Ambient Support Systems and Platforms for Health Self-management and Well-being

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“Enhanced Home-Based Medical Care Services Through Mobile Technology”
Enhanced Home-Based Medical Care Services Through Mobile Technology

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Roots of error
Effect of staff experience

![Graph showing the effect of lack of experience on total error. The graph compares 'Without control' and 'With control' scenarios at different error rates (10%, 20%, 30%, 40%, 50%). The graph indicates that the total error is higher in the 'Without control' scenario compared to the 'With control' scenario. ]
Influence on treatment
Home-based care system
Communication
Maintenance tracking

Inexperienced staff enters tag # of medical device to check maintenance history.

XXX-XXX-XXX

Secured Link
Control Room at Hospital

Experienced Staff monitors medical device information.

Medical Device
Summary

• Model enhances the home-based care service in a rapid and non-expensive manner

• Preliminary implementation of the system involved the collection of data comprising vital signs (body temperature, blood pressure, pulse rate), blood glucose, general appearance, and – in limited cases – urination frequency and volume

• Data produced seed information that was further used to extrapolate into more quasi-real settings

• Raw data is in complete accord with the proposed model based on the simulation data
Panelist

Youna Jung
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“Privacy-Preserving Online Monitoring Framework for e-Health Applications”
Privacy-Preserving Online Monitoring Framework for e-Health Applications

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Online Monitoring

- An essential technique to evaluate and enhance the performance of online applications
  - help the online service providers improve the usability of their applications
    - by collecting and analyzing user/usage data

- Three different approaches
  1) Log file analysis (Server side)
  2) Proxy-based monitoring (Between a server and clients)
  3) Use of monitoring scripts (Client side)
Script-based Online Monitoring

Enable the tracking and recording of user characteristics, data entered, and actions.

- e.g.) mouse clicks, frequency of use, time spent in a particular page, media viewed, page navigation sequences, content entered into a textbox, location information, whether a mobile device is being used, and etc.

Advantages

1) requires less time and effort to collect and analyze user/usage data
   - e.g.) Google Analytics and Adobe Analytics

2) widely used in a variety of online application areas
   - e.g.) e-commerce, information retrieval, e-health, and etc.
e-Health

“e-health is an emerging field at the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies.”

- Eysenbach [9]

- An umbrella term that includes a variety of online healthcare applications and systems that use information technologies
  - Electronic data management
  - Information Retrieval
  - Data Mining
  - Rich interaction skills
  - etc.
e-Health Applications

- **Application Domains**
  - Online healthcare education [10]
  - Healthcare interventions
  - Disease prevention and self-management
  - Health promotion [13]

- **Major Functionalities**
  - Self-assessment or self-profiling
    - to recognize individuals’ health-related status
    - provide personalized healthcare services
  - Continuous communication with patients/users using interactive tools
    - e.g.) online trackers
  - Wide dissemination of information related to health and safety

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**Detailed monitoring is critical**
- to provide personalized healthcare services
- to confirm that e-health apps are used correctly

← Need to collect detailed, and often identifiable, user data including health information.

**Protection of user privacy is critical**
- e-health applications often deal with very sensitive private data, including health status, medical records, and family health histories.

→ Control over the sharing of this information is of the utmost importance and urgency.
How can we simultaneously achieve these two important yet opposing goals -- *monitoring identifiable user data while protecting user privacy*.

How can we define the level of disclosure of private data that is essentially required for patient treatments?
Requirements

- Strict verification and enforcement of user policies
  - Online monitoring services that are aware of user policies rather than application policies
  - Verification methods to ensure that an application complies with policies mutually agreed by providers and users on user side
  - Enforcement methods to protect user privacy on user side

- Easy-to-use tools
  - User-friendly interfaces to intuitively specify privacy policies
  - Support in generating privacy policies for e-health applications
  - Support in converting existing e-health applications to monitorable applications
PPoM Framework

- Architecture

![Diagram of PPoM Framework]

- Privacy-Preserving Online Monitoring Service
- In-page Selector
- Monitoring Code Generator
- Application Code Generator
- Privacy Policy Generator
- Policy Miner
- Application Converter
- Privacy-Preserving Online Monitoring Tool (PPoMT)

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Panelist

Tom Ruette
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“Current ICT in Health and Wellbeing projects @ SIRRIS Data Innovation”
Current ICT in Health and Wellbeing projects @ SIRRIS Data Innovation

**With-Me**
- People’s **adherence** to healthier behaviour will improve by using **persuasive** electronic services.
- With-Me ensures continuity of **personalised assistance** from lifestyle improvement to prevention and care.
- Artemis IA
- [www.with-me-project.eu](http://www.with-me-project.eu)

**CareWare**
- The health domain will have **personalised**, simple-to-use and technologically advanced solutions, which combine **real-time data** from various sources and advanced **wearable smart sensors**.
- To develop and leverage novel unobtrusive cyber physical systems for monitoring and advancing personal health and wellbeing.
- ITEA 3
- [www.itea3.org/project/careware.html](http://www.itea3.org/project/careware.html)

**SMARTpro**
- Stimulate the **collaboration** across the ICT, electronic and textile sectors and confection companies in (home) care and medical markets
- Advance on issues of **knowledge** on smart textiles, wearable intelligence and communication possibilities.
- Regional funding (IWT)
- [www.smart-pro.eu](http://www.smart-pro.eu)
Panelist

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“Ambient Technologies for Well-being and Quality of Life“
Ambient technologies for well-being and quality of life

George Margetis
Institute of Computer Science
Foundation for Research and Technology - HELLAS
Improving quality of life through AmI

• Ambient Intelligence and distributed sensors environments are expected to have a significant impact on the daily lives of everyone
  • Especially people belonging to vulnerable groups, such as the elderly, patients, and people with disabilities

• Project "Quality of Life - Development of advanced technologies to improve the quality of life through the provision of home medical monitoring and facilitation of daily activities"

• An integrated multidisciplinary approach of three FORTH’s Institutes
  • aims to develop new methods and technologies to improve the quality of life of people interacting in smart environments
Objectives

• Data collection and analysis
  • characteristics and requirements of elderly patients
  • to support their daily activities in smart environments

• Study and development of
  • medical treatment protocols for reduced duration of hospitalization, and monitoring / support at home
  • monitoring through intelligent technologies

• Creation of intelligent environments
  • to support and improve everyday life hospitalization, including "smart materials" and advanced sensor technologies

• Design, implementation and pilot operation in an integrated intelligent environment
  • prototype systems and services to support the improvement of quality of life
  • user – friendly systems for health monitoring at home
  • assistance systems for simple daily activities for seniors.
User requirements

• Patients
  • Questionnaire survey involving recently hospitalized post-stroke patients and elderly was conducted in Spring 2014
    • University General Hospital of Heraklion and "Talos" Centre of Open Protection for the Elderly in the Municipality of Heraklion
  • Results
    • Unobtrusive monitoring through portable or wearable devices with sensors
    • The majority of the participants disagreed regarding recording their medical data on a daily basis
    • Most of participants would like to have a physical exercise programme proposed for them to follow and would use a medicine reminder - monitoring application
    • Everyone agreed that their doctor should be contacted if needed

• Medical personnel
  • Interviews with six cardiologists during the same period
  • Results
    • everyone agreed that the monitoring plan should be prepared in collaboration with the patient
    • 83.3% prefer to select patients at discharge from the hospital and would use an electronic communication platform with their patients
Medical treatment protocols & services

Services for patients

• Implementation of an accessible and user friendly system of patient monitoring

Central patient monitoring system

• receives the data sent by patients, processes it and provides visual reports for the doctors and medical personnel
• make initial estimates based on the signals and data received by the monitoring devices, automatically creating alerts to that are set depending on the clinical situation of each patient
• provides a care plan system that allows the development of individualized plans for each patient, including medications, diet, exercise, medical examinations

Medical Team Platform

• access to the full list of patients' notifications and their electronic health record
• communication facilities with the patient (either by phone or messaging service)
• facilities to communicate with other team members regarding patients' issues and requests
• an emergency audible and text notification to an emergency medical monitoring team