in the sphere of information. *Journal of «European Applied Sciences»,* Number №6, 2013;

Ryan Steven, Ronald Plue. SQL, M.: BINOM, 1998.

Sachin Kumar, Ashish Kumar. System and Methods for Converting Speech to SQL. Appeared In proceedings of International Conferenceon ERCICA 2013 pp: 291-298.

Siasar djahantighi F., M. Norouzifard, S. Using Natural Language Processing in Order to Create SQL Queries. Proceedings of the International Conference on Computer and Communication Engineering, 2008, Malaysia

****