A US Perspective on Research Trends in Technologies for Ambient Assisted Living

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How does the U.S. compare?

- Same crisis in aging demographics
- Same financial squeeze
- Same need for a new model of delivering care
- Different financing of health care
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- Same crisis in aging demographics
- Same financial squeeze
- Same need for a new model of delivering care
- Different financing of health care

- Same interest in research in technology for successful aging
Organizations Coordinating Research Efforts

- European Commission
  - CAPSIL, AALIANCE, ePAL, SENIOR
  - Session 18: Trends and Roadmapping in AAL
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- United States
  - CAST – Center for Aging Services & Technology
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- United States
  - CAST – Center for Aging Services & Technology
  - ORCATECH – Oregon Center for Aging & Technology
Important Trends

- Hospital / Clinic → Home Health
- Reactive Care → Proactive Care
- Medical Focus → Quality-of-Life Focus
- Involvement of Patient & Family
- Ubiquitous Computing in Home
Needs of Older Adults at Home

- Many with loss of cognitive and physical function
- Majority have more than one chronic disease requiring ongoing care
- Need holistic health management for quality-of-life and independence
  - Socialization, Depression, Exercise, Diet, Cognition, Help with Medications, Safety
- Financing of home health care
  - Technology for home health not well financed
  - Medicare, insurance companies, out-of-pocket expenses?
Research Trends

- Earlier Research Focus -
  Medical monitoring
  - Blood glucose, heart rate, weight, blood pressure, peak airway flows, symptoms

- New Research Focus -
  Unobtrusive monitoring of behaviors
  - Activities, Falls, Adherence to Health Behavior Goals, Exercise, Diet, Sleep …
AAL Technologies

- Safety Technologies
  - Fall detection
  - Mobility aids
  - Stove use detectors
  - Smoke and temperature alarms
  - Door locks
  - Wander management tools

- Health / Wellness Technologies
  - Health coaching, disease management
  - Telemedicine, home monitoring
  - Medication management
  - Cognition

www.cast.org
Technology Challenges in Monitoring Health Behaviors

- Hardware Devices
- Software Algorithms for Inference
- Social Issues
Monitoring Devices in the Home
Technology Challenges
- Devices

- Need to integrate into routinely used devices (cell phone, watch, Web portals)
- Size of devices and battery life
- Low cost sensors
Software Challenges

Fusion

Activity

Inference
Technology Challenges - Software

- Noisy data – fusion from multiple sensors
- Inference of behaviors
- Tailoring information to individuals
  - Detect trends
  - Deviation from typical individual behavior
  - Embed sophisticated clinical protocols
  - Automated tailored messaging
- User models
- False alarms
Current Safety Monitoring System

1. Motion sensors track activities of daily living (ADLS).
2. Base station calls QuietCare Secure Server every 2 hours.
3. ADLs analyzed for deviations from normal behavior.
4. Alerts automatically generated and sent to caregivers.
Technology Challenges - Software

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Technology Challenges

- Social Issues

- Privacy
- Improving social connectedness
- Workflow for clinicians
- User centered design for older adults
Home Safety Technologies

- Example – Current Emergency Response Systems
  - Examples: Medical Guardian, Brickhouse Alert

- Example – Research Systems
  - Fall Detection
    - Cameras
    - Accelerometers
    - Pressure sensitive mats
Home Health Technologies – Intelligent Medication Reminding

- Example – Currently Available System

- Research Areas
  - Intelligent Context-Aware Reminding
    - Location of user & dispenser
    - Activity of user
    - Importance of drug
Home Health Robots

Nursebot Project from Carnegie Mellon University & University of Michigan

Pearl's configurable head, her eyes and lips are all important elements in projecting a "persona."
Home-Based Cognitive Training

For **auditory** processing and memory

For **visual** processing and memory

See www.positscience.com
Example Cognitive Research System
Socialization

Presence Lamp

Feedback on Social Interactions

Video-conferencing as part of Health Coaching System
Behavioral Health Interventions

Health Coaching

- Weekly action plan for health behavior goals
  - Physical Exercise
  - Cognitive Exercise
  - Nutrition / Weight Management
  - Medication Management
  - Stress – Mood Management
  - Socialization
- Monitoring – Tailored Feedback
Research Trends in Technology Development for Aging in the US

- Ubiquitous computing devices
- Low cost sensors
- Facilitated by lower cost personnel
- Intelligent algorithms for inference
  - Trends – early detection
  - Context for intelligent alerting
  - User models for tailoring
US Government Initiatives

- Funding translational research
- Stimulus recovery funding
- New Health Care Reform
US Government Initiatives

- Funding translational research
- Stimulus recovery funding
- New Health Care Reform

However – Grass Roots Initiatives for Home Technology for Aging
  - Alzheimer’s Association
  - Intel Corporation
  - CAST
Opportunities for EU-US
Future Research Collaborations

- Standards and Interoperability
- Coordinate Study Designs
- Share Research Platforms
  - Common Devices
  - Common Data Transfer / Data Bases
  - Common Algorithms
- Share Lessons Learned
Questions?

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