МИНИСТЕРСТВО НАУКИ
И ВЫСШЕГО ОБРАЗОВАНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ

Федеральное государственное бюджетное
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«Новосибирский государственный технический университет»

НГТУ
НЭТИ | **Факультет прикладной
математики и информатики**

Кафедра прикладной математики

Лабораторная работа № 3

по дисциплине «Введение в искусственный интеллект»

Внутренняя база данных Турбо - Пролога

Бригада 10   ЗАЛЕВСКИЙ ВЛАДИСЛАВ

Группа ПМ-91   ЗАТОЛОЦКАЯ ЮЛИЯ

Вариант 10   ЛЕБЕДЕВ НИКИТА

Преподаватели   АВДЕЕНКО ТАТЬЯНА ВЛАДИМИРОВНА

                  ЦЕЛЕБРОВСКАЯ МАРИНА ЮРЬЕВНА

Новосибирск, 2021

1. Текст задания.

а) напишите на Турбо-Прологе программу (используя внутреннюю базу данных), позволяющую спрашивать у пользователя, каким языком он владеет, и записывать ответы в базу данных. За основу можно взять следующую схему, сделав соответствующие изменения:

ЯЗЫК (итальянский).
ЯЗЫК (немецкий).
ЯЗЫК (японский).
ЯЗЫК (французский).
ЯЗЫК (английский).
ДИАЛОГ:- WRITE ('Введите Ваше имя :'),
    READ (Имя) , ЯЗЫК(Яз),
    WRITE (Знаете ли вы),
    WRITE (Яз),
    WRITE ('язык'),
    READ (да),
    ASSERT (ВЛАДЕЕТ(Имя, Яз)),
    FAIL

б) в базу данных включите факты: ЯЗЫК(...), ВЛАДЕЕТ (_ , _);

в) измените программу, включив в нее предикаты чтения базы данных из файла и записи в файл по окончании сеанса работы.

2. Измените свое индивидуальное задание из лабораторной работы № 2 таким образом, чтобы все основные факты вашей программы хранились во внутренней базе данных (считывались из файла, обрабатывались программой и снова записывались в файл). При этом введите диалог с пользователем для добавления или удаления фактов в базу данных (за основу организации диалога возьмите предыдущее задание 1).

2. Тексты разработанных программ.
Часть 1

```
database
      lang(symbol).
      know(symbol, symbol).
```

```
predicates
        nondeterm answer(integer)
        menu
        nondeterm repeat
clauses
        lang (italian).
        lang (german).
        lang (japanese).
        lang (french).
        lang (english).
        answer('1'):-
                WRITE ("Insert Your name :\n"),
                readln(Name) , lang(Lan),
                WRITE ("Do you know ", Lan, "?\n"),
                readln (Answer),
                Answer="yes",
                ASSERT (know(Name, Lan)),
                FAIL.
        answer('s'):-
                save("C:\Users\zalevskij.2019\Desktop\database"),
                write("Information saved successfully\n").
        answer('l'):-
                consult("C:\Users\zalevskij.2019\Desktop\database"),
                write("Information loaded successfully\n").
        answer('q'):-
                exit.
        menu:-
                repeat,
                write("1 - add information about you\n"),
                write("s - save database in file\n"),
                write("l - load database from file\n"),
                write("q - quit"),
                write("Choose : \n"),
                readchar(Answer),
                answer(Answer),
                FAIL.
        repeat.
        repeat :- repeat.
goal
        menu.
```

Часть 2
```
database
        composition(food,proteins, fats, carbohydrates,vitamins, microelements)
domains
        food, vitamins, microelements = string
        proteins, fats, carbohydrates, calories          , grams = integer
```

```
predicates
        nondeterm calories(food,calories,grams)
        nondeterm what_to_eat(food,proteins, fats, carbohydrates,vitamins,
microelements,calories, grams)
        nondeterm answer(integer)
        menu
        nondeterm repeat

clauses
        answer('1'):-
                write("Food name\n"),
                readln(Food),
                write("Proteins\n"),
                readint(Proteins),
                write("Fats\n"),
                readint(Fats),
                write("Carbohydrates\n"),
                readint(Carbohydrates),
                write("Vitamins\n"),
                readln(Vitamins),
                write("Microelements\n"),
                readln(Microelements),
                assert(composition(Food,Proteins, Fats, Carbohydrates,Vitamins,
Microelements)),
                fail.
        answer('l'):-
                consult("D:\database"),
                write("Information loaded successfully\n").

        answer('2'):-
                write("Proteins\n"),
                readint(Proteins),
                write("Fats\n"),
                readint(Fats),
                write("Carbohydrates\n"),
                readint(Carbohydrates),
                write("Vitamins\n"),
                readln(Vitamins),
                write("Microelements\n"),
                readln(Microelements),
                write("Grams\n"),
                readint(Grams),
                write("Calories\n"),
                readint(Calories),
                what_to_eat(Food,Proteins, Fats, Carbohydrates,_, _,Calories,Grams),
                write (Food, "\n"),
                fail.
        answer('3'):-
```

```prolog
            WRITE ("Insert product name :\n"),
            readln(Food),
            WRITE ("Amount of grams?\n"),
            readint (Grams),
            calories(Food, Calor, Grams),
            WRITE ("Amount of calories:",Calor,"\n"),
            FAIL.
      answer('q'):-
            save("D:\database"),
            exit.
      answer('4'):-
            write("Food in the database:\n"),
            composition(Food,Proteins, Fats, Carbohydrates,Vitamins, Microelements),
            write("Food : ",Food, ";   Proteins : ",Proteins,";   Fats : ", Fats,";
Carbohydrates : ",Carbohydrates,";   Vitamins : ",Vitamins,";   Microelements :
",Microelements),nl.



      what_to_eat(Food, Proteins, Fats, Carbohydrates, Vitamins, Micr, Calories, Grams):-
            composition(Food,  Prot, F, Carb,V, M),
            calories(Food, Calor, Grams),
            Calories<=Calor,
            Proteins <= Prot,
            Fats <= F,
            Carbohydrates <= Carb,
            Vitamins = V,
            Micr = M .
      calories(Food, Calories, Grams):-
            composition(Food,  Prot, F, Carb,Vit, Mic),
            Calories = (Prot*4 + F*9+ Carb*4)*Grams/100.
      menu:-
            answer('l'),
            repeat,
            write("1 - add information about product\n"),
            write("2 - what to eat\n"),
            write("3 - calories\n"),
            write("4 - show database\n"),
            write("q - quit and save database\n"),
            write("Choose : \n"),
            readchar(Answer),
            answer(Answer),
            fail.
      repeat.
       repeat :- repeat.
goal
      menu.
```

3.   Результаты выполнения.
Часть 1

1 - add information about you
s - save database in file
l - load database from file
q - quitChoose :
Insert Your name :
Ju
Do you know italian?
yes
Do you know german?
yes
Do you know japanese?
no
Do you know french?
yes
Do you know english?
no
1 - add information about you
s - save database in file
l - load database from file
q - quitChoose :
Information saved successfully
1 - add information about you
s - save database in file
l - load database from file
q - quitChoose :
Information loaded successfull
1 - add information about you
s - save database in file
l - load database from file
q - quitChoose :

Файл database:
lang("italian")
lang("german")
lang("japanese")
lang("french")
lang("english")
know("Ju","italian")
know("Ju","german")
know("Ju","french")

Часть 2

Information loaded successfully

1 - add information about product
2 - what to eat
3 - calories
4 - show database
5 - quit and save database
Choose :
Food in the database:
Food : beef;   Proteins : 19;   Fats : 12;   Carbohydrates : 0;   Vitamins : b12;   Microelements : co
Food : peanut;   Proteins : 26;   Fats : 45;   Carbohydrates : 10;   Vitamins : pp;   Microelements : cu
Food : oatmeal;   Proteins : 12;   Fats : 6;   Carbohydrates : 62;   Vitamins : b1;   Microelements : co
Food : flax_seeds;   Proteins : 18;   Fats : 42;   Carbohydrates : 1;   Vitamins : b1;   Microelements : mg
Food : bread;   Proteins : 6;   Fats : 1;   Carbohydrates : 47;   Vitamins : pp;   Microelements : mn
Food : apple;   Proteins : 0;   Fats : 0;   Carbohydrates : 10;   Vitamins : c;   Microelements : fe
Food : orange;   Proteins : 0;   Fats : 0;   Carbohydrates : 8;   Vitamins : c;   Microelements : si
Food : hazelnut;   Proteins : 15;   Fats : 61;   Carbohydrates : 9;   Vitamins : h;   Microelements : si
Food : egg;   Proteins : 13;   Fats : 12;   Carbohydrates : 0;   Vitamins : h;   Microelements : co
Food : pasta;   Proteins : 11;   Fats : 1;   Carbohydrates : 70;   Vitamins : pp;   Microelements : cu
Food : curd;   Proteins : 32;   Fats : 10;   Carbohydrates : 6;   Vitamins : b12;   Microelements : co
Food : cucumber;   Proteins : 1;   Fats : 0;   Carbohydrates : 3;   Vitamins : c;   Microelements : si
Food : potato;   Proteins : 2;   Fats : 0;   Carbohydrates : 16;   Vitamins : c;   Microelements : co
Food : white_mushroom;   Proteins : 3;   Fats : 2;   Carbohydrates : 1;   Vitamins : b5;   Microelements : co
Food : sunflowe_oil;   Proteins : 0;   Fats : 100;   Carbohydrates : 0;   Vitamins : e;   Microelements : p
Food : olive_oil;   Proteins : 0;   Fats : 100;   Carbohydrates : 0;   Vitamins : e;   Microelements : fe
Food : butter;   Proteins : 1;   Fats : 80;   Carbohydrates : 0;   Vitamins : a;   Microelements : p
1 - add information about product
2 - what to eat
3 - calories
4 - show database
5 - quit and save database
Choose :
Food name

banana
Proteins
3
Fats
0
Carbohydrates
22
Vitamins
b1
Microelements
k
1 - add information about product
2 - what to eat
3 - calories
4 - show database
5 - quit and save database
Choose :
Insert product name :
banana
Amount of grams?
100
Amount of calories:100
1 - add information about product
2 - what to eat
3 - calories
4 - show database
5 - quit and save database
Choose :
Food in the database:
Food : beef; Proteins : 19; Fats : 12; Carbohydrates : 0; Vitamins : b12; Microelements : co
Food : peanut; Proteins : 26; Fats : 45; Carbohydrates : 10; Vitamins : pp; Microelements : cu
Food : oatmeal; Proteins : 12; Fats : 6; Carbohydrates : 62; Vitamins : b1; Microelements : co
Food : flax_seeds; Proteins : 18; Fats : 42; Carbohydrates : 1; Vitamins : b1; Microelements : mg
Food : bread; Proteins : 6; Fats : 1; Carbohydrates : 47; Vitamins : pp; Microelements : mn
Food : apple; Proteins : 0; Fats : 0; Carbohydrates : 10; Vitamins : c; Microelements : fe
Food : orange; Proteins : 0; Fats : 0; Carbohydrates : 8; Vitamins : c; Microelements : si
Food : hazelnut; Proteins : 15; Fats : 61; Carbohydrates : 9; Vitamins : h; Microelements : si
Food : egg; Proteins : 13; Fats : 12; Carbohydrates : 0; Vitamins : h; Microelements : co

Food : pasta; Proteins : 11; Fats : 1; Carbohydrates : 70; Vitamins : pp; Microelements : cu

Food : curd; Proteins : 32; Fats : 10; Carbohydrates : 6; Vitamins : b12; Microelements : co

Food : cucumber; Proteins : 1; Fats : 0; Carbohydrates : 3; Vitamins : c; Microelements : si

Food : potato; Proteins : 2; Fats : 0; Carbohydrates : 16; Vitamins : c; Microelements : co

Food : white_mushroom; Proteins : 3; Fats : 2; Carbohydrates : 1; Vitamins : b5; Microelements : co

Food : sunflowe_oil; Proteins : 0; Fats : 100; Carbohydrates : 0; Vitamins : e; Microelements : p

Food : olive_oil; Proteins : 0; Fats : 100; Carbohydrates : 0; Vitamins : e; Microelements : fe

Food : butter; Proteins : 1; Fats : 80; Carbohydrates : 0; Vitamins : a; Microelements : p

Food : banana; Proteins : 3; Fats : 0; Carbohydrates : 22; Vitamins : b1; Microelements : k

1 - add information about product
2 - what to eat
3 - calories
4 - show database
5 - quit and save database
Choose :
Proteins
4
Fats
0
Carbohydrates
23
Vitamins

Microelements

Grams
100
Calories
110
oatmeal
bread
pasta
1 - add information about product
2 - what to eat
3 - calories
4 - show database
5 - quit and save database
Choose :

Файл database:

```
composition("beef",19,12,0,"b12","co")
composition("peanut",26,45,10,"pp","cu")
composition("oatmeal",12,6,62,"b1","co")
composition("flax_seeds",18,42,1,"b1","mg")
composition("bread",6,1,47,"pp","mn")
composition("apple",0,0,10,"c","fe")
composition("orange",0,0,8,"c","si")
composition("hazelnut",15,61,9,"h","si")
composition("egg",13,12,0,"h","co")
composition("pasta",11,1,70,"pp","cu")
composition("curd",32,10,6,"b12","co")
composition("cucumber",1,0,3,"c","si")
composition("potato",2,0,16,"c","co")
composition("white_mushroom",3,2,1,"b5","co")
composition("sunflowe_oil",0,100,0,"e","p")
composition("olive_oil",0,100,0,"e","fe")
composition("butter",1,80,0,"a","p")
composition("banana",3,0,22,"b1","k")
```

4.   Привести схему поиска решения одной из поставленных целей.

```
                    ┌─────────────┐
                    │  answer(2)  │
                    └─────────────┘
                           │  Answer = 2
                           ▼
        ┌──────────────────────────────────────────────┐
        │ What_to_eat(Food, 20, 40, 9, Vitamins, Micr, 548, 100) │
        └──────────────────────────────────────────────┘
                │  Food = butter, Prot = 1, F = 80, Carb = 0, V = a, M=p
                ▼
        ┌─────────────────────────────────────┐
        │ composition(butter, 1, 80, 0, a, p) │
        └─────────────────────────────────────┘
                │  Calor = 724, Grams = 100
                ▼
        ┌──────────────────────────────┐
        │ calories (butter, 724, 100)  │
        └──────────────────────────────┘
                ▼
            ┌───────────┐
            │ 548 <= 724 │
            └───────────┘
            ┌─────────┐
            │ 20 <= 1 │
            └─────────┘
            ┌──────────┐
            │ 40 <= 80 │
            └──────────┘
            ┌─────────┐
            │ 9 <= 0  │
            └─────────┘
                │  False
                ▼
               NO
```