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User centric communities
Patient monitoring and support

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User centric communities
Patient monitoring and support

- Health and Social science
  - For elderly and patients with chronic diseases: importance of social support
    - seek for support and for information
    - must keep involved in maintaining/improving their health condition
  - Rich literature (physiology, sociology, mobile computing…)
- Financial issue
  - Search for most efficient investments in healthcare
  - Ageing population: more and more people are concerned

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User centric communities
Patient monitoring and support

- Expected improvements
  - → Improve life conditions for elderlies, patients
  - → Keep healthy people healthy
  - → Improve life conditions for helpers (for instance: reduce culpability, reliable alert system, etc.)
  - → Improve efficiency of care (for instance: by using actual objective data about patients, etc.)
  - → Decrease cost

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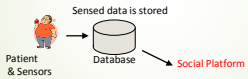
User centric communities
Patient monitoring and support

Principles of a connected Health Social Platform



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User centric communities
Patient monitoring and support

Principles of a connected Health Social Platform

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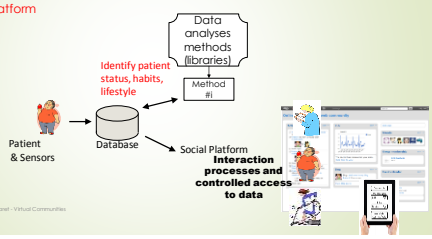
User centric communities
Patient monitoring and support

Principles of a connected Health Social Platform



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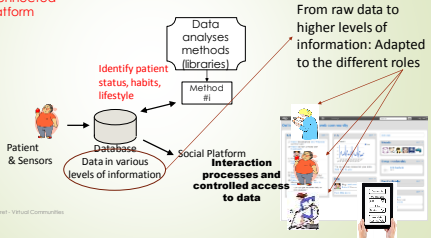
User centric communities
Patient monitoring and support

Principles of a connected Health Social Platform



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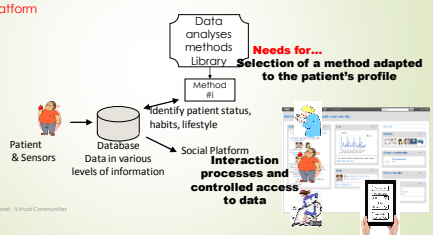
User centric communities
Patient monitoring and support

Principles of a connected Health Social Platform



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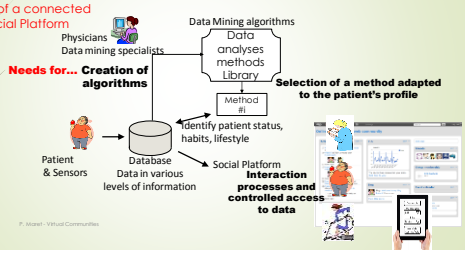
User centric communities
Patient monitoring and support

Principles of a connected Health Social Platform



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User centric communities
Patient monitoring and support

TogetherActive

- Combination of virtual community functionalities with physical activity assessment methods to increase or maintain the physical activity (PA). (Elloumi 2017)
- Different states in PA practice: Precontemplation, Contemplation, Preparation, Action, Maintenance
- Study hypothesis: can the use of VC postpone the decrease of activity level?
- Importance of objective assessment of the PA: sensors (instead of questionnaires)

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User centric communities
Patient monitoring and support

- Method: [Design → Prototype → Evaluate] * 3 times

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Patient monitoring and support
Enhancing activity (PA) using VC

- Functionalities for social support in telemedicine (result from various studies)
  - **Self awareness**: dashboard to consult self results, set personal goals
  - **Feedback**: user receives feedback on personal (and peers') performances
  - **System interaction**: the systems is able to deliver reminders, rewards (punishments), suggestions, recommendations (links, similarities)
  - **Social interaction**
    - Exchanges on performances: Share and compare information, give/receive support to/from peers
    - Cooperate between peers, participation to challenges, competition.
  - **Facts and information**: access to documents, links related to activity and health

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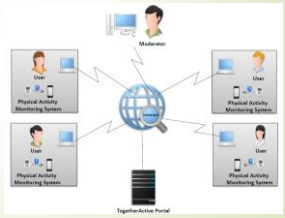
Patient monitoring and support Enhancing PA using VC

- TogetherActive Architecture Overview
  - 2 roles: user, moderator
  - Portal:
    Set of web pages
    with specific functions
    (data gathering, display…)



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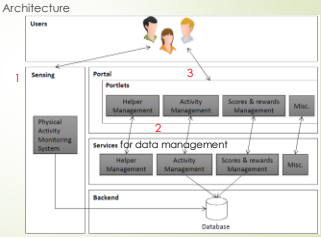
Patient monitoring and support Enhancing PA using VC

- TogetherActive Functional Architecture
  1. Data collection
  2. Data preparation
  3. Interaction



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Patient monitoring and support Enhancing PA using VC

Functional architecture : list of the pages

- **Portal main pages**
  - Profile Management
  - All Groups
  - Group i
  - Portal blog page
  - Portal wiki
  - Portal settings
- **Personal pages**
  - Daily PA
  - PA history
  - Current pers. goal
  - Pers. goal mangt
  - Pers. goal history
- **Group pages**
  - Group PA
  - Group PA history
  - Current group goal
  - Group goal mangt
  - Group goal history
  - Current group members
  - Group members mangt
  - Group members history
  - Group blog

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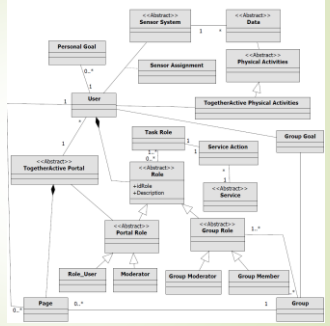
TogetherActive
Information model



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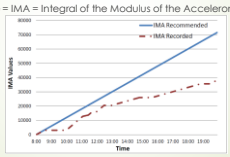
Patient monitoring and support Enhancing PA using VC

- From sensor data to PA level
  - Use of the 3D-accelerometer a sensor, coupled with a smartphone.
  - PA value = IMA = Integral of the Modulus of the Accelerometer



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Enhancing PA using VC Experimentation

- Goal: Test the usability of the portal + Show the impact of VC functions
- Study design:
  - 4 Intervention groups : they use VC functions
    - Receive group-based functionalities of the system
    - Asked for collaboration and communication between them
    - Daily group goal, Competition against other 3 groups; Rewards for achievements
  - 1 Control group : no VC
    - Receive basic version of the system : PA monitoring
  - Duration: 9 weeks

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Enhancing PA using VC Experimentation

- Results
  - Questionnaire + Analysis of portal logs to evaluate the system use and usability
  - Analysis of PA data to evaluate the potential difference with VC functions
- Questionnaire
  - Method (from Lewis 95): Overall system usability (OVERALL) / System usefulness (SYSUSE) / Information quality (INFOQUAL) / Interface quality (INTERQUAL)
  - Result: Same results; Ease of use in both cases

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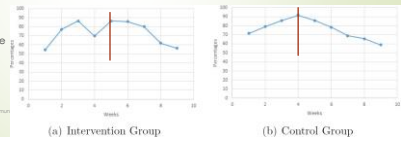
Enhancing PA using VC Experimentation

- Analysis of portal logs
  - Method: number of sessions, pages visited, exchanged messages (intervention group)
  - Intervention group uses the portal twice as often the as the control group
  - Very few messages posted
- Analysis
  - Steps per day

A strong decrease at week 7 vs. 4



(a) Intervention Group (b) Control Group

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Enhancing PA using VC Conclusion

- The study shows the potential difference of virtual communities Decrease arises 2 weeks later
- Difficulty encountered: recruitment, sensor wearing, objective analysis (ex: steps per hour wearing the sensor)
- Such study are useful
  - Improvements/adjustment of systems (usability, functions)
  - For political investments
- Lot of means and energy required for such study.
- Ethical question raised
- Next study: PA activation with a coaching system (The system rings a coach when it detects low activity by the patient)

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Other works on User centric communities Patient monitoring and support

- Social support for patients with metabolic syndrome
  - Among the chronic disease
  - Cardiac problems, unhealthy meals, no physical activity, depression

→ Social support may help to recover a better life style

(Cooperation with the University of Tokyo and JST)

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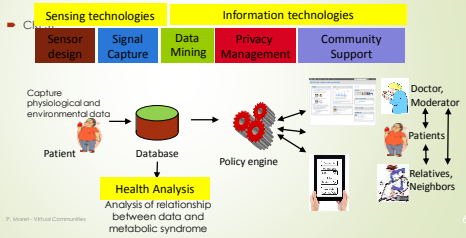
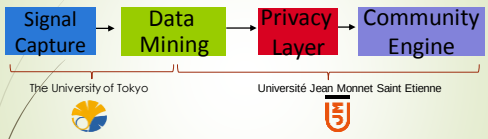
Other works on User centric communities Patient monitoring and support

- Cl…



A Community-Based Framework for Healthcare Data Sharing

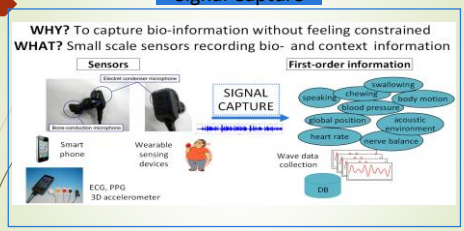


A Community-Based Framework for Healthcare Data Sharing

Signal Capture → Data Mining → Privacy Layer → Community Engine

Recording bio- and context information

Signal Capture

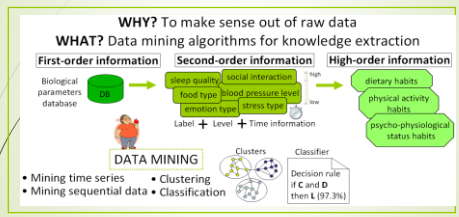


A Community-Based Framework for Healthcare Data Sharing

Signal Capture → Data Mining → Privacy Layer → Community Engine

Implementing new algorithms for extracting knowledge from raw data

Data Mining

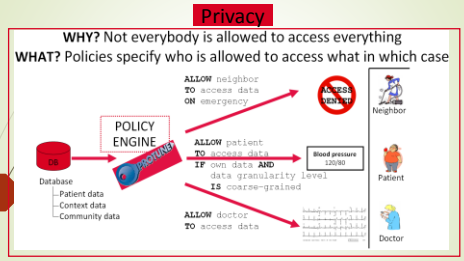


A Community-Based Framework for Healthcare Data Sharing

Signal Capture → Data Mining → Privacy Layer → Community Engine

Defining a mechanism for privacy enforcement

Privacy



A Community-Based Framework for Healthcare Data Sharing

Signal Capture → Data Mining → Privacy Layer → Community Engine

Designing a social platform to monitor and give recommendations

Community Engine

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Other works on User centric communities
Patient monitoring and support

- Social support for patients with metabolic syndrome - Results
  - Prototype design with
    - Privacy engine implementation
    - Community platform (based on Elgg)
    - Data mining: data model and framework description (lack of real data!)
  - No in-use evaluation

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User centric communities
Patient monitoring and support

Related research topics in CS (a selection of)

- System engineering methods Component based; Agile design
- Text analysis on social networks applications (NLP) Identify patient's needs and status
- Data mining Identify the actual patient status, habits, lifestyle
- Data security Ensure identity on Internet (blockchain); privacy preservation; information granularity management
- Linked data Reuse knowledge bases; large scale reasoning (data; stream data)