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Implementation of Telemedical Network: Application for Health Smart Home

N.Hamlil[1], M.Benabdellah[2]
Faculty of Technology, Laboratory for Biomedical Engineering,
University of Tlemcen, Algeria.
BP 230, Tlemcen 13000, Algeria

Abstract:- This paper presents a health smart home (HSH) system represent a temporary or durable alternative to the hospitalization or the recourse to the establishments of lodging of long life – elderly people's homes or specialized centers. The patient is not then constrained any more to give up his residence and the life in society. He preserves a broad autonomy in his social environment and privative, while profiting from preventive services of health. These systems particularly concern the elderly, but more generally the people presenting of the risks of driving affection (falls for example) or cognitive (depression, senile insanity, etc), or requiring care or an special attention (diabetics, asthmatic, etc).

Keywords:- Telemedicine, microcontroller, biomedical sensor, networking, intelligent system, health smart home.

I. INTRODUCTION

Since the advent of communication and information technologies medicine experienced accelerated developments with aiming preventive, diagnostic and therapeutic, which lead the decision makers of health and the experts of medicine to make choices and to establish strategies [1,2,3,4,5,6], according to criteria of safety, of effectiveness and utility.

The work we have developed in this article based on a technological development aimed at the implementation of a dedicated telemedicine network Smart Home Health (HSH).

II. GENERAL REPRESENTATION OF HEALTH SMART HOME

Figure 1 gives a global illustration of Health Smart Home.

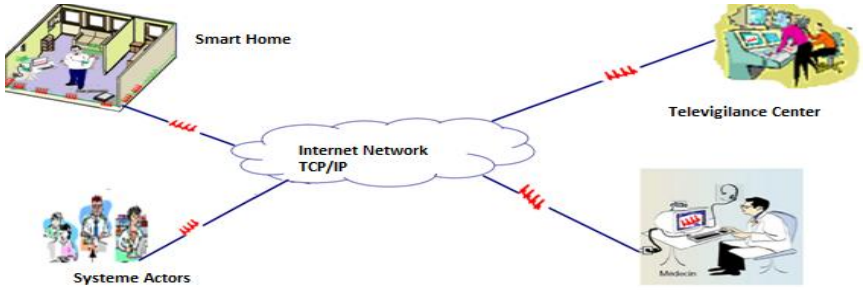


Fig. 1: Implementation of HIS in global network

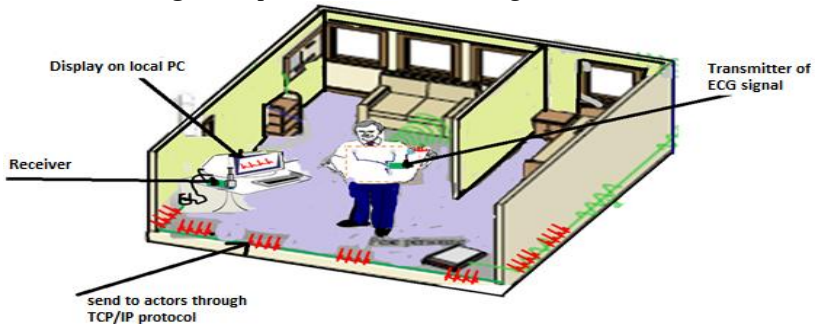


Fig. 2: Implementation of HIS in global network

Figure 2 shows an example configuration of a patient domicile HSH normally pursuing his daily activities and enjoying a continuous telemonitoring of vital parameters [4, 6].
After realization of wireless transmission of the vital parameters taken on the patient at the local station of HSH we present in what follows the implementation software of the multi-media interface of communication under environment Visual BASIC (VB) including:

- A textual connection.
- A vocal connection
- A video connection
- A transfer of file multiform.

All these connections are configured according to customer-server architecture, implementing the technology of the sockets.

III. FAST PRESENTATION OF VIDEOCONFERENCE SYSTEM

Generally a videoconference system brings into play a camera, a microphone, an ear-phone, the sound card; the network card, the graphics card and port USB of two or several computer terminals inter-connected by means of a dedicated software ensuring the capture and the transfer of the different flow (textual, vocal, video, data), of, (In our case Windows), a technology operating system of the sockets (In our case the component Winsock of VB) and of a communication protocol (In our case protocol TCP/IP) [8,9,10,14,15,16].

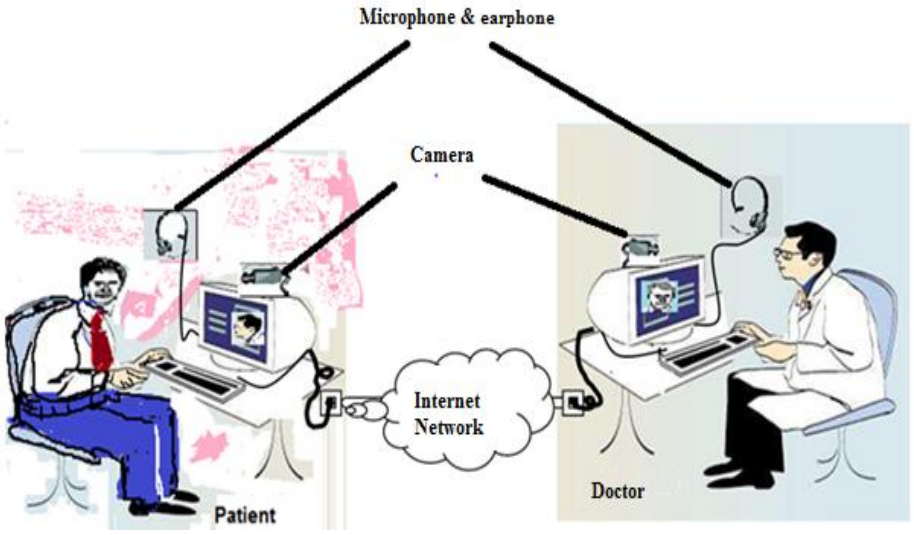


Fig. 3: Videoconference representation

IV. SOFTWARE INTERFACE OF COMMUNICATION

Our program is composed of two parts, the emission and the reception. It presented in the form of a transfer in real-time and thus makes it possible to user to send towards the receiving computer various flows.

A. Representation of the Communication Interface between the Patient and the Doctor

In this part we present the interface developed under environment VB. Figures 4 and 5 show that this one is composed of two parts.
Each east coast made up of a principal window to manage the start up connection as well as the various types of communication. It comprises:

- The textual transfer window.
- The vocal transfer window.
- The video transfer window.
- The file transfer window.

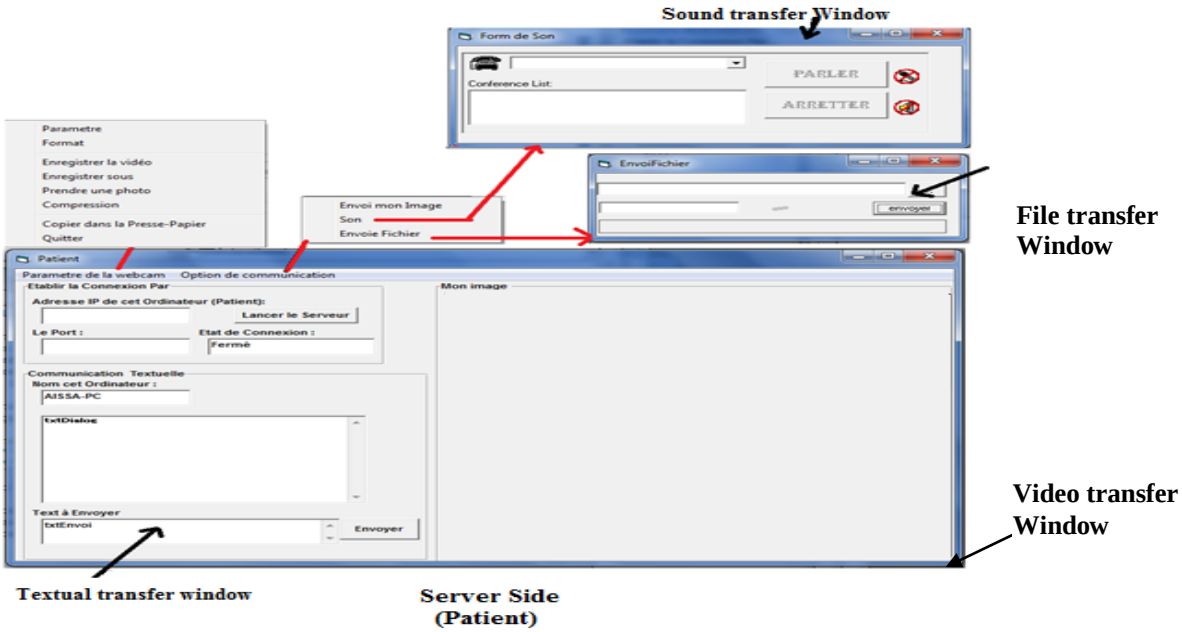


Fig. 4: Videoconference representation

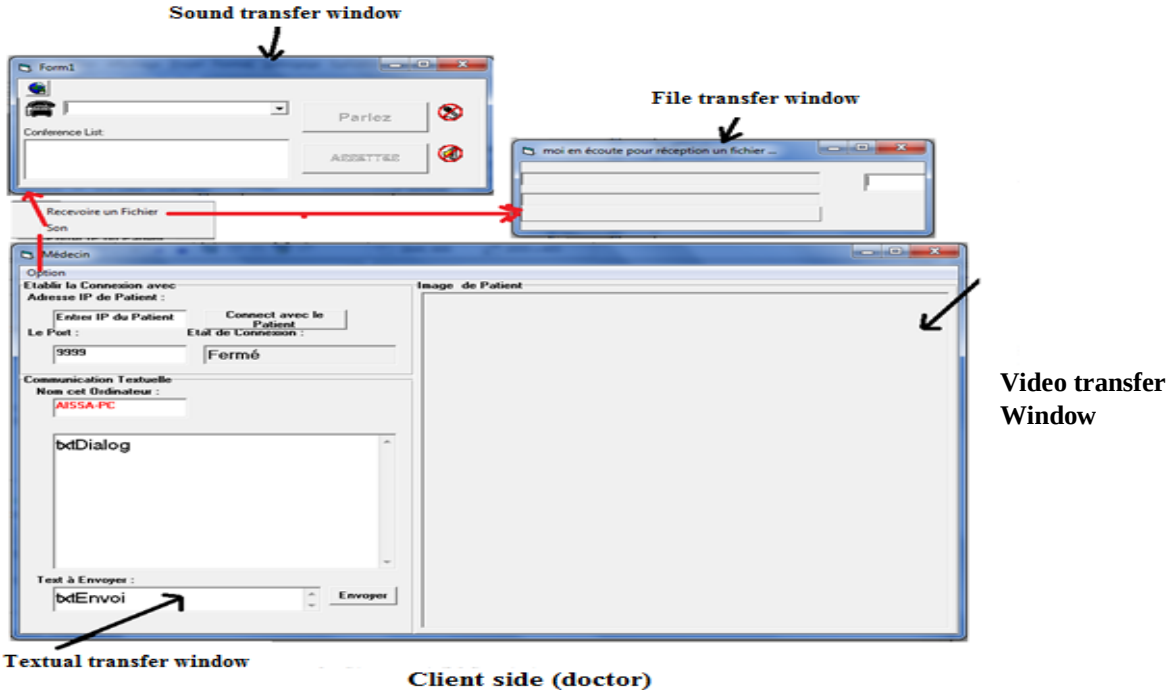


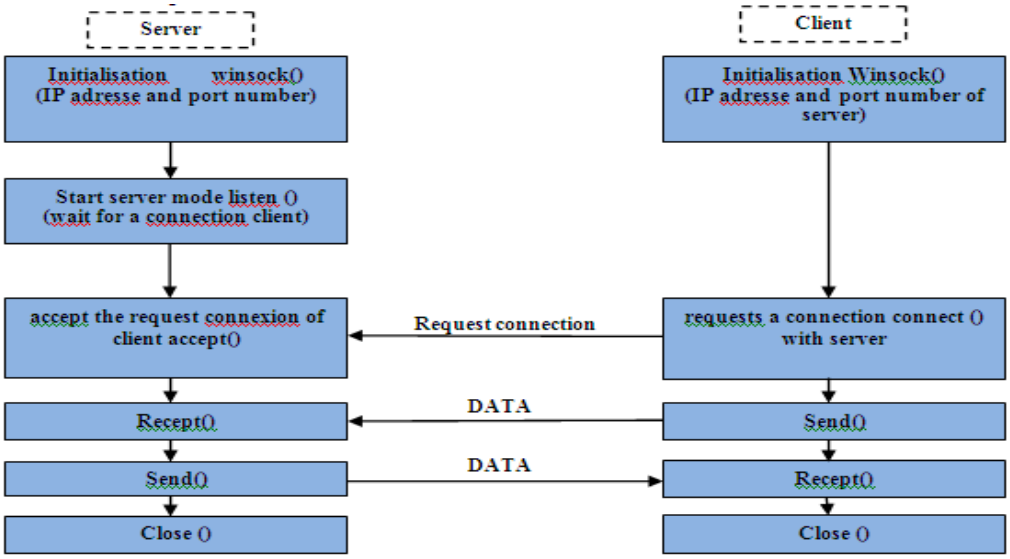
Fig. 5: Principal interface doctor side.

All these windows is divided with accessible procedures and functions and other routine masked. In what follows we explain in detail each window of the interface, which it comprises as difficulties to which we brought solutions.

B. Flowchart of the establishment of connection Internet between the server and client (Patient/Doctor)

Before sharing any information internet TCP / IP between the patient and the doctor must first establish a connection between the two parties.

Flowchart I: Implementation of server/client connexion



C. Videoconference Procedure and flowchart

The videoconference consists in carrying out a remote conference between the Doctor and the patient associating the image and the sound, using a system comprising a camera and a microphone. It requires the installation of a connection Internet of good quality not to encounter a problem of quality (image or its).

1) *Flow chart and procedure to send video images:* The first part to be described in this section relates to the problems can be met in the development of interface of video communication.

The first problem to solve it is the communication of the interface with the camera through port USB in the system of Windows exploration because one cannot directly connect our interface to the camera since the Windows system prohibits all communications or access to the direct port of manner for a general protection of the system.

The second problem is inherent in the fact that our program is composed of two parts, the emission and the reception. For that it is necessary to program of such kind to give to the system diversity, the adaptation and the sensitivity of communication to arrive at a system which functions in real-time with a margin of error acceptable for communications of videoconference.

The third problem is inherent in the volume of the data generated by the camera which are considerable, which induces problems of storage and transport

Let us take the example of an image to standard VGA (640 × 480 256 colors). A coding on 8 bits (1 byte) of each pixel of the image gives a range of 256 colors (or 256 levels of gray in the case of an image in black and white). It will thus be necessary:

640 × 480 = 307.200 bytes

1 KB = 1.024 bytes thus 307.200/1 024 = 300 KB to store such an image. With 25 images (that is to say one second of video), we obtain a weight of 7,5 Mo. We note on this example that it is impossible to transmit in video real-time without passing it by a technique of compression to other technique of coding.

For resolution of these problems one can quote various methods with different systems of development but the solution must have the simplicity and the speed of use.

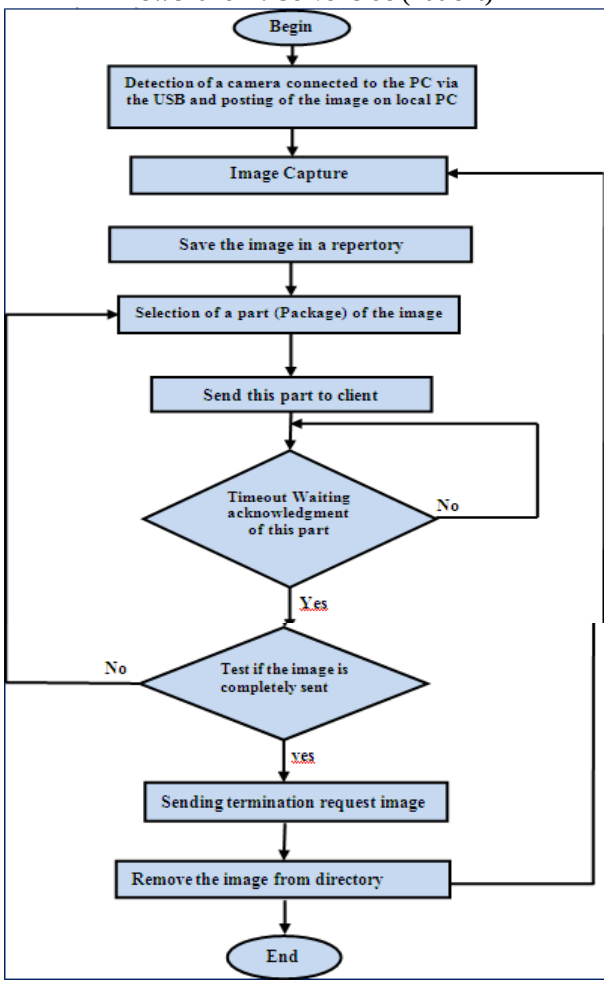
To solve the first problem we call upon the DLL (Direct Link Library, dynamic-link library) who are components of programming with architectures ready to be used These DLL are components developed by the supplier of origin of our system of development.

For our application we found a DLL for the communication between our interface and the camera through port USB. This DLL is called “avicap32.dll”.

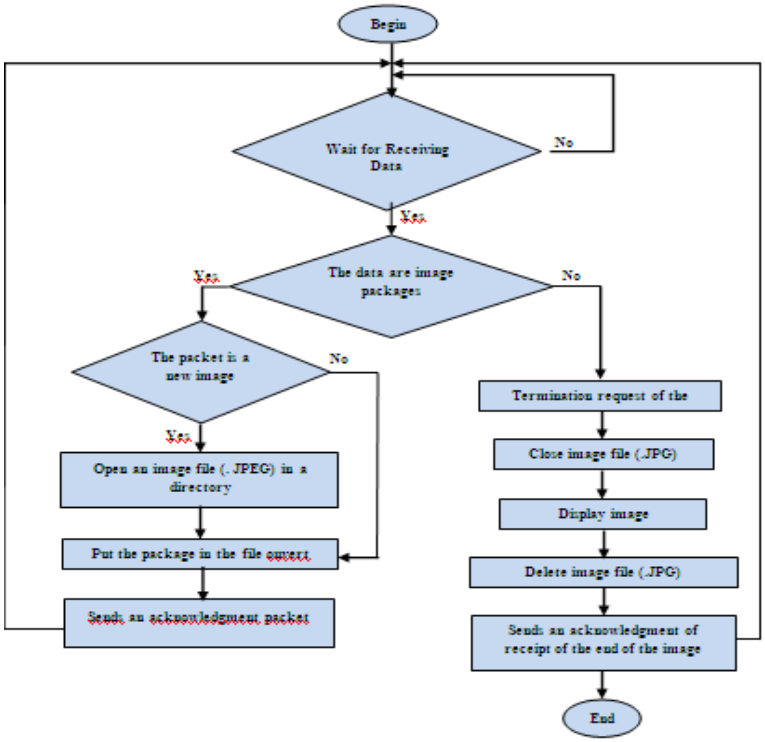
The other difficulty of surmounting is that of the synchronization of the transmitted video stream and receipts in real-time.

The following diagrams represent the structure of the program for transmission and reception of video image between the server and the client

Flowchart II: Server side (Patient)



Flowchart III: Client side (Doctor)



2) *Flowchart and procedure for the voice signal:* We begin by describing the problems that can be found in the development of the interface for voice transmission.

The first problem is the communication interface with the microphone through the sound card, or through the USB port, for the same reasons mentioned above in the case of video transfer.

The second problem lies in the strong time constraint due to the interaction between individuals. The latency must be less than 300 ms if you want to keep an acceptable human interaction. If a good quality of the conversation is desired, the latency should not exceed 150 ms.

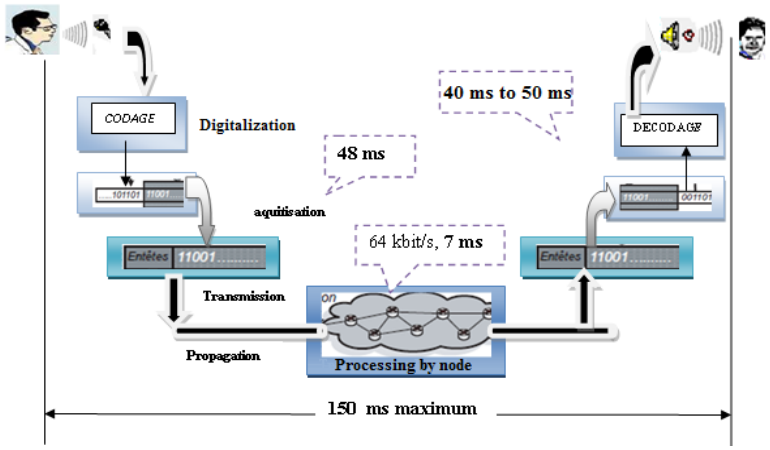


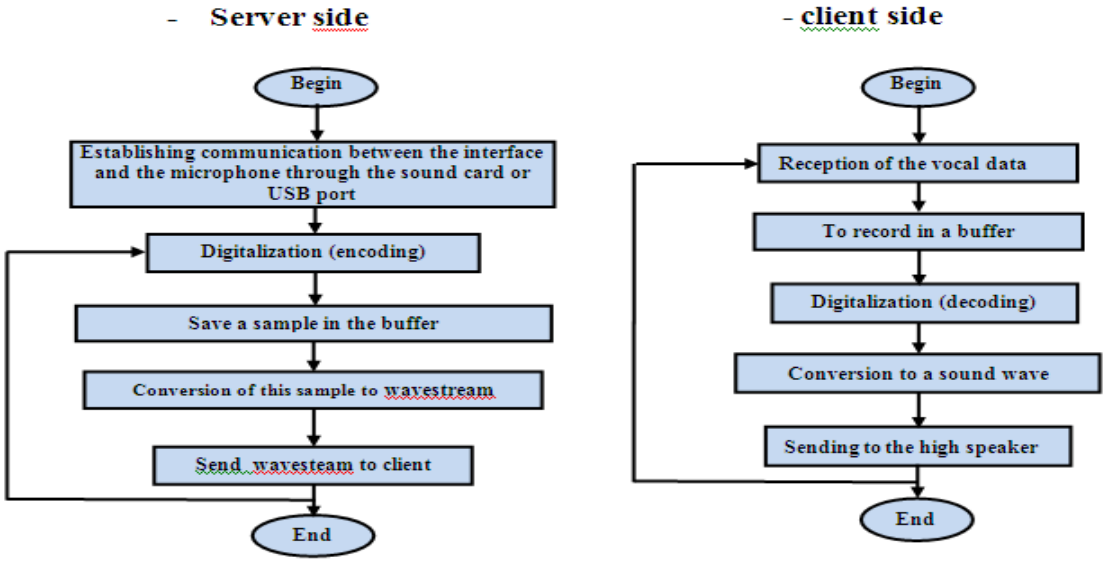
Fig. 6: Transfer time of a packet

Pour le son nous avons mis en œuvre les des DLL intégrées dans le système d'exploitation Windows. Ces DLL sont : **winmm.dll, Kernel32.dll et user32.dll.**

The most important component that we found is a class module called **wavestream.cls** who facilitated our acquisition process and transmission of voice signals in WaveStream form for transmission over TCP / IP (since TCP / IP support this kind of data.)

The following flowchart shows the steps of transmitting sound:

Flowchart III: Sound transmission

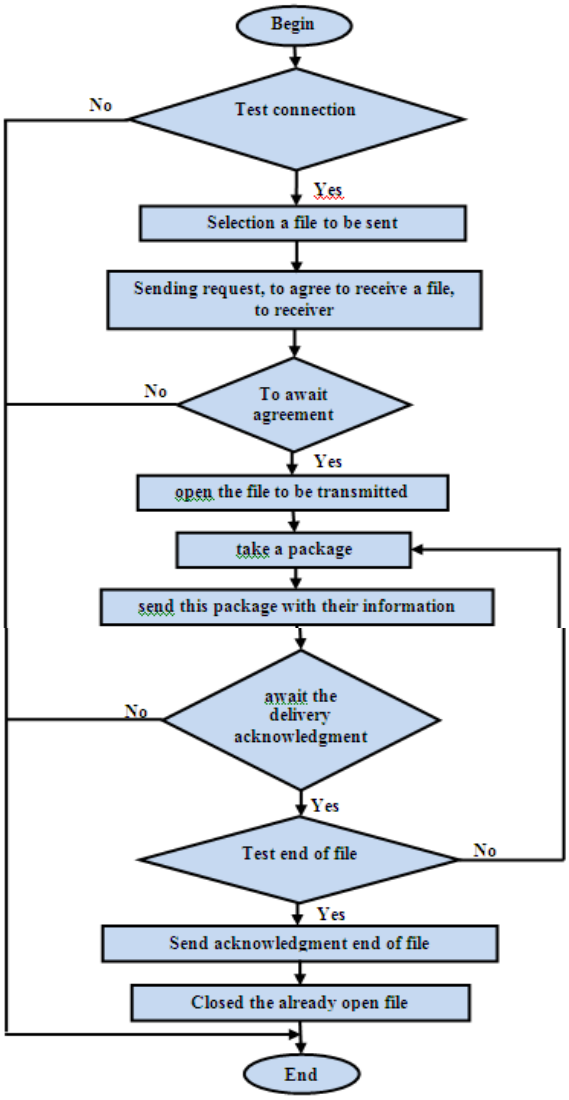


3) Flowchart and procedure of the file transfer: Thus, a file transfer corresponds to a constant binary flow. It requires a relatively important flow but is far from sensitive to the time of transmission.

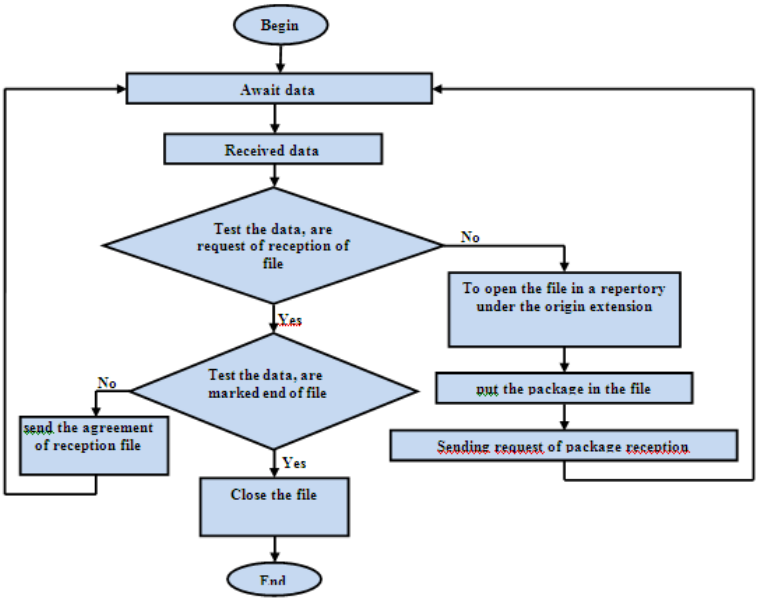
For the file transfer we used the principle of dividing this file in segment of given size and then to send each segment to the all alone receiver, to be gathered with dimensions receiver with the original file.

We did not use any API in this part. All the procedures of sending of the file are described in the following flowchart:

Flowchart IV: server side



Flowchart V: Client side



V. CONCLUSIONS

The Work that we developed within the framework of this article is a work of technological development having for goal the implementation of a tele medical network which places at the disposal of the health professionals information medical of the patient to supervise remotely, that dedicated to the health smart home. The objective of such systems is to make it possible to the people to live at them longest and most independently possible, in an environment of comfort and safety.

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