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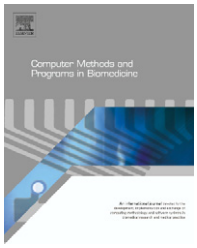

Personal Digital Assistant in an orthopaedic wireless ward: The HandHealth project

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ABSTRACT

Personal Digital Assistant devices are becoming a frequently used device for the bedside care of the patient. Ways of application are many, but limitations are also numerous. Input device and monitor resolution are limited by the device size. Moreover, the choice of specific programs and the amount of storable data are limited by the quantity of memory.

During HandHealth project a system was developed using a different point of view. Personal Digital Assistant is only a means to access data and use functionalities that are stored in a remote server.

Using that system patient ward note can be showed and collected on the handheld device but saved directly on the Hospital Information System. Medical images can be showed on the device display, but also transferred to a high-resolution monitor. Large amount of data can be dictated and translated by remote continuous speech recognition.

1. Introduction and background

Nowadays, Information Technology (IT) is broadly used in healthcare environment. Applications are several and one of them is the ward time management. There are several ways for time optimisation and more and more the answer to these problems are Personal Computers. Today, it is not unusual to find PCs in hospital wards, especially in physicians and nurses offices. Nonetheless, it is still difficult to access patient information during bedside care. This implies gathering information before the ward round and hand writing the note at the end.

Several studies have proposed ways to overcome such a situation via the utilization of handheld technologies (Personal Digital Assistant: PDA). Proposed solutions vary significantly, despite similarities among different devices. Drug information [1,2], access to literature [3], visualization of medical images [4,5], communication to remote physician [5], visualization and writing of clinical report [6–8] are some of the examples available in literature. The use of this kind of technology gives the opportunity to gather information at any moment and place, but also promises to make faster and more secure the everyday ward work.

The studies analysed usually present some common drawbacks, most of which are related to the PDA hardware structure. All PDAs have limited data input devices. Keypad, virtual keyboard, or handwriting recognition, are the most common methods nowadays available for data input.

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Unfortunately, none of these input ways is applicable for inserting large amounts of written data [9]. PDAs have limited amount of memory, so it is not possible to install several different software in the same device. In some cases even a single software can present problems. For instance, some software could help in data input operation, such as continuous voice recognition, but currently it is difficult to implement a solution with a large vocabulary due to memory limitations [9]. Monitor resolution and size are also limited. For a PDA, in order to be portable, small dimensions are required, which means that the monitor cannot be wider than a few inches. Finally, all data have to be stored inside a handheld device and synchronized. Further on, this reduces the amount of memory. In a single handheld device it is impossible to store all the digital data of a healthcare institute. It is thus necessary to choose a clinical application for every PDA. In this way it is possible to update only data related to a specific application. The data security is another limitation regarding the environment and not the devices. In a healthcare environment, data access has to be secure. Accordingly, strict password protocol must be developed in order to guarantee data security [6].

The HandHealth project was a feasibility study in which we developed a system by using a different point of view. PDA is only a means of data access and functionalities use that are stored in a remote server, in order to make the everyday ward work faster and more secure. We developed a wireless system by using the wi-fi (IEEE 802.11) specifics. In the course of the project a wireless net was realized in an orthopaedic ward of Istituti Ortopedici Rizzoli (IOR, Bologna, Italy). Using that system patient ward note can be collected through a predefined form and than visualized. Medical images can be shown on the PDA display, but also transferred to a high-resolution monitor. Large amount of data can be dictated and translated by a remote continuous speech recognition software. Moreover, security access was guaranteed by the use of Radio Frequency IDentification (RFID) badges.

The aim of the project was to verify the feasibility of a structure in which the services above described could coexist in a handheld device. In this work we describe the system framework developed. Some preliminary findings are shown and the application put into practice in an orthopaedic ward is illustrated.

2. Design considerations

The developed system framework is described (Fig. 1). The PDA can dialog anywhere and any time with the Health Information System (HIS) by means of a web server. Data were directly read and written in the HIS database, no synchronization was needed.

A continuous speech recognition server was used. It was possible to send a maximum of 2 min voice file to a large continuous speech recognition software by using the PDA. The translation was copied in the HIS via web server. Once the translation was copied it was possible to visualize it on the PDA display, so as to apply some fast corrections. A remote work-

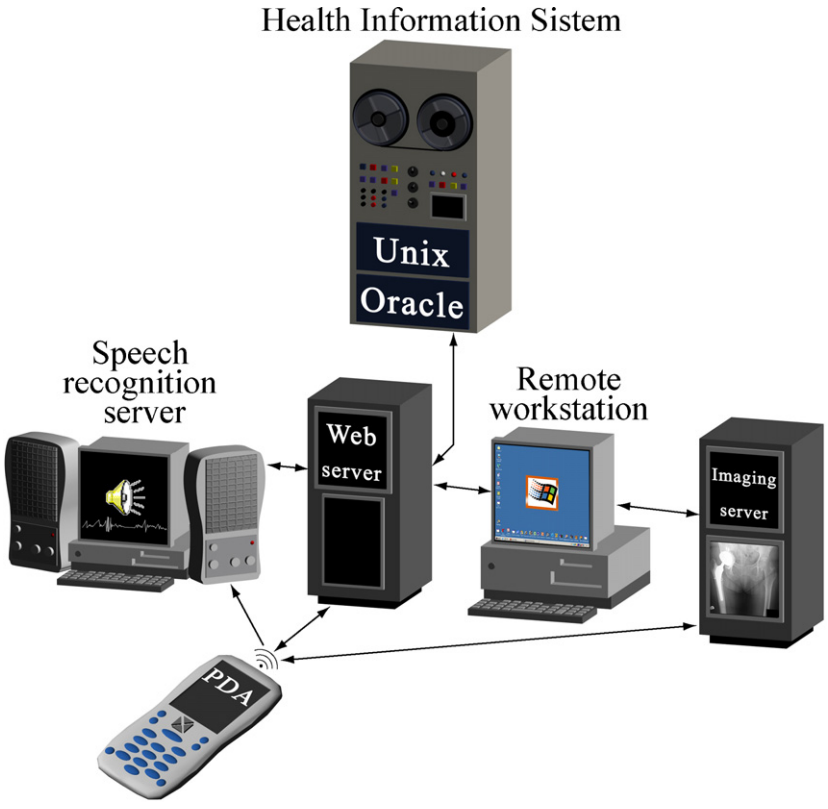

Fig. 1 – Main system framework. PDA can access to HIS via a web server and can use remote programs and capabilities stored in the speech recognition server and the imaging one.