International Journal of Engineering Inventions
e-ISSN: 2278-7461, p-ISSN: 2319-6491
Volume 4, Issue 7 (December 2014) PP: 20-27

Transfer of Physiological Signals: Application for Patients with Chronic Diseases in their Home

M. Kedim[1], A. Amine Aissa Mokbil[2], M. Benabdellah[3]
Department of Electrical Engineering AND Electronics, Faculty of Technology, University Aboubekr Belkaid BP 230, Tlemcen 13000, Algeria

Abstract: *A Medical home for patients with chronic diseases (heart disease, respiratory, diabetes ...) participle in the improvement of the lives of such patients including remote monitoring (from a monitoring center vigilance) . The prospects for global development of sophisticated telecommunications systems therefore remain very important in this area and makes the overall goal of providing at the same time to everyone with access to advanced communication, information and control systems needed to improve their living conditions; monitoring, assistance, consultation and even expert services remotely. In this article we having a system that organizes the transfer of information for this kind of patients remain in their homes. Remote monitoring and telemetry recording are utilized to attempt to secure a level of care in home at least equivalent to that provided in the health facility.*

Keywords: *Medical home, information transfer, telemedicine, client-server, WINSOCK, Visual Basic (VB).*

I. Introduction

The Medical home for patients with chronic diseases responds to many issues. First it improves the quality of care and services for patients who need physical and psychological help. Secondly it contributes to reducing congestion in hospitals. Thirdly it limits the risks due to contamination by another disease because of prolonged hospitalization (nosocomial diseases).

Counterpart, the medical home meets needs for people living alone. In this case, it is necessary to maintain a continuous monitoring of the patient or a nurse to delegate to that effect. The solution provided by telemedicine can meet those needs with a system that facilitates the monitoring, assistance, medical consultation and even other services (Figure 1) by remote communication allowing the physician monitoring the evolution the health of the patient in real time while providing the advice and decisions to the patient, online. This solution also allows the patient to understand their situation when they want without leaving home. In case the condition becomes critical the system triggers an alarm to the doctor on an emergency service or monitoring center vigilance can support the patient in quickly.

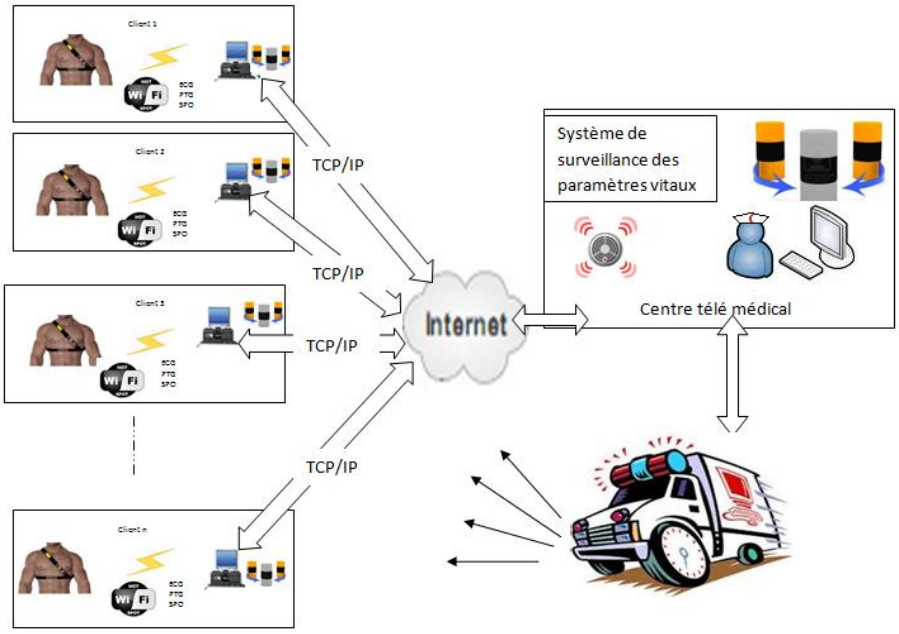


Figure 1: Architecture of the Tele-health platform

II. Materials and Methods

2.1 Concept of the proposed system:

The essential features necessary for the establishment of a platform for providing services for the medical field are the acquisition, collection, analysis, development, design, storage and transmission of data and information about the person tele-monitored [1,2,3,4,5].

Characteristics required by the remote monitoring systems have been identified for a long time [4,5]. It is now widely accepted that these systems should be open, able to integrate various technologies enough, and at the same time flexible enough to suit the needs of every patient and to take into account the dynamic aspect of the evolution of health.

For this, we can enumerate sub key systems design, development and deployment of remote care services (Fig 2):

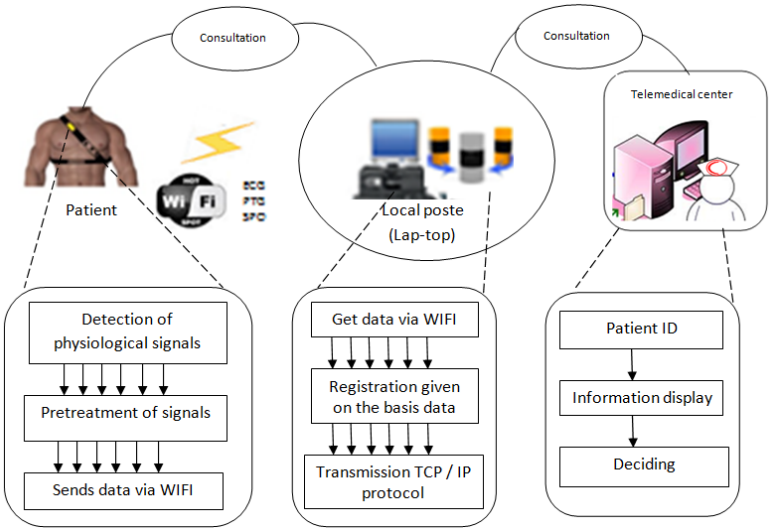


Figure 2: Structure of various measures taken

- Sensors and mobile acquisition system: This is an waistcoat support sensors [6], an acquisition circuit and a wifi module for sending signals picked up at the local station.
- Data processing system on the local post: The large amount of collected data requires the design and effective treatment of intelligent assistants for extraction relevant information.
- Database System: Data collected or retrieved information must be stored in databases and accessible for consultation or update.
- System remote communication: This is a computer system for the interoperability of subsystems through a medical network that connects the local post in the center of vigilance and more generally to various players in the system.

2.2 Method

The network we have executed is broken down into two main parts: This is a server software (dedicated to the monitoring center vigilance) and client software (hosted in local posts assigned to patients) that communicate depending on the architecture client-server supported by the technique of SOCKET. In our case it is the WINSOCK component of Visual Basic compatible with the WINDOWS operating system and the communication protocol TCP / IP (Transmission Control Protocol / Internet Protocol).

In more detail, the client application sends a request to the server application to request information.

The proposed algorithms are developed according to the needs of patients in first and in second as required by the supervising physician.

We've broken down our work into two main algorithms:

2.2.1 Identifying patients

For the identification of patients we have developed a database online using the VB Winsock link that allows to enter the name (User Name) and password (login) of the user.

The following two charts stand the different stages in the identification and data security on the database (figure3.a) for the patient interface (client) and (figure3.b) for the physician interface (server)

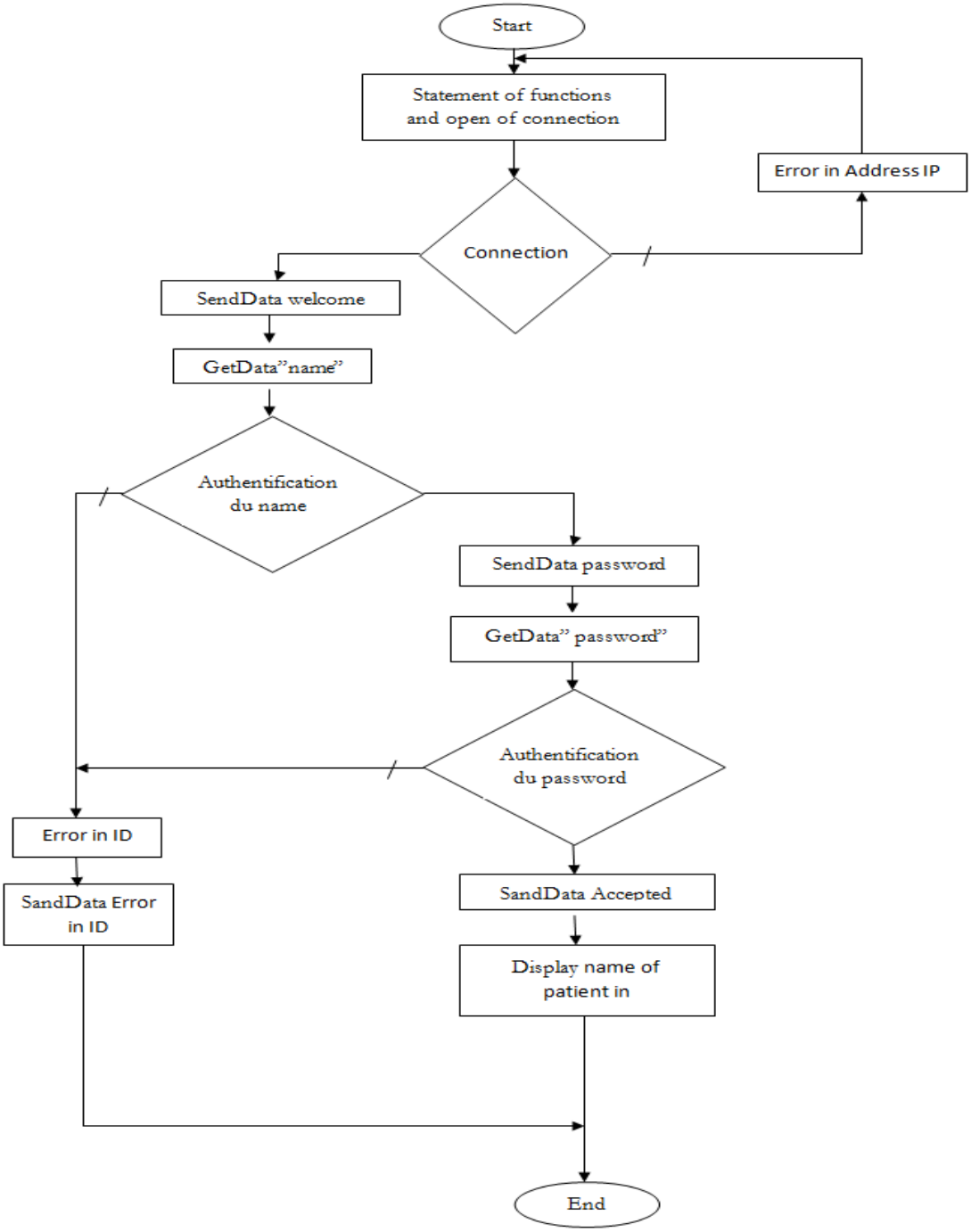


Figure 3.a; organization chart of the client interface for patient identification.

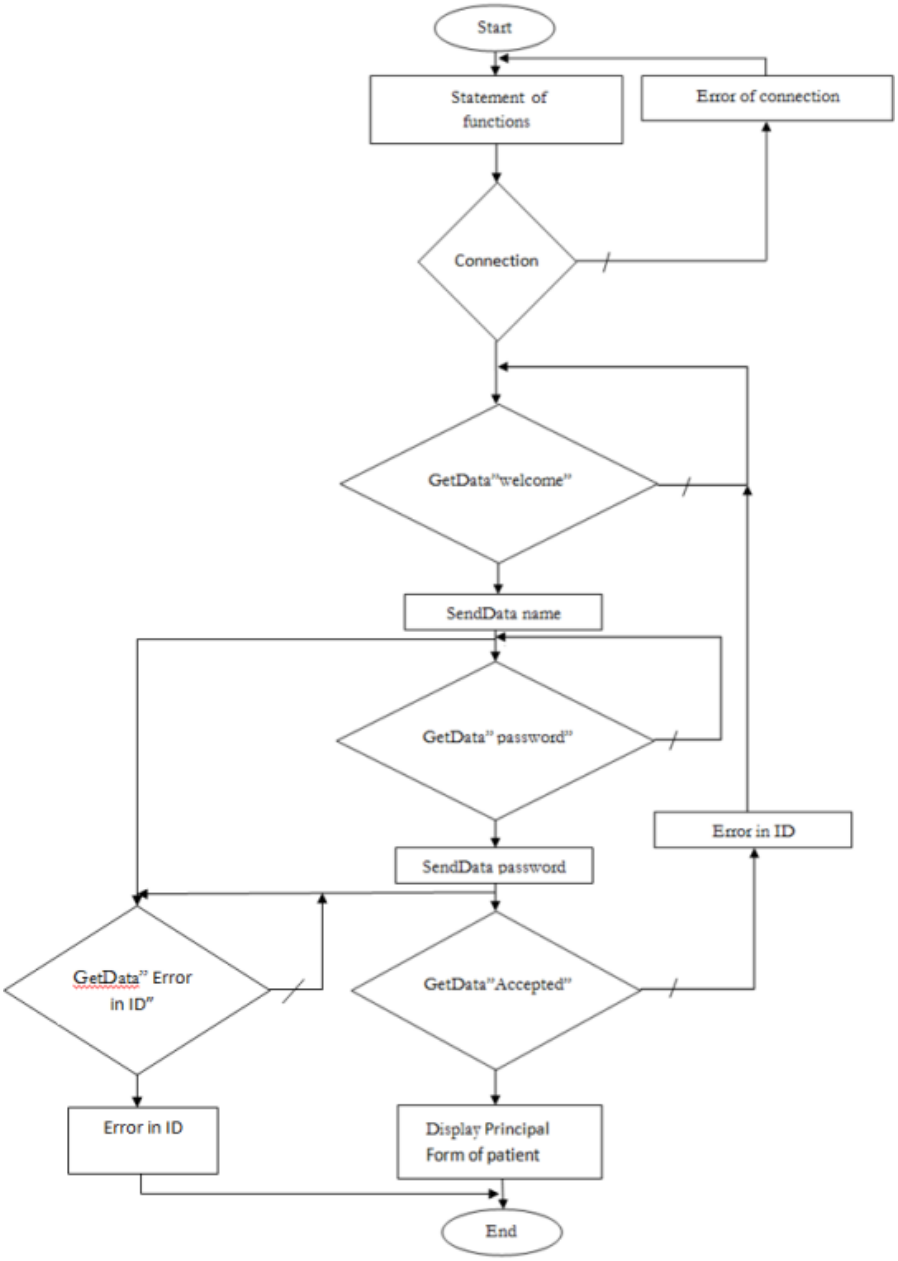
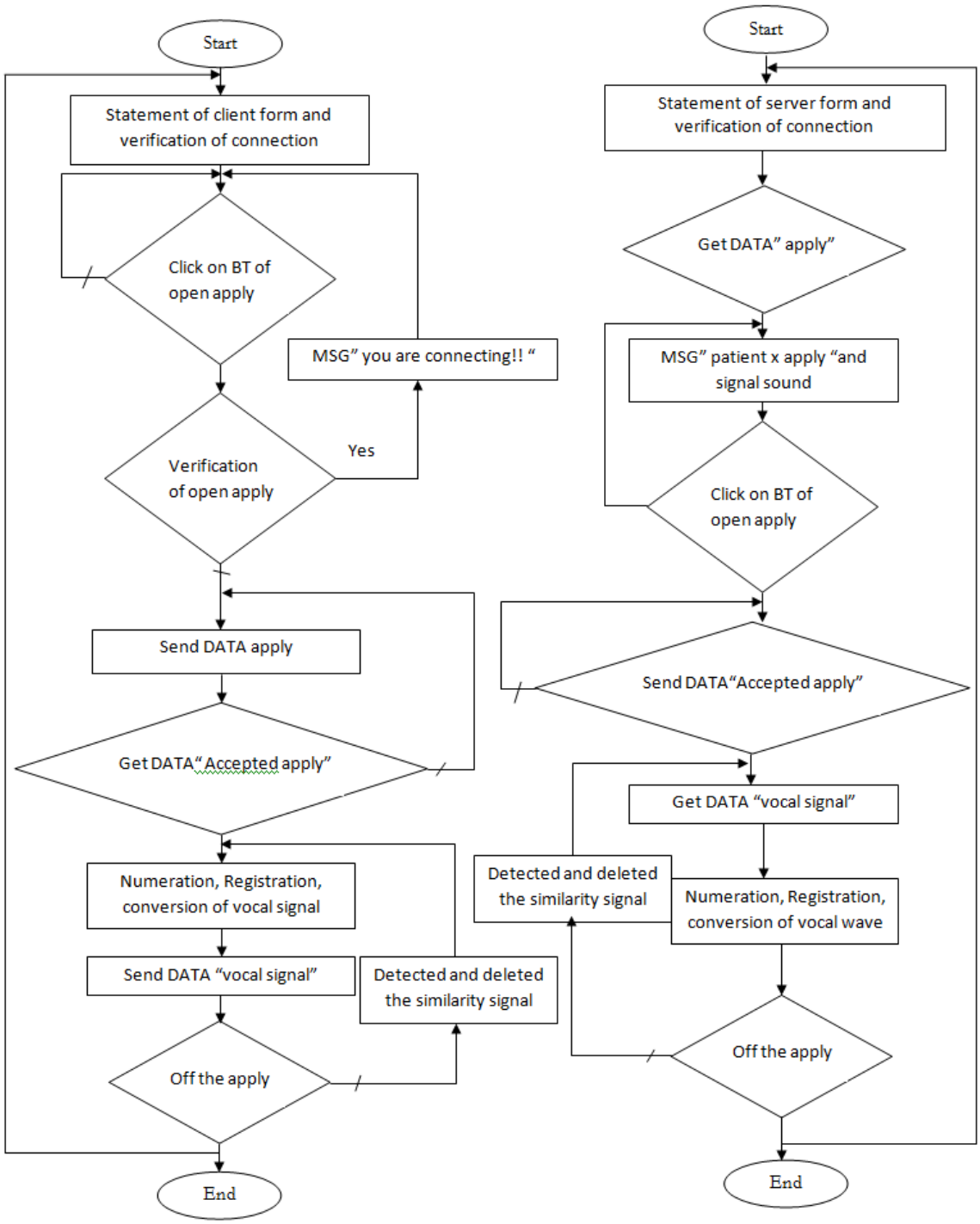


Figure3.b: organization chart of the server interface for authentication of the patient.

2.2.2 The sending of physiological signals

Attending physicians can extract an infinite number of relevant parameters from the physiological signals (depending on the disease) in the case of the patients in their home we have developed applications using Visual Basic (client-server) environment enabling connection and sends physiological signals by means of TCP / IP protocol using the WINSOCK control of VB

Figures 4.a and 4.b show the organization charts of different steps:



(a) (b)

Figure 4: (a) preparing and sending the recorded signal to the client, (b) receiving and signal display on the server.

III. Result and Discussion

Our program consists of two parts, the transmission and reception. Each side consists of a main window for the connection to manage and the start thus as the various types of communication. It comes in the form of a transfer in real time and allows the user to send to the reception computer different streams.

3.1 The interface of the tele-vigilance center (server).

In this section, we present the interface developed, allowing the treating physician to enter all patient information with the option to edit or delete. This information reveals the state of chronic patient during all the time through the transfer of their vital signs. Figures 5 and 6 shows the different options which are:

• The login window.
• The registration window on the database.
• The window of reception and of physiological signals display.

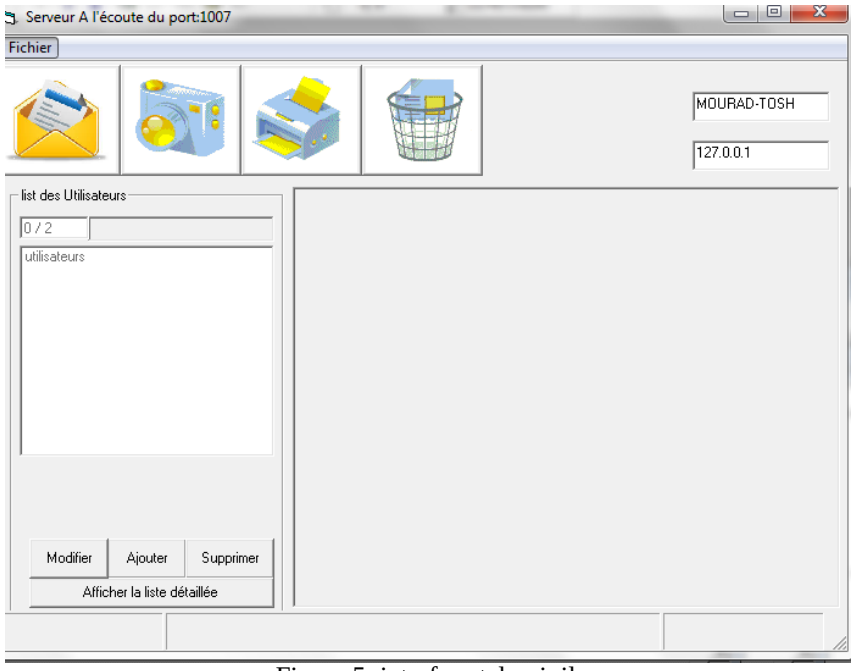


Figure 5: interface tele-vigilance

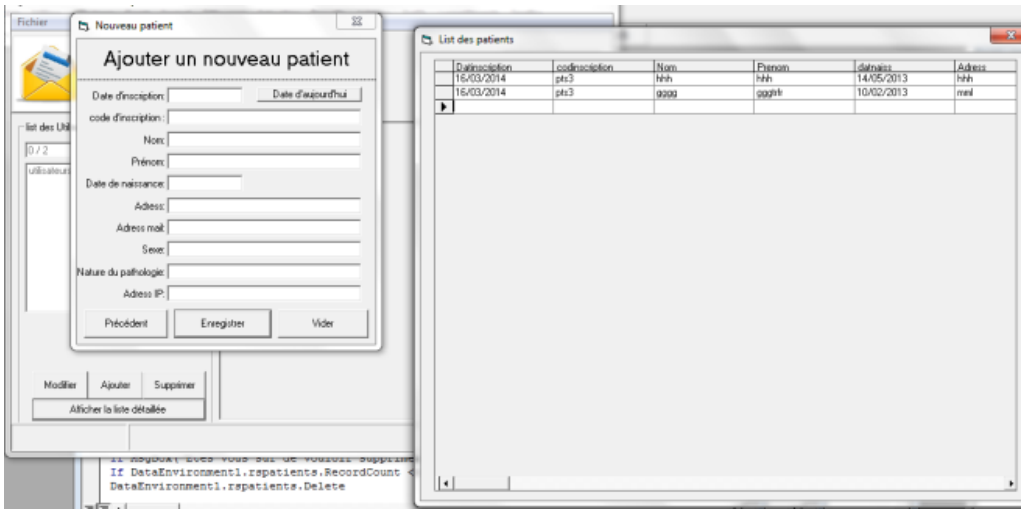


Figure 6: interfaces databases

3.2 The patient interface (client)

The patient part serves initially to confirm the connection with the tele-vigilance center by ID and Login through of the IP address, and secondly to send physiological signals to thereto. Figure7 shows the interface realized.

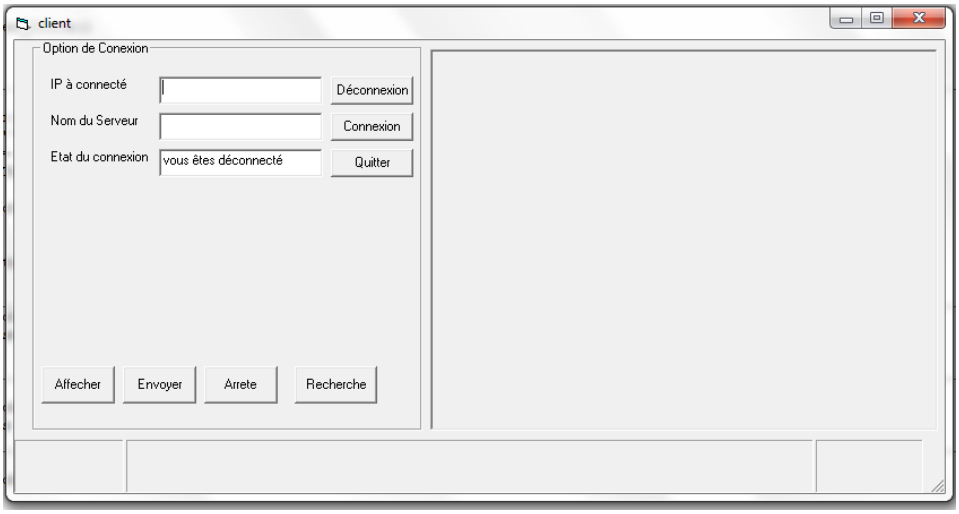


Figure 7: Patient interface

3.3 Example of sends an ECG signal and a signal PTG.

Figures 8 and 9 illustrate the transfer of an electro cardio graphic signal (ECG) and a pneumotachograph signal (PTG) of a local post (patient) to a center tele-vigilance in real time with a delay of a few seconds (it depends on size of the packet sent).

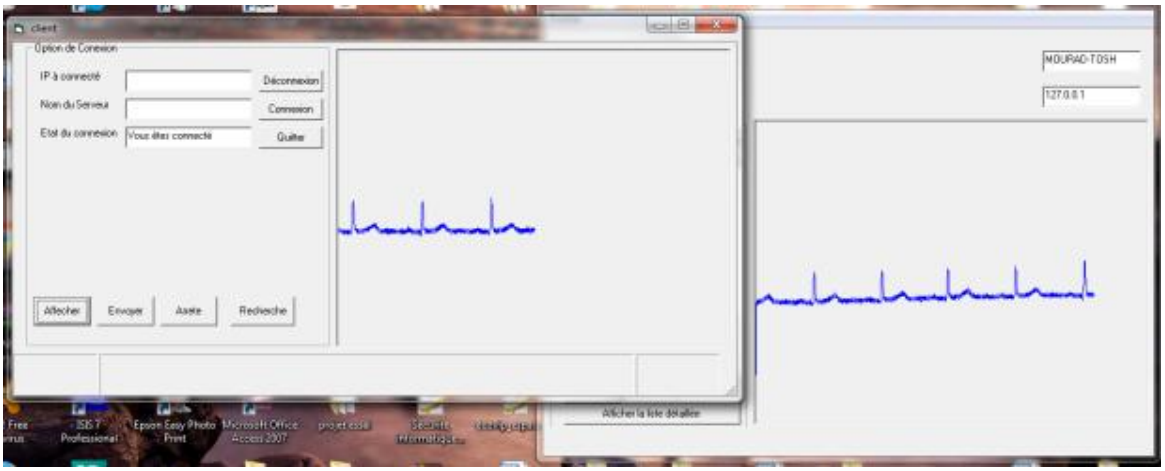


Figure 8: Transfer of the ECG signal

Figure 9: Transfer of PTG signal

The experiments were performed on a same PC with a TCP / IP connection between the two interfaces, on two different PC interconnected with a local WiFi network, and in Internet network.

IV. Conclusion

The growing interest in detecting and ubiquitous computing is potentially applicable to a wide range of innovative technologies and easy to use. Smart devices, medical sensors, actuators and other technologies designed to enable people with chronic disease to be enterprising became increasingly available and affordable in terms of price.

With recent advances in the technology of smart home of health, it is now possible to observe the state of health of the elderly or people with chronic illnesses living at home, to care them and ensure their safety and well-being.

REFERENCES

[1] Akyildiz IF, Su W, Sankarasubramaniam Y, Cayirci E. Wireless sensor networks: a survey. Comput Netw 2002;38:393–422.
[2] Chan M, Campo E, Estève D. PROSAFE, a multisensory remote monitoring system for the elderly or the handicapped. In: Actes de 1st ICOST International Conference On Smart homes & health Telematics. 2003. p. 89–95.
[3] SJ Brownsell, G Williams, DA Bradley, R Bragg, P Catlin, J Carlier, "Future systems for remote health care", Telemed & telecare, 5, pp 141-152.
[4] Noury N. « Système télématique pour l'organisation de l'hospitalisation à domicile ». Grenoble: université Joseph-Fourier; 1992 [Thèse de doctorat].
[5] Vetel JM. « Le logiciel AGGIR »— revue hospitalière de France.1995, 1 jan. p. 108.
[6] Esteve F, Blanc-Gras N, Baconnier P, Benchetrit G. Visuresp: a new device for pulmonary rehabilitation based on visual feedback. I: Principle and methods. Innov Biol Med 1994;15:10–9.