

Chapter 11

Distributed Monitoring and Supervising System for E-Health Applications

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ABSTRACT

The system presented in this chapter is mainly destined to offer support and to monitor chronic and elderly patients. In accordance with the new tendencies in the field, it integrates innovative components for data acquisition systems, Web-based virtual instrumentation, personalized user interfaces, and relational data in a complex, modular, flexible, and opened structure. Compared with other similar integrated communication systems, which are based on Wi-Fi technology, the presented one has as distinctive features: small dimensions, low power consumption, and a considerable autonomy. A large set of experiments and the corresponding results illustrates the functionality of the configurable virtual web instrument principle materialized in the E-Health Monitoring and Supervising System (EMSS) that has many possible applications. As an example, a cheap, easy to use, and personalized support destined to improve the quality of life for subjects suffering from chronic diseases or elderly patients was chosen. The implementation of the complete application included a model for gesture recognition, which allows the classification and assessment of the characteristics of the subject's movement, highlighting even small progresses of the monitored patients.

INTRODUCTION

Following the new requests, resulted from the complex social and medical necessities of the present moment and some specific problems of chronic patients, the chapter presents a Web based monitoring and supervising system, which integrates many innovative characteristics. The main design concepts included in the presented experimental system aim to offer a cheaper, easier to use, and personalized support destined to improve the quality of life of the subjects suffering from chronic diseases or of the elderly patients. The flexible and modular structure of the system offers reliable solutions for an adequate and permanently updated treatment, adaptable to a long-term evolution of the disease. In order to enrich the practice of medical staff besides the borders resulted from each individual experience, suggestions, case studies, and especially long-term observations and obtained results will be stored in common, accessible data bases. So, even though it was not the main priority in the presented context, the system can bring a considerable contribution to the improvement of the defective relationship among groups of researches involved in similar or close area of interest.

Using adequate, performing, and promising technologies, the presented virtual monitoring system integrates innovative components for data acquisition systems, WEB based virtual instrumentation, personalized user interfaces, and relational data in a complex and open structure. Compared with other similar integrated communication systems which are based on the Wi-Fi technology, the presented one has as distinctive features small dimensions, low power consumption and a considerable autonomy. Consequently, the resulting assembly is easy to wear and to use. Furthermore, neither specialty knowledge, nor prior special training of the users is required. It is not necessary to install a dedicated soft on the users' computers, wired connections are eliminated, the freedom of movement in the working

space is preserved and the effectuation of routine, daily activities is possible without restrictions or drawbacks.

Resuming the above considerations, the main objectives of our presented research were:

1. To offer to clinicians, doctors and therapists, not only new conceptual but also implemented technical solutions regarding the supervising and adapting of the rehabilitation process for many categories of subjects affected by neuromotor disorders. stage is at the level of "proof of concept," being possible many improvements and developments;
2. Based on repetitive practice, to offer to the subjects, the solutions are based on two core elements: a new, Wi-Fi based, performing acquisition system and the concept of web virtual instrument. It is important to mention that the implementation the possibility to perform compensatory tasks and to re-learn the main steps involved in complex activities;
3. To complete the significant statistical information regarding the evolution and treatment results for many categories of chronic diseases.

The content of the chapter is organized as follows:

The first two sections focus on the necessity to assess the human movement in a close relationship with the health status as a consequent of the increasing number of patients having motor impairments and their special rehabilitation necessities.

A brief overview of the technical solutions applied to measure and quantify the human motion, a special emphasize being given to configurations containing accelerometers is presented in the third section of the chapter.

Recent techniques for the signal processing such as Fast Fourier and Wavelets Transformation are presented, as are the key elements which can generate innovative features. The main advantages of LabVIEW are considered to be the implemen-

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