Usable Security for Persons with Alzheimer's Disease

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Research Goal

- To develop a calendar/reminder system that can be used throughout the phases of cognitive decline

- Adapt the information to a useful granularity and a usable form

- Securely store the personal information, yet allow it to be accessible for users with reduced cognitive abilities
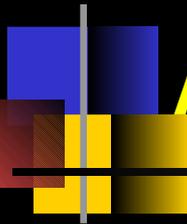
Alzheimer's Disease

- Most common cause of dementia

- Progressive decline in cognitive abilities (memory, functional abilities, language)

  - Normal aging ➡ Mild Cognitive Impairment ➡ Dementia (Mild ➡ Moderate ➡ Severe)

- Abilities can fluctuate
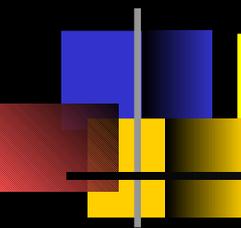
Prior Requirements Gathering

- Semi-structured interviews (in situ)
  - Person with Alzheimer's Disease (PwAD)
    - What info they would like to know
    - How they would like to find out
    - Interaction abilities
  - Caregiver
    - Repetitive questioning behaviour
    - Current strategies
    - Information needs of PwAD
    - Interaction abilities of both
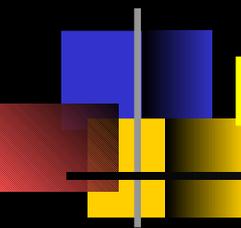
Participant Perspective

- Caregiver
  - All reported RQB being a daily problem
- Person with Alzheimer's
  - thought they had no problem remembering information (2)
  - thought memory problems were normal for age (1)
  - knew he needed help, but had always relied on his wife/secretary (1)
  - were aware of limitations and able to discuss in detail (3)
  - All were able to converse
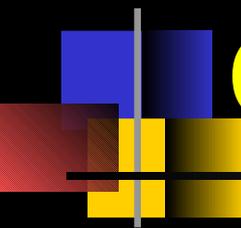
Coping Mechanisms

CG discussing PwAD who had inaccurately portrayed her independence, abilities, and living arrangements

"those are her realities... it's a very fluid reality..." "she's tricking the doctors too when she says that.. She has some standard answers and she has things that she says when she doesn't know the answers... she's really... she's lying..."
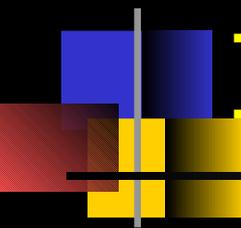
Information access

- Reminders vs. available info
  - Reminders viewed as limiting independence
  - But helpful if PwAD forgets to ask
  - Reminders needed for those still with some autonomy
    - *"She may or may not [take the pills]... the note is there and the question is whether the note is read at the right time.. She might read it, have her breakfast and then... [forget the message]"*
  - Combination felt to be appropriate
- Information generally for peace of mind
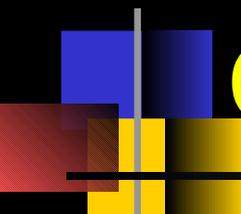
Changing Information Needs

- PwAD
  - *"Like if they say you've got an appointment to see Joe Blow today, that's meaningless to me, because now I've got to find out who's Joe Blow and where I've got to meet him and when and how I'm going to get there. There's all those things. But if I've got the information that says you've got to meet Tom Smith at 1:00 downtown by the post office, you know that kind of stuff... that's the information I'd like to know."*
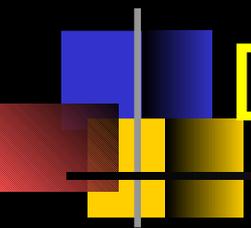
Device Requirements

- Must be authoritative information source or PwAD won't use
- Should be mobile
  - Small screen/input issues
- Afford multimodal interactions
  - Speech may be a key
- Should maintain a presence
  - Initiation of activities can be an issue
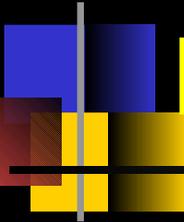
Feasibility: Tech. Introduction

- Mechanical skills/fears
  - Few have any device interactions, often because of previous bad experiences
  - Needs to recover gracefully

- Willingness of caregivers to maintain
  - Must reduce questioning behaviour enough to justify burden of maintaining
  - Idea: leverage earlier data capture
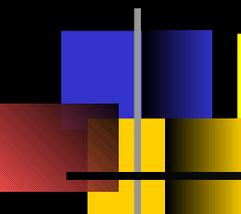
Research Plans

- Include elderly with normal cognitive functioning and Mild Cognitive Impairment
  - What types of information do they need?
  - How do they currently find and record it?
  - What is their willingness to use assistive technology

- Determine if a more general solution can adapt to changing requirements as the memory and cognitive abilities of the elderly decline
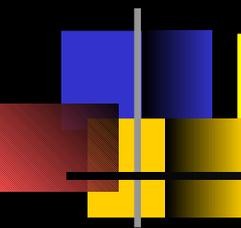
Privacy & Security Concerns

- Such an system will contain a great deal of sensitive information
    - Sensecam
- Mobile devices can be easily misplaced
- How to secure the information in case the device is lost or stolen?
    - How to authenticate with the cognitively impaired
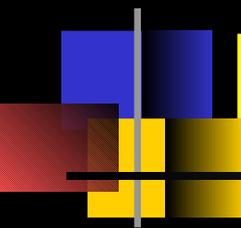
Privacy & Security Concerns

- Speech/audio interaction will likely play a strong role as cognitive abilities decline
- How to safeguard information from eavesdropping
  - Large text (on small device!)
  - Audio I/O
- Less of an issue in later phases as independence becomes more limited
  - Could be problematic when transitioning from MCI to AD
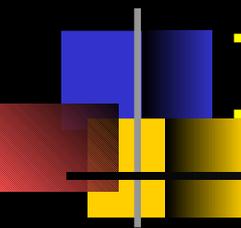
Initial Thoughts

- Biometrics could be problematic
- Need seamless authentication with task
- Can use of a personal vocabulary not only help interaction abilities, but also provide some defense?
- Can we use proximity as a way to safeguard from theft/loss?
  - RFID identity/medical tag?
  - Password agent then goes into action and takes care of the tricky bits

Comments?

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