HEMOGRAM DATABASE SYSTEM

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1. INTRODUCTION

We present you the Hemogram Database. It's main purpose is to allow analyzers, doctors and patients to have a common access to a common document: the hemogram.

Each type of user will be able to have a type of account, having each type different actions that are related to hemograms.

This hemogram is made of several parts, showing the patient information, its features (showing if they are in the recommended interval), and a possible comment that the doctor is able to add in order to get the patient informed. It also displays the date of the hemogram, which will help the doctor to follow the progress of its patients.

2. CHARACTERS

There are three type of users in our database:

2.1 ANALYZER

This is the scientist that is responsible of creating the patients and its hemograms. It will take the patient values and put them into the hemogram database.

2.2 DOCTOR

As everybody knows, the doctor takes care of the health of the patients. In this database, the doctor will be able to supervise the feature values in order to check its patient's health, with the possibility, as it is mentioned before, of adding comments. These comments will be useful for the patients to know if they have to receive a specific treatment, or to see the doctor's point of view of their tests and their progress.

2.3 PATIENT

An ordinary person would be the perfect example to explain the patient. As a normal person it can be concern about its health. The database let this patient to see its values, which also show if the values are in the optimal interval. The doctor comments will be available for the patient to know how it can treat to return their tests to normal feature values, getting healthy.

3. USING OUR PROGRAM (MANUAL)

This is how the program starts. If it's the first time using the database, the first user that has to be registered is the analyzer. The doctor or the patient won't be able to do their actions if there aren't any hemograms, which are created by the analyzer. Furthermore, the analyzer creates the patients.

```
Who are you?
1. Analyzer
2. Doctor
3. Patient
0. Exit
Select an option:
```

ANALYZER

Once the analyzer has sign in, it will be able to add patients to the data base. And to log in a future situation.

```
ANALYZER

1. Sign In
2. Log In
3. Go back
Select an option:
```

```
FILL IN YOUR INFO
Name (Username): Manolo
Surname: Fernandez
Work User (password): 111
Hospital: PHierro
Records inserted.
```

```
ANALYZER

1. Sign In a new patient
2. Search for a patient
3. Create patient and hemogram from XML
4. Go back
Select an option:
```

```
LOG IN
Username (name): Manolo
Password (workUser): 111
```

```
FILL IN THE PATIENT'S INFO
Name: Juanita
Surname: Hernandez
DNI: 123
Date of Birth (yyyy-MM-dd): 1999-02-02
Records inserted.
```

The analyzer can import patients from the XML an include new hemograms. In this option is important to know that the type of file needs to be XML, that involves the file name to end in ".xml".

```
1. Sign In a new patient
2. Search for a patient
3. Create patient and hemogram from XML
4. Go back
Select an option: 3
Type the filename for the XML document (expected in the xmls folder, probably named Input-Patient.xml): Input-Patient.xml
Records inserted.

ANALYZER

1. Sign In a new patient
2. Search for a patient
3. Create patient and hemogram from XML
4. Go back
Select an option: 2

INTRODUCE THE DNI OF THE PATIENT
Patient DNI: 0000

Doctors list:
Doctor: Carlos Fernandez, id: 1
Insert the doctor id (if there isn't the doctor put 0): 1
```

```
Insert the date of the hemogram (yyyy-MM-dd): 2020-10-04
INSERT THE VALUES FOR THE HEMOGRAM
Leukocytes: 3
Erythrocytes: 4
Hemoglobin: 5
Hematocrit: 6
Platelets: 5
Cholesterol: 8
Cholesterol HDL: 8
Triglycerides: 20
Cholesterol LDL: 23
Glycemia: 6
Hemogram successfully created.
```

The analyzer can join doctors to patients. If there aren't any doctor in the database, there's no problem. It will have just to enter a 0. But the program will advise that the patient needs a doctor.

```
Doctors list:
Insert the doctor id (if there isn't the doctor put 0): 0
THE DOCTOR SHOULD BE REGISTERED, WAIT UNTILL HE REGISTERS!
```

DOCTOR

The doctor signs up in a similar way, but it has the possibility of adding its speciality. It will shows its possibilities.

```
FILL IN YOUR INFO
Name (Username): Aurelio
Surname: Lorenzo
Work_user (password): 222
Hospital: JCarlos
Specialty: Cardiology
Records inserted.
```

```
DOCTOR

1. List all your patients
2. Search for a patient
3. Go back
Select an option:
```

It will be able to list all of it's patients. An to search for a concrete one.

```
DOCTOR

1. New Doctor
2. Already signed up
3. Go back
Select an option: 2

LOG IN:
Username (Name): Carlos
Password (Work User): lunes

DOCTOR

1. List all your patients
2. Search for a patient
3. Go back
Select an option: 1

Patients list:
DNI: 0000 , Name: Mario , Surname: Lopez
To see a patient's hemogram, you need to search for that specific patient (option 2)
```

Once the doctor knows the DNI of the patient, it can start with the option 2. In this option the doctor can open a hemogram and add a comment if it's necessary.

```
DOCTOR

1. List all your patients
2. Search for a patient
3. Go back
Select an option: 2

SEARCH A PATIENT
Introduce the Patient's DNI: 0000

DOCTOR

1. Show his hemograms normally
2. Generate XML
3. Go back
Select an option: 1
Mario Lopez


Hemograms:
ID: 1, Date: 2020-10-04
Select the ID of the Hemogram you want to see: 1

Hemogram with date 2020-10-04
leukocytes; VALUE: 6.02, HEALTHY: true, [MIN: 4,80, MAX: 10,80]
erythrocytes; VALUE: 3.8, HEALTHY: false, [MIN: 4,20, MAX: 5,40]
hemoglobin; VALUE: 13.5, HEALTHY: true, [MIN: 12,00, MAX: 16,00]
hematocrit; VALUE: 50.0, HEALTHY: false, [MIN: 37,00, MAX: 47,00]
platelets; VALUE: 346.2, HEALTHY: true, [MIN: 130,00, MAX: 400,00]
cholesterol; VALUE: 139.0, HEALTHY: true, [MIN: 0,00, MAX: 200,00]
cholesterolHDL; VALUE: 43.54, HEALTHY: true, [MIN: 40,00, MAX: 60,00]
triglycerides; VALUE: 98.64, HEALTHY: true, [MIN: 10,00, MAX: 200,00]
cholesterolLDL; VALUE: 74.32, HEALTHY: true, [MIN: 0,00, MAX: 100,00]
glycemia; VALUE: 69.5, HEALTHY: false, [MIN: 70,00, MAX: 110,00]
```

It won't be necessary to comment the hemogram if the doctor doesn't want it. But in this example it is shown how the doctor adds it.

```
Do you want to introduce any comments?, please introduce YES/NO: YES
You can introduce your comments
The patient Mario has too high levels of Hematocrit, and low levels of erythrocytes.
```

PATIENT

The patient can't create its account, it can log in and observe the hemograms realized. The program will show the patient the list of hemograms done, with a date and an id that is needed to search the hemogram.

```
PATIENT

1. LogIn
2. Go back
Select an option: 1

LOG IN
Username (name): Mario
Password (DNI): 0000
```

```
PATIENT

1. List all Hemograms
2. Generate XML
3. Go back
Select an option: 1
```

As the doctor, the patient can access to the hemograms.

```
Hemogram with date 2020-10-04
leukocytes; VALUE: 6.02, HEALTHY: true, [MIN: 4,80, MAX: 10,80]
erythrocytes; VALUE: 3.8, HEALTHY: false, [MIN: 4,20, MAX: 5,40]
hemoglobin; VALUE: 13.5, HEALTHY: true, [MIN: 12,00, MAX: 16,00]
hematocrit; VALUE: 50.0, HEALTHY: false, [MIN: 37,00, MAX: 47,00]
platelets; VALUE: 346.2, HEALTHY: true, [MIN: 130,00, MAX: 400,00]
cholesterol; VALUE: 139.0, HEALTHY: true, [MIN: 0,00, MAX: 200,00]
cholesterolHDL; VALUE: 43.54, HEALTHY: true, [MIN: 40,00, MAX: 60,00]
triglycerides; VALUE: 98.64, HEALTHY: true, [MIN: 10,00, MAX: 200,00]
cholesterolLDL; VALUE: 74.32, HEALTHY: true, [MIN: 0,00, MAX: 100,00]
glycemia; VALUE: 69.5, HEALTHY: false, [MIN: 70,00, MAX: 110,00]
Doctors comments: null
```

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The patient can also export its hemograms in xml format.

```
PATIENT

1. List all Hemograms
2. Generate XML
3. Go back
Select an option: 2
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<patient name="Mario" surname="Lopez">
    <dob>2020-05-04</dob>
    <dni>0000</dni>
    <hemograms>
        <hemogram>
            <dob>2020-10-04</dob>
            <doctor name="Carlos" surname="Fernandez">
                <work_user>lunes</work_user>
                <hospital>rubber</hospital>
                <specialty>cardiologist</specialty>
            </doctor>
            <analyzer name="Laura" surname="Sanchez">
                <work_user>miercoles</work_user>
                <hospital>rubber</hospital>
            </analyzer>
            <featureValues>
                <featureValue>
                    <value>6.02</value>
                    <feature>
                        <name>leukocytes</name>
                    </feature>
                    <healthy>true</healthy>
```

```
                </featureValue>
                <featureValue>
                    <value>98.64</value>
                    <feature>
                        <name>triglycerides</name>
                    </feature>
                    <healthy>true</healthy>
                </featureValue>
                <featureValue>
                    <value>74.32</value>
                    <feature>
                        <name>cholesterolLDL</name>
                    </feature>
                    <healthy>true</healthy>
                </featureValue>
                <featureValue>
                    <value>69.5</value>
                    <feature>
                        <name>glycemia</name>
                    </feature>
                    <healthy>false</healthy>
                </featureValue>
            </featureValues>
        </hemogram>
    </hemograms>
</patient>
XML successfully created, to see the html please go to the xmls folder and open the Patien.html
```

The patient has the option to see the html. It will need to open the "xmls" folder and select the file in html format (ended with ".html"). This file will include a list of all the hemograms of the patient.

Name: Mario

Surname: Lopez

HEMOGRAMS:

Hemogram with date: 2020-10-04

Feature	Value	Healthy
leukocytes	6.02	true
erythrocytes	3.8	false
hemoglobin	13.5	true
hematocrit	50.0	false
platelets	346.2	true
cholesterol	139.0	true
cholesterolHDL	43.54	true
triglycerides	98.64	true
cholesterolLDL	74.32	true
glycemia	69.5	false

Hemogram with date: 2020-05-31

Feature	Value	Healthy