[Master Degree Thesis] An Assistance Application System for Deaf Patient

[Survey Paper #1]

Title – SOSPhone: a mobile application for emergency calls

Published Journal – Universal Access in the Information Society

Published Date – August 2014

Abstract – The general adoption of mobile devices and its wide network coverage made it possible to make emergency calls virtually everywhere, even in the absence of a valid contact. However, there is still generally the need for audio connection. This restriction is a problem for deaf people, but also for the elderly and people without disabilities who face sudden situations where speech is hard to articulate. In this context, this paper presents SOSPhone, a prototype of a mobile application that was developed to enable users to make emergency calls using an iconographic touch interface running in a touchscreen mobile device. The prototype implements the client-side of the application and was demonstrated and evaluated by a large number of users, including people without any disability, emergency services' professionals and deaf people. This paper describes the SOSPhone prototype and presents the results of the interface evaluation process, which is important to validate the main client-side interaction and architectural principles in order to proceed with the integration with each specific national emergency services' platform.

Index – Icon-based mobile application, SMS message to the emergency center

Note – This paper presents a mobile application that enables making emergency calls without requiring audio capabilities. This application offers to the user an iconographic touch interface that enables him to contact the emergency center by selecting the icons that represent the occurrence being reported, as well as clicking a few boxes to answer simple questions such as the number of victims in the incident. The result of this selection process is an SMS message that is sent to the emergency center containing the codes corresponding to the information selected, along with the user profile and coordinates of the caller.

A.   Applications and Areas applied

In an emergency, disabled people such as deaf or dumb can conveniently send SMS messages containing their symptoms to the emergency center.

B.   Technologies considered

Program language

 – Not mentioned but seems C#

Framework

Step 1. In an emergency, the user runs the application and touches the icon most similar to the symptom.

Step 2. The application receives the user's location information from the mobile phone

Step 3. SMS messages containing your location and symptom information are sent to the emergency center

Apps

- Implemented for Windows Phones and Android-based mobile devices / Planned for iPhone, Blackberry and Symbian platforms

GPS

 - Embedded GPS in mobile phone

Device controller

 – Windows Phone 7

C. Issues considered

Categorize each symptom (heart / pregnant / accident / stroke)

Receive user's location information from the mobile phone

Fig. 2 Mobile application prototypes: phase 1 (left), phase 2 (center), phase 3 (right)

< Three mobile application prototypes >

Fig. 4 Emergency flow protocol XML schema

< XML flow protocol for emergency call >

[Survey Paper #2]

Title – Personalized emergency medical assistance for disabled people

Published Journal – User Modeling and User-Adapted Interaction

Published Date – December 2017

Abstract – Being able to promptly and accurately choose a proper course of action in the field is a crucial aspect of emergency response. For this reason, emergency medical services (EMS) rely on well established procedures that apply to the most frequent cases first responders encounter in their practice, but do not include special cases concerning (sensory, motor or cognitive) disabled persons. In these cases, first responders may end up applying suboptimal or possibly wrong procedures or lose precious time trying to adapt on-the-fly to the special case. This paper proposes both (i) a detailed patient model for EMS that can account for peculiar aspects of the many existing disabilities and (ii) an adaptive information system called PRESYDIUM (Personalized Emergency System for Disabled Humans) that provides tailored instructions in the field for helping medical first responders in dealing with disabled persons. More precisely, we will illustrate and discuss: (i) the design and development process of PRESYDIUM, (ii) the patient model, which is partly based on the ICF (International Classification of Functioning, Disability and Health) standard proposed by the World Health Organization, (iii) the knowledge base used by the system to provide tailored instructions to medical first responders, (iv) the Web-based architecture of the system, (v) the different interfaces—including one for mobile devices—the system provides to enable all the identified stakeholders (disabled persons, their families, clinicians, EMS call center operators, medical first responders) to easily access and possibly provide data to the system, (vi) the evaluation of the validity of the patient model and of the system usability which has been conducted with end users.

Index – Patient model, categories of users, PRESYDIUM (Personalized Emergency System for Disabled Humans)

Note – This paper focuses on providing personalized instructions concerning disabled persons, by exploiting a detailed patient model that can account for the peculiar aspects of the many existing disabilities, a knowledge base containing the rules to generate the instructions, and a Web-based system that allows different categories of users to access and possibly provide data to the system through appropriate user interfaces.

A. Applications and Areas applied

Web server-based emergency rescue system for disabled users. The user can access the web server and input his or her symptoms to request the relatives of the user and the emergency system.

B. Technologies considered

Program language

– Java-based HTTP (Web) server

Framework

Step 1. In an emergency, a disabled user accesses the PRESYDIUM system website using his / her PC.

Step 2. Using the patient symptom model, the user inputs his or her symptoms, site, and location.

Step 3. The symptoms and location of the disabled user are sent to his / her relatives and to the emergency system phone operator.

Step 4. In an urgent situation, the emergency system phone operator requires the first responders to rescue of the disabled user.

Apps

- A four-button application

GPS

 - Not supported (manually inputted)

Device controller

- Disabled user, Relatives of disabled user, medical specialists: Web browser in personal computer

- Emergency service phone operator: Personal computer

- First responders: Mobile device

C. Issues considered

Patient model using symptom and symptomatic sites.

The system simultaneously requests the relatives of the user and the emergency phone operator, and the phone operator decides whether to request the first responders for the structure.

Role definition and database for each role (disabled user, relatives of disabled user, emergency phone operator, first responder)
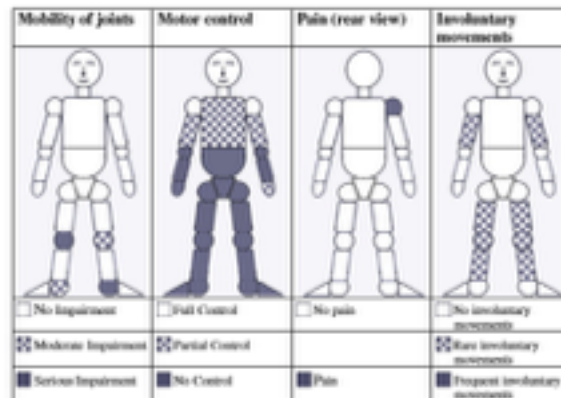
Mobility of joints	Motor control	Pain (rear view)	Involuntary movements
☐ No Impairment	☐ Full Control	☐ No pain	☐ No involuntary movements
⊠ Moderate Impairment	⊠ Partial Control		⊠ Rare involuntary movements
■ Serious Impairment	■ No Control	■ Pain	■ Frequent involuntary movements

Fig. 1 Examples of the 27-parts graphical representations of the human body used in the DPP; showing the impairments of a quadriplegic person in a real clinical case
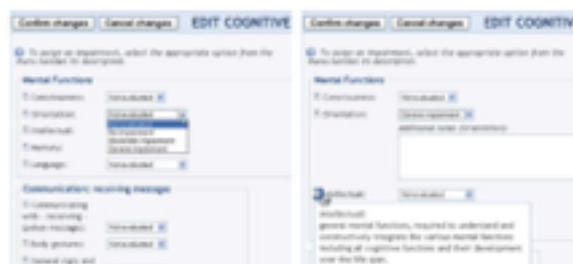

Fig. 4 Entering data in PRESYDIUM Web Portal: (left) combobox values for editing a DPP field; (right) a note for a DPP field with an impairment value and DPP fields popup definitions

Fig. 3 Clickable graphical representations of the human body and contextual help providing focused textual instructions at the top of the section (marked by the "i"—information—icon)
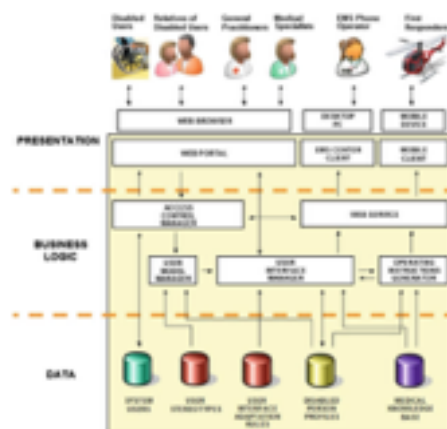
< Disabled Person Profile >

Fig. 2 The PRESYDIUM system architecture

< The PRESYDIUM system architecture>

[Survey Paper #3]

Title – Using Mobile Devices to Support Communication between Emergency Medical Responders and Deaf People

Published Conference – MobileHCI'10 Proceedings of the 12th international conference on Human computer interaction with mobile devices and services

Published Date – September 2010

 Abstract – Fast and effective communication is crucial during medical emergencies, but patients' disabilities can make it a challenging task for emergency medical responders. This paper proposes a mobile system to deal with the communication barrier between medical responders and deaf patients. The system allows medical responders to quickly browse a collection of emergency-related sentences, and show videos of the corresponding translations in sign language to the deaf patients. The design process involved experts in emergency medicine as well as experts from the deaf community. The evaluation carried out on ten emergency medical responders and ten deaf subjects showed that the system is useful to support communication with deaf people during medical emergencies.

Index – Emergency related sign language translator

Note – To help EM responders communicate with deaf people using sign language, this paper proposes a mobile system. The system allows emergency responders to quickly browse a collection of emergency related sentences, and show videos of the corresponding sign language translations to deaf patients.

A.   Applications and Areas applied

 In case of an emergency, the system informs the user of first aid treatment by sign language so as to cope with the symptom.

B.   Technologies considered

Program language

-   C# and .Net Compact Framework 3.5 for Windows Mobile devices

Framework

Step 1. In case of emergency, the user runs the application.

Step 2. The user selects one of the four answers for each question.

Step 3. After answering each question, a sign language video is played to remedy the symptoms.

Apps

- A system that informs the first aid method on a sign language video by using questions composed of 4 button answer sets.
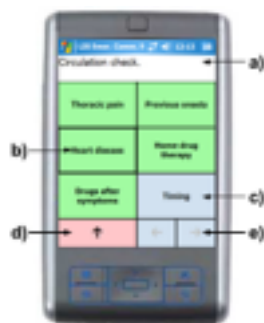
GPS

 - Not supported

Device controller

 - PDA or mobile phone

C. Issues considered

  By allowing the user to select one of four possible answers to the symptom, the user can explain his / her symptom in a convenient but detailed.

  Sign language video helps users cope with symptoms by himself.

Figure 1: Browsing the tree of sentences: a) description of current menu (e.g., "circulation check"), b) pale green software buttons to select sentences, c) pale blue software button to enter a sub-menu, d) pale red software button to go one level up in the tree, e) pale blue software buttons to navigate menu pages (disabled in menus with a single page). While the tested application is in Italian, this screenshot shows English items for readers' convenience.

Figure 2: System usage: a) a frame of a sign language video on a mobile device, b) an EM responder communicating with a deaf patient in the setting chosen for the experimental evaluation.

< Sentence tree for symptom / Example >

[Feedback Revision]

	SOSPhone [#1]	PRESYDIUM [#2]	Emergency Sign Language Translator [#3]
Key point (Major technology)	SMS message service / Iconographic interface / Touch screen input / GPS location tracking	Patient models / Web-browser / User-interface for roles (Patient, neighbors, first-responder)	Browsing an emergency related sentences / Showing videos of the sign language translations related to the problem
Services	SMS message service for emergency call including location information from embedded GPS	Personalized e-health information systems	Sign language translation system for deaf patients
Real-time	Yes	No	Yes
Architecture	1. The user selects the symptom by selecting the icon. 2. The location of the user is acquired through the GPS system of the mobile phone. 3. An SMS message containing the user's symptoms and location is sent to the Emergency Center.	 **System architecture** 1. The user enters his or her symptoms and sick part on the website. 2. Information about the patient's symptoms is sent to the neighbors and the first responder. 3. In case of emergency, the EMS phone operator requests the first responder to move.	1. The user answers questions with four options. 2. The application browses the symptoms from the answers to several questions. 3. The sign language video related to the symptoms is played.

Programming Language	C#	Java	C#
Device	Mobile phone	Patient: Personal computer First responder: Mobile phone	Mobile phone
Location tracking	GPS	Manual by user	Not supported

[#1] SOSPhone: a mobile application for emergency calls

[#2] Personalized emergency medical assistance for disabled people

[#3] Using Mobile Devices to Support Communication between Emergency Medical Responders and Deaf People