

## Chapter 3.26

# Distributed Mobile Services and Interfaces for People Suffering from Cognitive Deficits

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### ABSTRACT

The mobile device presented here is designed to offer several services to enhance autonomy, security, and communication for the cognitively impaired people and their caregivers. Two mobile devices are linked through a server; one is dedicated to the patient, the other one to the caregivers. The services fill three functions for patients: a simplified reminder, an assistance request service, and an ecological information gathering service. Three services are available for the caregiver: monitoring patients' ADLs, informing system

and colleagues of an intervention, and planning patients' ADLs.

### INTRODUCTION

The number of people suffering from cognitive impairments (Alzheimer disease, head injury, schizophrenia, etc.) is growing continually. For one, the aging of the society plays an important role in this trend. The always increasing needs for resources generates a huge stress on human and economical actors. Thus in Canada and United

States, as in most western countries, social and medical policies try to keep people suffering from cognitive deficits at home (Hareven, 2001). Progress in cognitive rehabilitation also augments the number of semi-autonomous people that would be able to stay at home if light assistance is provided. Of course, this results in higher expectations and even more demand on resources. But most of the time, families have to take responsibility for care without access to appropriate resources. Too often, this situation then turns to an exhausting weight. Therefore, natural and professional caregivers urge for help.

Recent advances in mobile technology can provide affordable solutions to lessen the burden and anxiety put on caregivers and to collect reliable information. For many years, numerous devices have been designed to counterbalance physical and sensory deficits. Nowadays progress in technology set high hopes for cognitive orthotics that address cognitive decline (Lange, 2002; Pollack, 2004). Thanks to their small size and their versatility, mobile devices can offer a personalized assistance anytime anywhere. Mobile devices then become portable cognitive prosthesis, for instance acting as pervasive system to remind people activities of daily living (ADL) to perform when needed. They can also foster sense of security by keeping people and caregivers directly in touch. In its simplest form a direct call button may be used to request immediate assistance. Geo referenced data may also be used to detect crisis of schizophrenia or when a patient suffering from Alzheimer disease is lost (Médical Intelligence, 2005). Mobile devices can also provide non-intrusive remote supervision by caregivers. Besides mobile devices can gather ecological data compulsory to adapt or fine-tune diagnosis and treatments. Nevertheless, the design of devices and mobile services must put a very careful attention to user interfaces used to deliver information. Population suffering from cognitive deficits has often severe limitations and constraints.

This chapter discusses features and implementation of mobile services for cognitive assistance and remote supervision. Mobile devices provide practical solutions to the issues presented above. First, we review benefits and limitations of current reminder systems that can assist patients and/or caregivers. Then we present the needs of the population regarding the assistance necessary to stay safely at home. The multiple mobile services, designed especially for that population, are also described. We show how supervision can safely foster autonomy. Next, we describe cognitive assistance to patients and remote supervision by professionals or relatives, and then we go further and gather ecological data to foster better treatments. Finally, outdoors, safety and security of the patients is relying on geo-localization features. Implementation specific details are also sketched.

## **MOBILE PROSTHETIC SYSTEMS**

The management of ADL is a central issue for people suffering from cognitive deficits. In the process of rehabilitation, occupational therapists provide a patient with a paper agenda as a tool he has to master to manage his life and autonomy. A lot of research projects and commercial applications also targeted electronic adaptation of specific functionalities of these agendas. In this section, we review the advantages and limitations of current reminder and/or agenda systems.

Some systems are device specific and are explicitly designed to be used inside the patient home and then could not help outside (Helal et al., 2003; Visions, 2005). Another category of systems is designed specifically for mobile devices in such a way that their use is not restricted to a specific location. These applications are usually running on PDAs or smart phones to either assist for needs specifically related to mobility (Patterson et al., 2004) or as general reminder/agenda systems or electronic organizers (Gorman, Dayle, Hood,

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