

New Technologies to Support Independence

Enhancing Autonomy & Quality of Life

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**Presenter*

EPSRC/BBSRC SPARC Workshop

University of Strathclyde

Glasgow

16th March 2005

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Older People

Increasing focus on the challenges facing older people

- ❖ Demographic changes – the ageing population
- ❖ A major issue facing developed societies
- ❖ Cost of care
- ❖ Quality of Life for older people and their carers
- ❖ Extending the independence of older people
- ❖ Extending the phases of independence

Support from Technology ?

Independence

- ❖ enhance / extend independent living & mobility

Information Services

- ❖ e.g. maps, bus / train timetables, shopping, weather, news
 - ❖ possibly very detailed and highly localised information

Inter-personal communication

- ❖ using speech, text or multimedia

Security & Safety

- ❖ monitoring, alarms & warnings

Structure of Presentation

Research activity

- ❖ A look at a couple of research areas
 - ❖ Prompting and reminding
 - ❖ Activity monitoring & lifestyle modelling

Communications

- ❖ A brief look at mobile communications
 - ❖ underlying infrastructure for future support

Some Research Directions

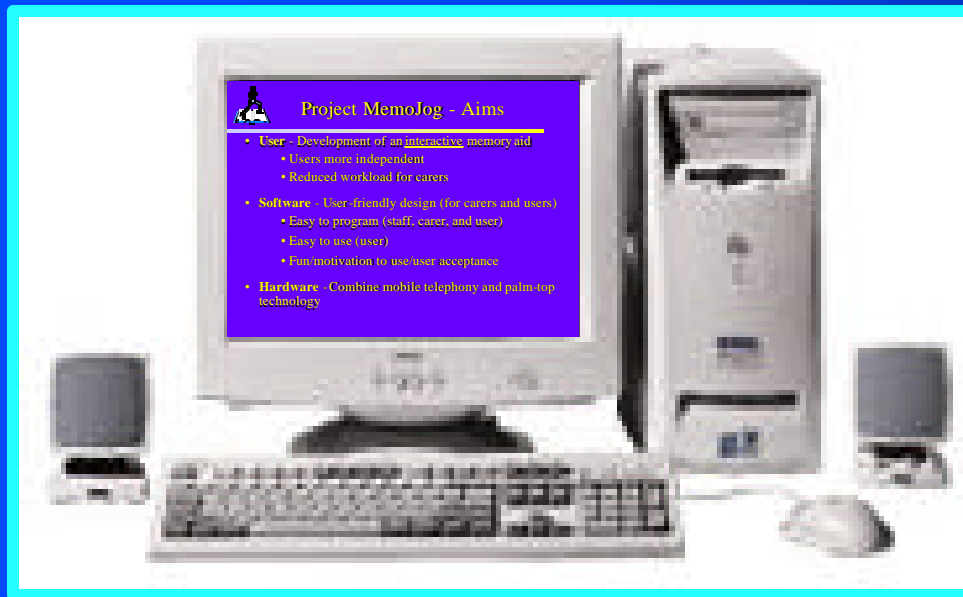
Prompting

- ❖ remind person to do things, take medication, etc.
- ❖ scheduling and planning

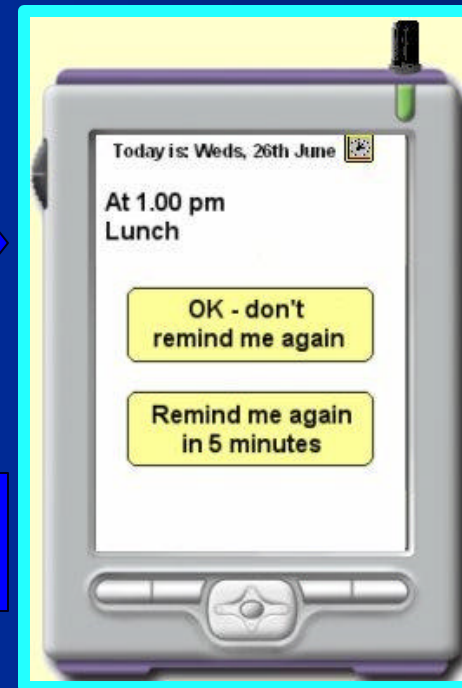
Activity Monitoring

- ❖ monitor status of disabled or older person
- ❖ auto-recognition of change, or cessation, of behaviour
- ❖ modelling of user behaviour / lifestyle

Prompting - MemoJog Memory Aid



Reminders



Confirmation

Person is given automatic reminders by mobile device (PDA), e.g. to take medication.

If person does not confirm that they have done it, a message goes to server to alert carers.

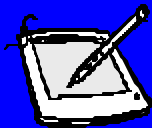
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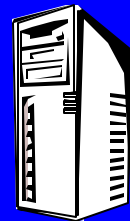
MemoJog System

PDA with mobile technology (user)

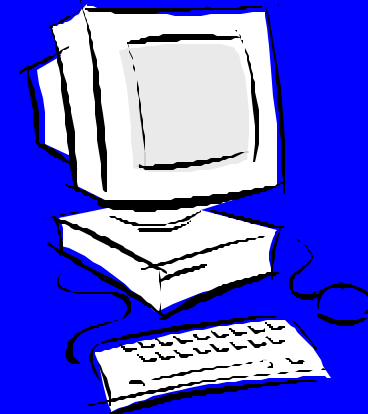


Wireless data transmission

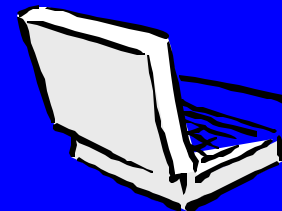
Server



PC with access to database on Internet server (administrative staff)



PC with access to database on Internet server (carer, relative)



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Activity Monitoring - Lifestyle Modeling

Aim

- ❖ Promoting well-being of older people
- ❖ Improving Quality of Life
- ❖ Enhancing and extending independence

Research

- ❖ Monitor and interpret personal activity
- ❖ Build model of behaviour
 - ❖ individual and generic models could be possible
- ❖ Detect change in activity ?

Lifestyle Modeling

Investigate

- ❖ how changes in behaviour over time might indicate shift in quality of life or well-being

Potential use for

- ❖ alerting care providers
- ❖ facilitating early intervention
- ❖ helping plan enhancement to provision

*Research consortia: EPSRC EQUAL “Supporting Independence”;
DTI “Domain Specific Modeling (DSM)”.*

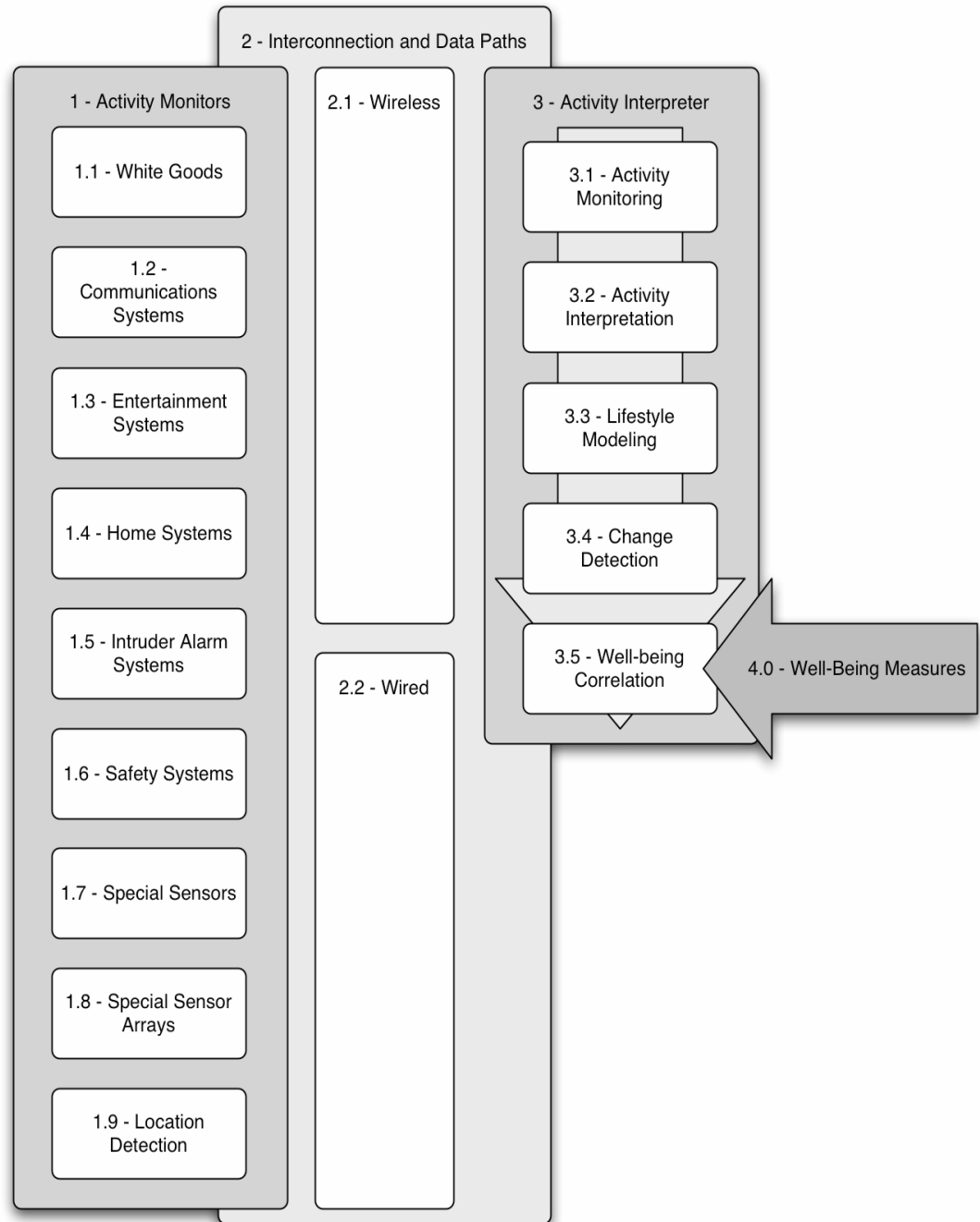
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Observing Lifestyle

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Techno-
logy

Deploy-
ment

Principle

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Modem



Preferred
Carers

Low Risk Client

Single sensor detecting person specific activity.

Activity logged by nominated carers' systems.

Activity compared to expected profile

Deviation from expected activity triggers a message that is passed to preferred carer.



Home Lifestyle
Monitoring Computer



Network
Router



Service Centre

At Risk Client

Generic sensor array detects activity in the home.

Activity logged by lifestyle monitoring computer.

Lifestyle model built up over time

Deviation from expected activity is detected by the system and this information is passed to preferred carer.



Home Lifestyle
Monitoring Computer



Network
Router



Service Centre

Client with Specified Risk

Generic sensor array supplemented with additional sensors specific to the identified risk.

Activity logged by lifestyle monitoring computer.

Lifestyle model built up over time

Deviation from expected activity is detected by the system and this information is passed to preferred carer.

Instrumentation of Domestic Space

Instrumentation of dwelling with unobtrusive sensors

- ❖ PIRs, door switches, beam-breakers, pressure mats, RFID tags
- ❖ Visualisation tools to assist researchers to see and monitor activity within the house
 - ❖ overview of status and trends in activity

Analysis & Recognition

Investigation of pattern detection algorithms

- ❖ clusters of patterns associated with particular movements at points in house (e.g. front door).

Initial application of decision tree algorithms

- ❖ e.g. to highlight regular activities at certain times of day or week.

Other analytical approaches

- ❖ e.g. identifying and aggregating house-leaving events within different time periods (hours, days, months).

Ethical Issues

Personal Monitoring

- ❖ significant ethical issues involved
- ❖ monitor to detect change, not observe activity

Privacy

- ❖ how to give people as much privacy as possible ?
- ❖ how to give people confidence in that privacy ?

Locus of Control

- ❖ who is in control - person, system or others ?

Communications

Communication infrastructure required

- ❖ for activity monitoring
- ❖ wired sensors for static situations
- ❖ wireless LAN and cellular for mobility
- ❖ ubiquitous and pervasive
- ❖ location-sensing for outside home
- ❖ context-sensitive

Reliability

Security and safety of user is essential

- ❖ Independent living requires reliable support systems

Reliable mobile communications needed

- ❖ We do not want gaps in service, signal failures, problems with “urban canyons”.
- ❖ Will reliability of future services be adequate ?
- ❖ Strategies to cope with communications failure ?

2G Mobile Devices

- ❖ Voice conversation & text messaging
- ❖ Cameras and photo-messaging
- ❖ GSM digital technology & cellular infrastructure
- ❖ GPRS for data transmission (2.5G)
- ❖ Location sensing typically to nearest cell
 - ❖ cell width can be several kilometres
 - ❖ so the location may not be very precise
- ❖ Add GPS satellite positioning for more precision
 - ❖ deliver services and information (e.g. maps)
based on known location of user / device

Third Generation – 3G

Videophone

- ❖ in search of good applications ?

Location sensing

- ❖ intended to be accurate to within a few metres
 - ❖ so possible to know exactly where device (user) is
 - ❖ track someone as they move around
 - ❖ send information to them relevant to their exact location
 - ❖ give older people more freedom to roam ?
 - ❖ give carers more confidence to allow roaming ?

Fourth Generation – 4G

Development said to be well-advanced

- ❖ Bit rates > 100 Mbits/second in laboratory
- ❖ Said that the cells will be small (e.g. 100 metres wide)
 - ❖ Will we need base stations in every lamp-post ?
- ❖ Internet enabled, e.g. Internet Protocol version 6 (IPv6).

Much higher frequencies involved

- ❖ Experimental spectrum use has been in regions such as 40 & 60 GHz.

Wearable Computing

Clothes with sensors and computing nodes woven into the fabric

- ❖ Applications have been suggested for patient monitoring, tele-rehabilitation, etc.
- ❖ Have mobile device sewn into garment (e.g. shirt)
 - ❖ Less invasive, less stigmatising
 - ❖ Wearer less likely to take it off, lose it or throw it away
- ❖ Could be good for walkers & others roaming

Round Up

- ❖ Monitoring and Prompting
- ❖ Modelling of user behaviour / lifestyle
- ❖ Location Sensing
- ❖ Security and Safety
- ❖ Reliability of communications infrastructure
- ❖ Advances in mobile communications
- ❖ Ethical Issues

Acknowledgements

Many thanks to

- ❖ *Members of the Telecommunications Research Group (TRG) at Dundee, past and present*

- ❖ *Colleagues throughout our centre, especially*
 - ❖ *the Memojog Team*

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for information systems to support older people
and people with disabilities



Some QMRC Projects

- Reminiscence and conversational support
- Fall and gesture recognition
- Memory Aids
- Design methodologies
- Lifestyle modelling
- Accessibility