# Design and Development of an Intelligent Mobile Health Tele-assistance System in Ambulance Practice Service.

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***Abstract*— The development and the design of telemedicine services have taken a great consideration and care in the domain of wireless communication nowadays. The set of these researches is linked to the aging population and the persons exposed to accident risks in their daily life or the decline of their health in short time. In this case, it is indispensible to make a diagnostic in a real time and well manage the patient's computerized data between the various medical actors with the permanent security insurance of highly risky persons. Furthermore, the need to make a speed diagnostic of patients and to detect their health state, their parameters (medical information) of analyses with efficiency, allows us to gain time while transmitting the patient to the hospital (before his/her admission to the emergency service). It concerns the conception and development of services on mobile terminals for transferring medical information (of evacuated patients) in a real time with ensuring the mobility, the permanent security and the reliability insurance in covered zone by the mobile network, PLMN (GSM/GPRS…).**

**Our attention has focused on the choice of a relevant work. It concerns an implemented and conceived service of medical Tele-assistance for monitoring risky persons brought by ambulance service. Thus, a medical bulletin is automatically filled on mobile terminal, immediately transmitted to the service of the emergency (on doctor's mobile terminal, data base of clinic…). This paper recalls a complete architecture of an economic wireless transmission system with the implementation of an effective application, adapted to the portable phone, allowing the doctor to have the medical information of patients who have a risk of accident.**

**Thus, the stakes of setting up such systems are numerous, so much for patients, medical staff and the society in general.**

***Keywords-component; Remote Monitoring; Services of Telemedicine; Medical Tele-assistance; Mobile; J2ME; Wireless sensors network.***

## I. INTRODUCTION

The recent technological progress of mobile telecommunications networks have contributed to the development of telemedicine [1]. It appears to be a medical reality and the use of portable devices as mobile phones is already imposed. These progresses applied to the medical field (medical imaging, transmission rate, confidentiality of data, the conviviality of systems…) and the miniaturization of devices open perspectives for medical development of Tele-assistance, remote monitoring in terms of a better quality of care and a reduction of public health cost [2]. These new technologies led to the emergence of a vast diversity of new ways for users to access and use information anywhere and anytime.

The majority of work and the systems undertaken in this field are carried out, implemented and installed in out of ambulance medical service. Moreover, these systems on one hand would have required large means and a large infrastructure in their deployment (installation, configuration…), which generates the disadvantage of the excessive expenditure and, on the other hand, they are directed to patients who need the aid of an ambulance.

Our contribution within the framework of work of this article is to introduce the medical Tele-assistance through the ambulances medical service and to handle the portable phones as basic tools. It is the reason that we are attached towards the medical Tele-assistance by mobile terminals.

Therefore, this research orientation exploits the mobility of wireless networks to transfer remotely the medical bulletin of persons brought in ambulance medical service. The suggested solution is an implementation of an algorithm which transmits the medical information received (from sensors networks set on person's body) and the calculated parameters (ECG parameters, Medical signals…) via a wireless communication in the purpose of exploiting a mobile phone for medical Tele-assistance.

## II. PROBLEM

In this work, we particularly focused on the design and the implementation of an open flexible system of service supplying for mobile environment. This system on one hand must satisfy the needs of the injured persons, and on the other hand, it is based on the technologies and the defined standards in this context. They notably concern the conception and development of communication architectures between the actors of these systems, monitoring, transfer in real time and improvement of human's quality life, the storage units of the collected data remotely, analytical tools and processing of large quantities of parameters.

The problem also is posed on the implementation level of an efficient algorithm intended to solve all the preceding constrains and adapted to mobile phones. This implementation requires many constraints (low resource calculation, size of screen, memory capacity, resolution and too simple software) to run properly.

In this context, the considered study leads to an inexpensive solution, efficient and comfortable for patients brought in ambulance, at anytime and anywhere, provided that they have a mobile terminal. Indeed, they could benefit from medical Tele-assistance and monitoring security, without the hospital care inconvenience and excessive expenditures.

## III. PLATFORM DESCRIPTION OF TELE-ASSISTANCE

The considered platform allows a person intended to the emergency (ambulance service) to be in contact, at any time, with his doctor to simplify the work in providing him means to be more effective in term of a rapid data transmission. So, the patient's problem is treated as soon as he reaches the emergency (Figure 1).

The purpose of this paper is to design and develop an Intelligent Mobile Assistant for medical Tele-assistance, allowing a transfer of medical information in real time between the various medical actors with mobility, security and reliability guarantees. Thus, an application of medical Tele-assistance allows the transferred medical file of a patient at home or in the emergency car before his admission to the emergency service.

The implemented application on an Intelligent Assistant (a mobile phone) of medical Tele-assistance functions on all mobile terminals or PDAs equipped with a KVM J2ME virtual machine. This algorithm allows not only PAN connections on limited perimeters (wireless sensors network), but also of WAN connections with medical actors. In this case, the transmitted medical file relates to the parameters, biological signals and medical information characterizing the current evacuated patients. The procedure consists of implementation and integration on a mobile device the following operations:

- Collection, treatment and organization of the transmitted measured parameters from wireless sensors network for the generation of a medical bulletin.
- Transfer in real time of the medical bulletin (all necessary information: ECG signal, Temperature, Tension…) to the emergency.
- Exploitation and activation of all transmission modes between the heterogeneous networks (Internet, GSM/GPRS…).

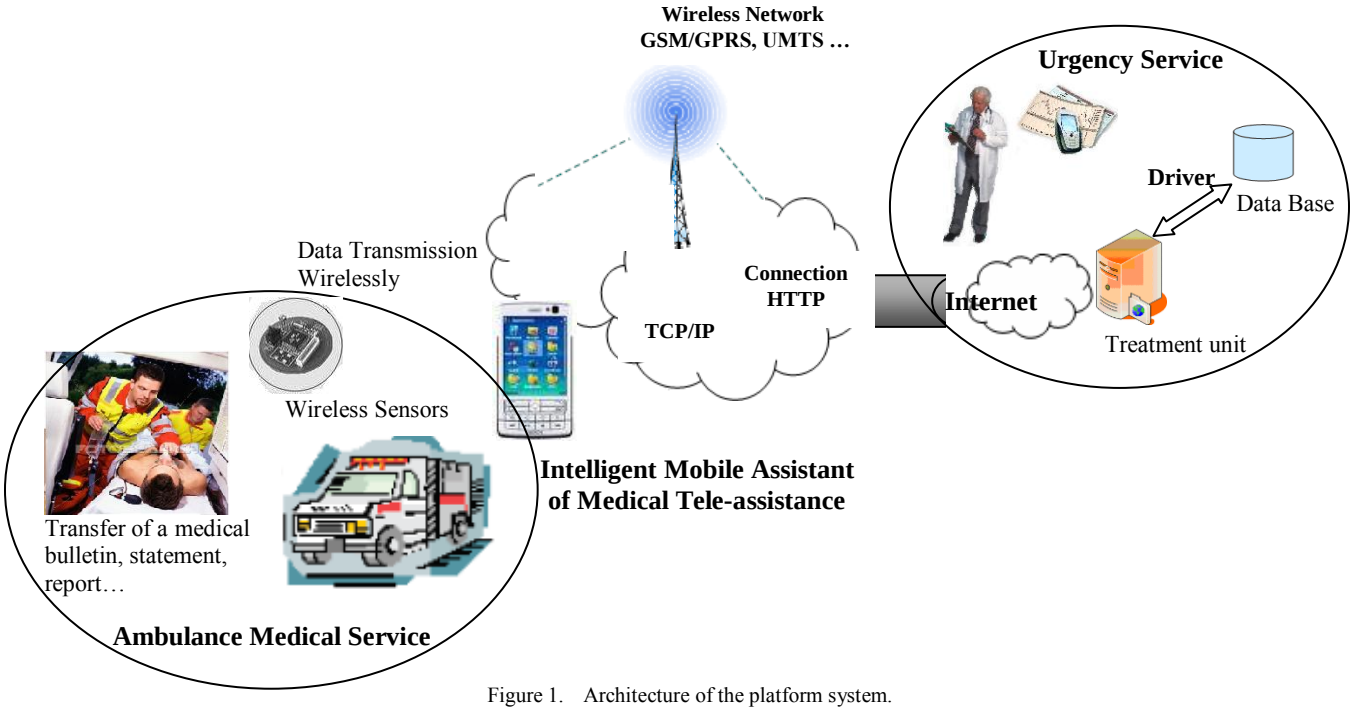


Figure 1. Architecture of the platform system.

The first part which must be realized, concerns the collection and automatic recuperation of remote medical data on the mobile terminal. These data are generated by sensors installed on person's body. The anticipation of the assistant intervenes for some information such as: Last Name, First Name…, before the immediate transfer of medical bulletin.

Then it is necessary to keep permanent interconnection of Intelligent Assistant of Tele-assistance which is in this case the portable phone with the sensors network and medical actors, so that they can exchange their data.

An adaptation strategy to medical context was followed to manage and gather the heterogeneity of medical data on the mobile terminal (detail in the following sections). Therefore, the patient will be evacuated at that moment and his reception will be done in the shortest period of time with the best conditions.

## IV. Assessment of the Analysis

This part, most significant which lies in studying various technologies and protocols used in the world of wireless communications. The tackled subjects are related to the data exchange between the various parts of the designed platform including a mixture of networks.

The analysis carried out made it possible to a better understand of the main protocols which can intervene in the development of works of this article.

### A. Selected technology

After studying the different technologies, in terms of exploitation of the data sent by a sensors network on a mobile phone using a specific algorithm to treat medical data and transmit the medical bulletin to the medical actors (heterogeneous devices). The most adapted solution relies on the usage of a simple mobile phone linked by two different systems, a wireless support WPAN (Bluetooth technology or ZigBee) and a GSM/GPRS system. Otherwise, these kinds of technologies are simple and rapid to implement.

This implies the exploitation of a pallet of integrated network protocols to establish connections that are described before, the mobile application, wireless medicals sensors networks and the doctor's tools. The choice of this pallet is dictated by the following characteristics: [3]

- *Protocols* in question are obligatorily implemented on all terminals MIDP (J2ME).
- *Technologies* must simple, effective and more easily installed.
- *A reduced cost* of the implementation, deployment and installation.

Concerning the devoted study to the transmission of medical information of the patient remotely, one learns that this transfer is based on the following communications:

*1) Transmission between two mobile terminals:* To transmit a data between two mobile phones, there is not an enormous existing possibilities. Indeed, it is possible to send SMS, MMS and e-mail. On these three modes of transmitted data, two are available only on the last generation phones; they are e-mail and MMS. Moreover, these two possibilities appear more sophisticated than the others [3], [4]. They allow sending all kind of electronic documents (text, photo, sound…).
For our project, the choice is related to the MMS service which has the following characteristics:

- *MMS Protocol is implemented in the optional packages of J2ME.*
- *A large range of use.*
- *An important content of multi-media which can be transmitted.*

*2) Transmission between a mobile and a server*

This implies the existence of an https connection (exchange of protected information) between intelligent assistant of Tele-assistance and the data base server via WAP gateway to transfer medical bulletin. This choice is dictated by the following characteristics:

- HTTPS is obligatorily implemented on all terminals MIDP (J2ME).
- HTTPS is independent of the network.
- The port of the https protocol is more easily working on the firewall.
- HTTPS protocol is implemented by default in J2ME package. Other protocols are not necessarily available [5].

This transfer is based on a communication WSP/https. As it suggests Wireless Session Protocol (WSP), layer session allows the connection setting to make transactions. Thus it allows the layer application to benefit from two different types of sessions:

- Connected session mode which the layer session will interact with the layer transaction.
- No-Connected session mode where the session layer will act directly at the transport layer for sending brutes' datagram.

WSP is equivalent to the https protocol, and we find moreover many identical implementations to https in WSP [6].

*3) Transmission between Sensors Network and a mobile terminal:* The sensors, which are placed on the patient body, use a wireless support of WPAN technologies: Bluetooth or ZigBee. They transmit on a short perimeters measured data of a patient through these kinds of technologies.

The part concerning the reception of these data on a mobile phone does not require a particular study; it's the research of library which allows such a handling of a sensor. It's on the level of the implemented application that we open a simple tunnel (Input Stream: for the reading, Output Stream: for the writing [7]) with a Buffer to recover and to store the transmitted data.

The particularity of sensors networks is located in the routing and economy of the network layer. The current protocols of routing use the metric (a number of hops, stability of the bonds) which inevitably do not optimize the energy of the nodes like that of the network and this by the use of some nodes more than others. Indeed, the protocols of routing with energy conservation must determine the optimal roads while being based on the metric related to the energy state of the nodes. In this context, many protocols are proposed.

For that, we proposed an improvement of the protocol DSR to include the aspect of energy economy in establishment of the roads. The original version of DSR does not take in consideration this aspect and chooses as road that having the minimum of hop which is not always effective in the sensors networks having constraints major of energy.

Our named proposal TMM-DSR (Taux Min-max Dynamic Source Routing) saves energy during the establishment of road, as in the remainder of the lifespan of the sensors because the metric used by TMM-DSR does not support the roads having the minimum of hop but uses each time the road having the best energy rate. What balances the use of the sensors for the routing and saves their battery and consequently gives a long lifespan for the network [8].

TMM-DSR preserves the nature of DSR as a reactive protocol, based on two operations: discovering and maintenance of road. To implement this technique each node must have information concerning energy level and the energy rate of its battery at anytime during the lifespan of network [9].

*a- Technique of road selection (Max-Min)*

In the conventional networks, the metric used is the number of hop which separates a source node from the destination. This metric is adapted to the wire networks but for wireless networks, the number of hop as parameters to evaluate a road is insufficient, following the imposed constraints by these networks such as the mobility of the nodes, the limitation of the band-width as well as the energy constraints.

New suggested metric is based on consumption rate of nodes' batteries in order to improve the power consumption of the network. It is called "Max-Min" technique.

*b- Calculate rate of energy consumption*

The rate of energy consumption or battery discharge can be defined as being effective energy (the remainder of energy) divided by maximum energy (initial).

$$T = \left(E_{ini} - e_c\right) / E_{ini}$$

$T \cong 1$ : Low consumption rate.

$T \cong 0$ : Very significant rate consumption.

$e_c$ : Power consumption.

The implemented algorithm, based on the new metric, is responsible for the choice of the roads. This algorithm will proceed in the following way:

1- Each node when it receives a new request, will insert the rate pre-calculated on the request heading of discovered road until the arrival of each node to the recipient.
2- It waits a time D after the reception of each new request. Then, it determines the minimum of the rates of each received road:

$$T_k = Min\left(T_i\right)$$

i : The number of the nodes on the road K.

After the determination of the minimum rates of each road, the recipient will choose principal road that has the maximum rates.

$$T = Max\left(T_k\right)$$

The algorithm Max-Min does not give any guarantee on the time from the beginning to the end. To solve this problem, we have introduced a factor of rate energy differences that makes it possible to switch between the ways which have performance indexes very close in such manner to choose the shortest way then the smallest time from the beginning to the end. This parameter is given by the following relation:

If $\left[Min\left(T_j\right) - Min\left(T_i\right)\right] < \varepsilon$ and $hR_j > hR_i$. So to use the road $R_i$

*B. Development environment*

Java applications have been implemented under NetBeans IDE environment.

A simulation tool Sun Java ™ Wireless Toolkit was exploited to examine all the possible wireless communication. It allows applications on devices with low calculation resources such as a mobile phone.

The choice of Java is justified by the different problems associated to coding in C++ on Symbian operating system:

- Management of the memory: for the majority of applications, java system seems to be sufficient.
- Environment of execution: the proposed options on executable Java as protections for downloading or secure execution are free, whereas in C++, it is

necessary to develop them, test them and maintain them.

- Perpetuity: Java seems to have been accepted for the development of applications on mobile phone. The future developments will make Java perhaps as fast as C++.

Therefore, Java was chosen in our project, but it is necessary to mention that both environments can be used [7].

## V. Process of the Implementation of Proposed Model

As mentioned before, our implementation achieves the medical service which provides the continuity and the constant of a remote medical Tele-assistance, the transfer immediate then the interactions in real time between the various medical actors for a rapid and effective taking off of patient, an immediate evacuation, a reception within shortest time, to consult the relative details and the automatic release of the treatments.

The schedule of conditions of our project consists of:

- The implementation of this service requires the development of two distinct applications:

- A first to be installed on the mobile phone (Intelligent assistant) to collect, taken measures and gather the received medical data of patient and the immediate sending of the medical bulletin to the medical actor via wireless support.
- A second function on the doctor's devices in order to receive, record and analyze the bulletin that is related to the patient.

- To program the application in a language which is most portable possible, the algorithm must be simple to use and install.

- To program a user interface of high quality.

The process of suggested model is also based on techniques and methods of programming adapted not only to the limited resources but also to the generated heterogeneous parameters. What allows in particular showing the diversity of persons' profiles and types of generated situations, including the simulation of "normal" modifications and disturbing of behavior. Moreover, it is possible to show, to organize the diversity of the data resulting from various sensors and these regroupings with the distinction, the re-assembly and recovery on the level of reception.

The following paragraphs present, (I) Development on mobile phone, (II) The process of proposed model.

### A. *Development on mobile phone*

J2ME is a collection of technologies and specifications which are conceived for numerous parts of the market of the small devices [5]. The principal part of platform J2ME is composed of two different configurations (Figure 2): Connected Device Configuration (CDC) and Connected Limited Device Configuration (CLDC).

A configuration defines the central libraries of Java technology and virtual storage capacities of the device. CLDC is adapted to recent mobile phones. This configuration is useful for our application. To still note, that in the case of J2ME, the virtual machine is called KVM for Kilobyte Virtual Machine.

At the top of the configurations (Figure 2), there are the profiles which define the functionalities in each specific category of devices. The "Mobile Information Device Profile" (MIDP) is a profile for the mobile devices using configuration CLDC, like the mobile phones. Profile MIDP specifies the functionalities like the use of the interface user, the persistence of storage, the setting in network and the model of application.

On the majority of the current phones, J2ME is composed of configuration CLDC and profile MIDP.

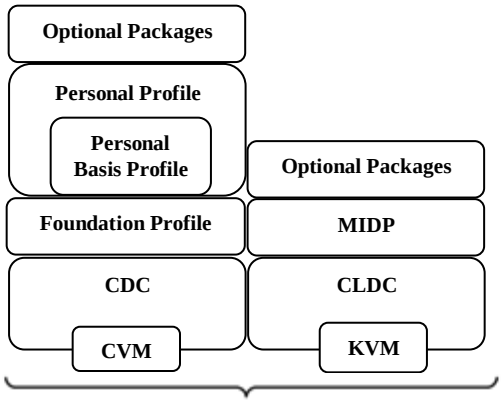


Figure 2. Architecture of J2ME.

In addition to standard MIDP (Figure 2), additional (optional) packages can be added according to the devices, allowing the use of their specificities.

As these options are typically reserved to mobile phones, it was natural to not integrate them directly in the profile MIDP.

As a result, the development of our application on mobile phones is based on the use of configuration CLDC and profile MIDP [10]. Besides to these two standard elements, we have exploited some optional packages such as WMA for the management of services SMS / MMS and Web Services API. The libraries necessary for the implementation for each component of J2ME are as follows:

***API MIDP:*** is currently that which one finds on the compatible mobiles:

***- javax.microedition.Icdui:*** For the graphic components necessary to the creation of applications.

***- javax.microedition.midlet:*** It provides the component application as well as the primitives managing the life of the application.

***- javax.microedition.rms:*** A possibility of storing information on the terminal.

***API CLDC:***

**Javax.microedition.io**: It contains the classes allowing connection via TCP/IP or UDP. The main class of this package is the class Connector.

This network part determines on which means is used to communicate medical information.

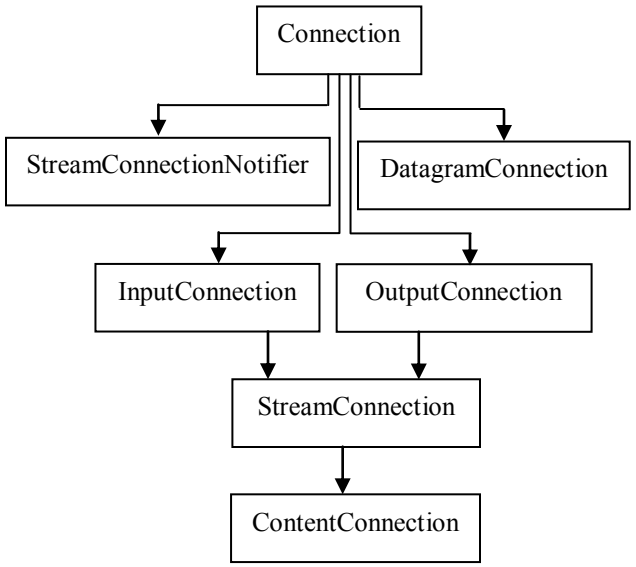


Figure 3. Arborescence of the classes javax.microedition.io [5].

The previous diagram corresponds to the different classes of javax.microedition.io. Thanks to these implementations for allowing us to make http requests.

This algorithm, called *MIDlet*, is carried out with the virtual machine J2ME (KVM) on the mobile terminal. It has the role to receive measurements of the sensors of the patient, to treat these data, to transmit or to store them if necessary. It also allows to the doctor to be able to evacuate the patient at that moment and his reception in shortest time with the best conditions.

### *B. Simulation of proposed model*

The networks GSM/GPRS are useful to transmit information concerning the person taken a way at that moment.

Currently, mobile phones of last generations are able to send and receive all sorts of messages (text, image, sound…). They offer in addition to the voice communication, a supply of services on a large scale, which allows multi-applications for these devices.

Our investigation, thus consists to integrate and grouping in a medical assessment a whole of the heterogeneous data (ECG signal, parameters of ECG, Temperature, Tension…) on mobile telephone (Intelligent assistant) with a medical Tele-assistance service insurance of remotely person taken a way by the ambulance service.

#### *1) Cost of the developed project*

The cost of the health represents a considerable weight in the economic balance sheet on international scale. Also, in many countries, aging or psychological shocks tend to increase the number of people who are in an urgent need of medical monitoring even more or less intensive care, and based on that fact this affects the global cost of medical care.

As all the technologies, the mobile telephony is evolved, and actually the offered possibilities are more important than the last decade. But indeed the majority of users usually use only the basic functions, phoning and sending messages, what have already allowed imaged the multi-applications.

In our research paper, we propose the exploitation of the mobile phone in order applications apart from the vocal communications. The idea is to divert these devices of their basic function to make them useful for the telemedicine and the medical Tele-assistance.

Whereas ten years before, such a taking off would have required large means as well as a large infrastructure. Today a simple mobile phone can effectively contribute to the protection of human lives.

#### *2) Application*

This section describes a medical application which exploits the portable telephone for an application of Tele-assistance in urgent case. Our application depends on a development of the *MIDlet* to take the reception and the collection of medical information (measures taken, ECG…) of a patient remotely before his arrival at the hospital or on any other place.

The implementation of process of the proposed model for transmission simulating, storage and medical data processing is realized with the J2ME environment. It is always preferable to avoid carrying out specific applications to a type of mobile equipment owner (Windows, Symbian, Palm OS) for reasons that is related to the rapid evolution of technology. J2ME allows the development of applications which can be executed on all compatible mobiles [11]. It brings to the portable systems the power and the modularity of the programming JAVA and this in a way is adapted to the characteristics of the embarked terminals.

Concerning the study of mobility (the key factor) as part of this work is bound by the variations which can be observed in a mobile environment. They are low-level phenomena. These phenomena directly influence the protocol layers used by the applications. To make transparent the movements and disconnections, it is therefore necessary to adapt the protocols for mobile environments. IP addressing, TCP, NFS and HTTP are the main protocols that have been the subject of research in this direction.

The following paragraphs present the principle of the implementation, the global structure of the implementation of process of simulation and finally the sending/the reception of medical assessment.

*a) The principle of implementation*

Being given the complexity between the portable telephone's technology, the number of parameters of the proposed model which must be defined in priori and the heterogeneity of the communicating systems, an adaptation of data to this context consists to use a set of medicals files in the format text for the definition of the current exploited parameters for the simulation and the default information. The adapted algorithm undertakes to recover, to collect and analyze the associated flow to the transmitted medical files through the radio interface between wireless sensors network and telephone of Tele-assistance. It implements an intermediate graphic interface on intelligent assistant allowing the display, the transfer in a sufficient time; not only the contained parameters in the files and measurements taken, but also biological signals obtained (ECG…).

After execution of the application, one can then recover the values and the information in files. At the end of the application, the generated medical bulletin (measurements, medical signals obtained, information…) are remotely stored on a data base of hospital, a doctor's mobile terminal or doctor's personal assistant and possibly displayed on his screen.

Figure 4 presents a diagram synthesizing the general principle of the process implementation of simulation:

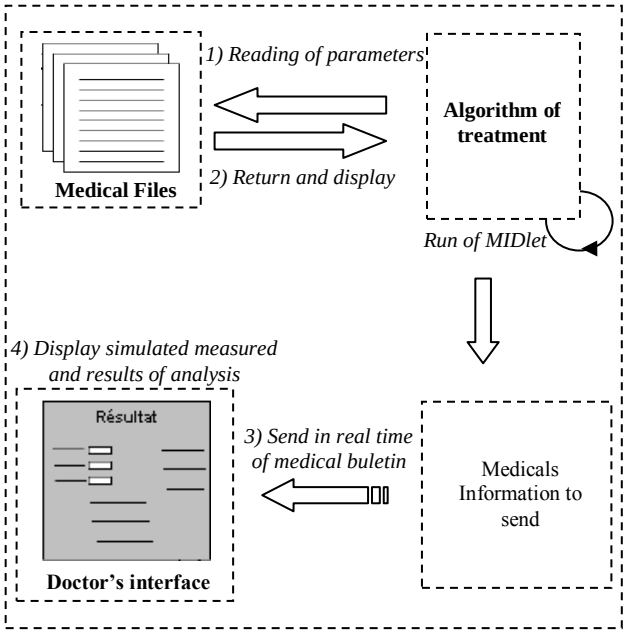


Figure 4. Principle of the implementation of the process of simulation.

The result interface is presented on Figures 5, 6 and Figure 7. The medical signals and the parameters are generated according to the simulation model sequences on which they involve. They are integrated into the medical bulletin and possibly sent in a possible time to the hospital's data base via an intermediate Servlet and on the doctor's telephone portable.

*b) Global structure of the implementation of simulation*

The global structure of the program of the assistant of Tele-assistance is completely sequential. It calls one after the other, the functions realizing the principle stages of treatment and successively corresponding to the generation of the distinct medical signals. These signals and these parameters respectively relate to the ECG and measurements taken. Each called function of treatment takes as entering parameters the results of the call of the previous function and provides the results of its execution to the following function [12].

In order to optimize the storage memory on the assistant of Tele-assistance (which is in this case the portable telephone), we exploited vector of the fixed dimensions to fill them during periods then will be affected to others parameters or values so on. The stages of the *MIDlet* execution are detailed in the following section.

*c) Result*

As we have already seen before, j2me wireless development was exploited to implement the proposed model of mobile Tele-assistance. In this section, we present and discuss the various stages of execution of the algorithm. All this series of tests was made thanks to the phone emulator.

During the launching of the application, *MIDlet* allows to the assistant to activate the mode of the medical Tele-assistance.

At the beginning, the application operates and communicates in autonomous mode with patient's measurement sensors network. Then, the phone collects and recovers periodically the measurement samples, generated by these wireless sensors of patient (Figure 5, 6). These data are stored in a sequential way in a whole of the tables (several boxes). Part of these data will be treated by this algorithm to generate the desired signals and consequently to integrate them in the medical bulletin to be sent. The remainder of these data will be to organize and gather in a filled form.

The unit carries out the medical assessment of the person taken a way by emergency car.


Figure 5. Medical assessment.

This interface of the intelligent assistant of Tele-assistance represents the organization of the medical assessment (different parameters) on a form automatically filled by various measurement sensors of person transferred in the ambulance.

*NB: For some information concerning the Last name, First name…, requires the intervention of the assistant at the time of the sending of the Medical Assessment.*

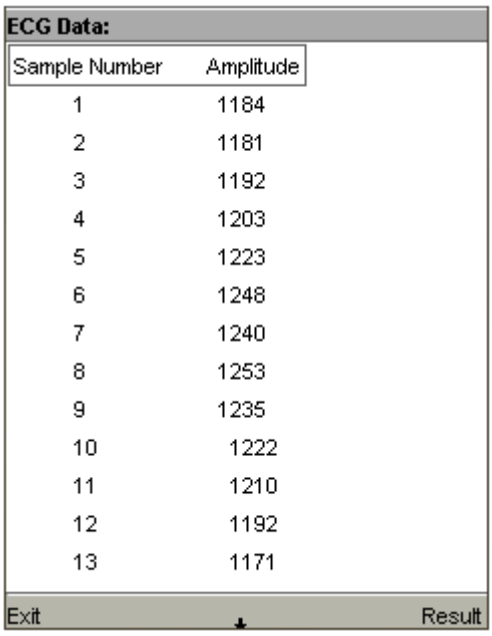


Figure 6. ECG Data transmitted to the portable telephone.

Figure 6 shows the organization in vectors (10000 samples) of ECG values transferred via wireless PAN technologies (Bluetooth, ZigBee…) to the internal memory of the phone.

Such a medical application proposes a set of services to the professional users (List of the patients, the display of the medical profile of a patient, Digital processing of the signals…). These services make treatments with variable complexities (management of data via a wireless sensors network set by the person or a data base, numerical calculation…) and exchange data with the user through a graphical interface on doctor's display device (Mobile phone, Server with data base…). This environment type presents important heterogeneous information, a great variability and numerous possibility of evolution, as well on the level of the means of execution as the means of communication. Indeed, the offered resources on the level of terminal can be extremely different according to the use of a personal assistant, a laptop or a workstation. Thus it is necessary to implement an adaptation strategy to conceive and develop the algorithm by respecting these required constraints.

The intermediate graphic interface of the assistant of Tele-assistance which is in this case the screen of mobile phone, allows to collect, display, store, calculate (treat) and to transmit the bulletin in a possible time to the hospital or clinic, after an adaptation of medical data to the context.

Our adaptation strategy leans on to exploit a vector of storage of medical files, of fixed dimension relating to the size memory available on the mobile phone (32 KB). This contained is sequentially transmitted by sensors network what leads with time to increase the space of storage on the intelligent assistant's terminal.

For this reason it is necessary to adapt these measurements to the mobile context. For example, in the case of data ECG, this adaptation consists to recover and treat regularly each 10000 samples in a vector to be periodically erased, in order to optimize the memory for the storage of the other parameters.

The medical data recovered on wireless Tele-assistance tool, are exploited to generate the medical signals, or are organized in specific fields before sending them. Thus, the doctor is invited to consult the medical assessment of his patient (Figure 7) in order to take the adapted decision and makes it possible to re-examine the files

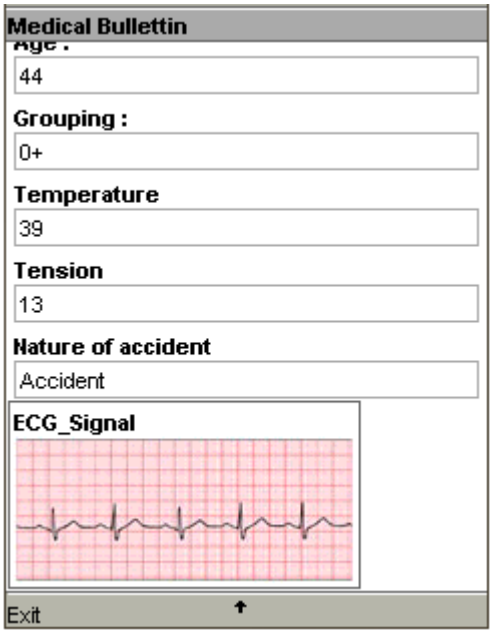


Figure 7. The received medical assessment.

The transfer and the complete treatment could be done by using the implementation of the calculation algorithm on the mobile. It makes it possible to calculate the most significant parameters necessary to the characterization and the accuracy and continuous location of all the waves characteristic of a signal ECG (Figure 7, 8).

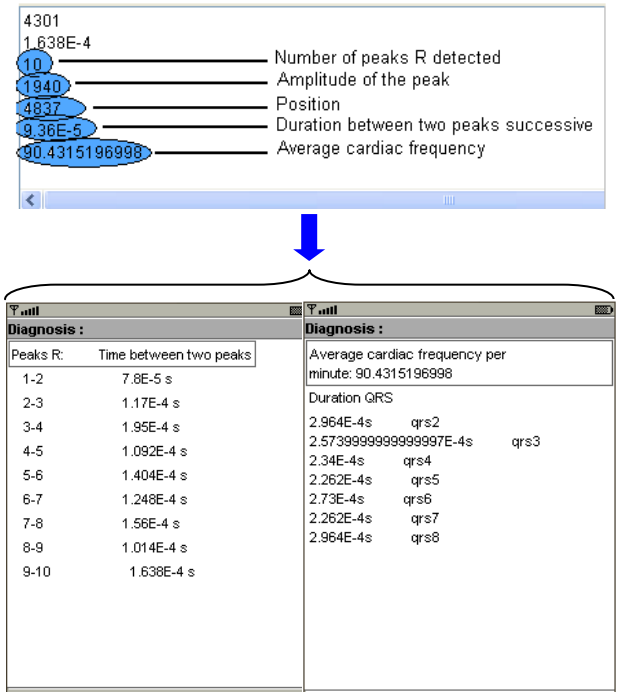


Figure 8. Calculation of the significant parameters of the ECG.

Thus, the doctor can observe the taken measurements and the ECG signal in real time on his screen. A more importantly option allowing the zoom of the part which presents an ambiguity and an anomaly, is implemented in our application.

It is enough to the doctor to introduce a start and end point (time interval) in order to widen the part in question.

## VI Evaluation

The proposed simulation algorithm is articulated on two fundamental points. The first one relates to the simulation step in the respect of the complexity and objectives of the medical Tele-assistance context at distance. The second links to the global vision in the cycle of resolution of the problems: time of transport (to make travel information rather than the patients), the construction of the behavior profile of person to ensure a critical situation, immediate evacuation of the patient and his reception in the most shortest time and with the best conditions.

The suggested Tele-assistance consists to monitor and diagnose the state of an evacuated patient using the methodology developed in this project. Thus, the doctor treating a person at the moment of his injury can at any time receive the medical information and control the state of his patient by consulting in a real time the transferred medical signals on his device (Mobile terminal, Personal assistant, Server…) and the measurements taken by the sensors networks.

The development times of the achieved functionality using J2ME were considerably reduced. For this, time measurements carried out on the principal operations of a Teleassistance system such as, the collection and the regrouping of data, the treatment and the transfer of medical bulletin represent a shortest time and effective to contribute in the protection of human lives. Tests were carried out on a Smartphone: Nokia Series N, N96, memory of stockage intern 16 Go, Processor CPU-ARM9, given rhythm of 264 MHz with 128 MB of RAM.

Relative to the capability of setting near real-time transmission of the data received from medical sensors and transmit them (with treatment) to the emergency, one remarkable design decision has been the evolution from a traditional synchronous request/response mode of HTTP to pipelining request mode using persistent TCP connections.

## VII Conclusion

This article refers to a collection, an organization, a treatment of taken measurements and to a construction of biological signals of the evacuated person, transmitted by the sensors on portable telephone then to send them remotely in a good time to the doctor. This technique of medical Tele-assistance allows an evacuated of an injured person remotely via the ambulance medical service such as the cardiac, the hypertensive patients…

Also, the stages of identification, by the developed algorithm, of the medical profile of a remote patient and the construction of the medical signals cannot cover all medical

indicators corresponding to each patient. Thus, the improvements of this algorithm must be added as one is interested to the new profile (parameters, medical signals…).

This solution is adapted to the portable devices ensuring medical Tele-assistance anytime and anywhere and above all it is cheap and easily realizable. It is in this vision that other services, associated to mobiles and intended for the telemedicine and the house automation are under development.

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