

AAL Research. Creating the future technologies in Ireland – challenges and realities

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CLARITY: Centre for Sensor Web Technologies

The CLARITY centre

- **CLARITY: Centre for Sensor Web Technologies (2008 – 2013)**
 - UCD DCU and Tyndall
 - National, multi-site CSET
 - Irish funding sources: EPA, MI, IDA, EI & SFI
 - 8x Prof./PI + 17x lecturers
 - 33x senior researchers + 49x PhD students
 - 8x support staff + 8x admin
- **Focus on 4 demonstrators:**
 - Personal Health and Sports
 - Energy and the Environment
 - Real Time Web
 - Ambient Assisted Living



CLARITY Centre & Ecosystem

Social/Agency Collaborators



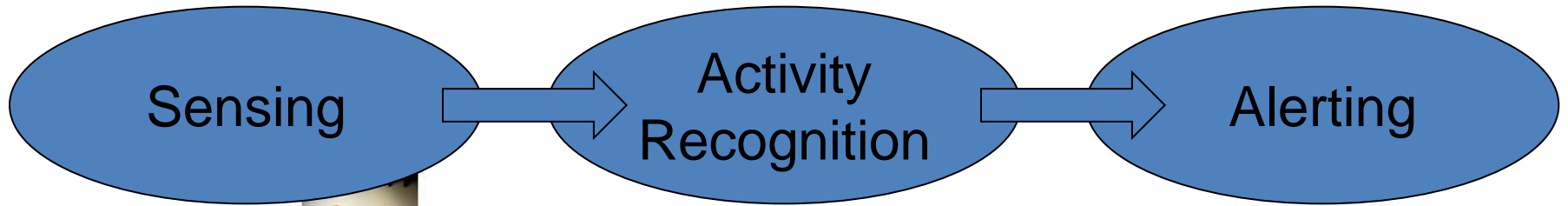
Industry Collaborators



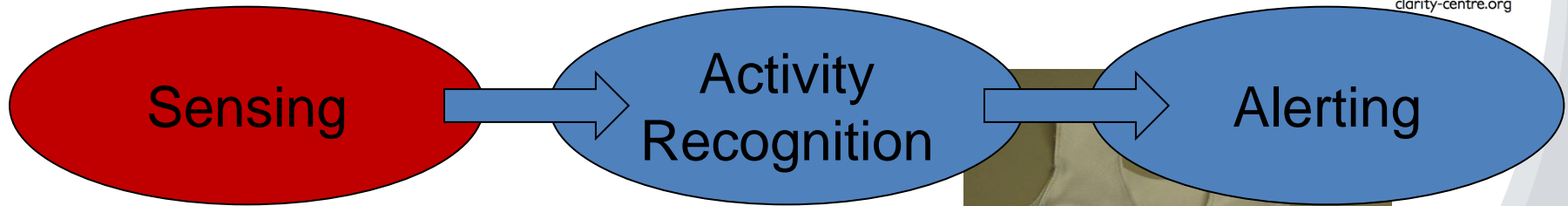
CSET Core



CLARITY AAL Demo

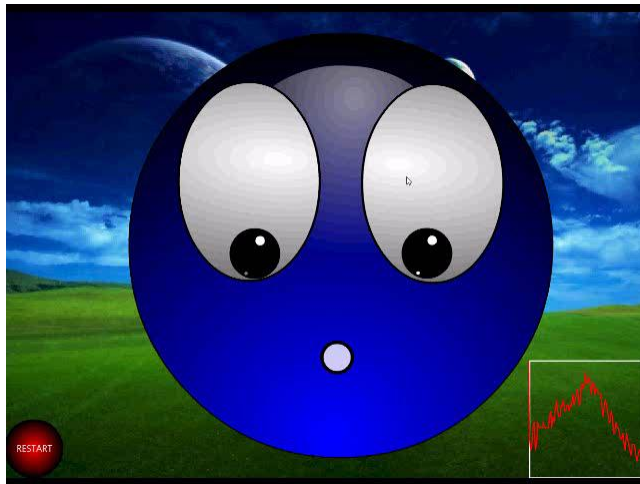
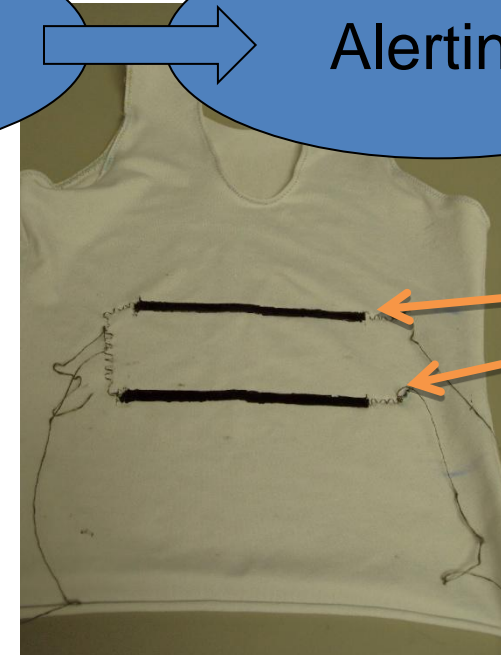


Fabric stretch/bend sensors

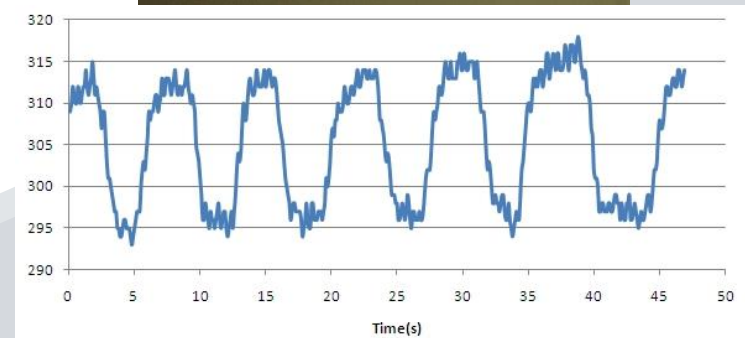


Fabric sensors respond to stretching

e.g. fabric stretches due to ribcage expansion or due to joint movement

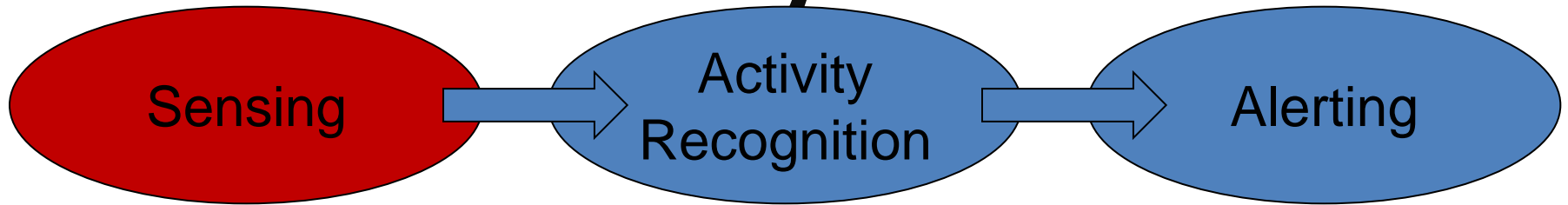


Breathing feedback application for children with respiratory illness

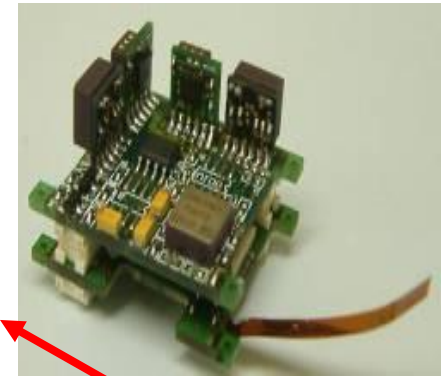


Monitor breathing

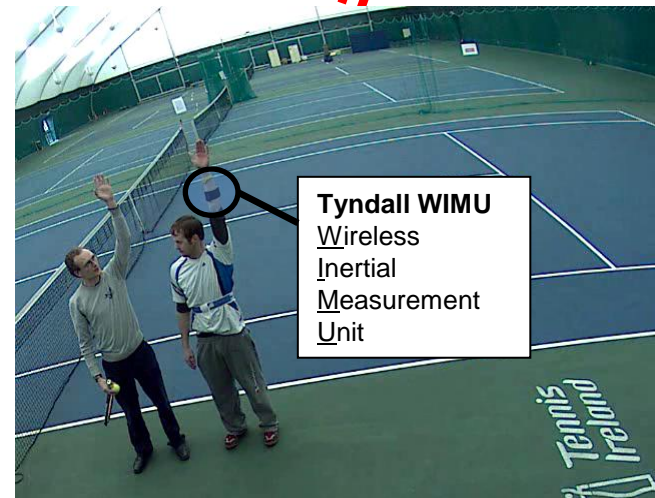
Movement Analysis



- **6 DOF Wireless Inertial Measurement Units (WIMUs)**
- **Features:**
 - 3-axis Accelerometers
 - 3-axis Gyroscopes
 - 3-axis magnetometers
 - ADC: analog-digital converter
 - Microprocessor
 - Serial Wireless Link

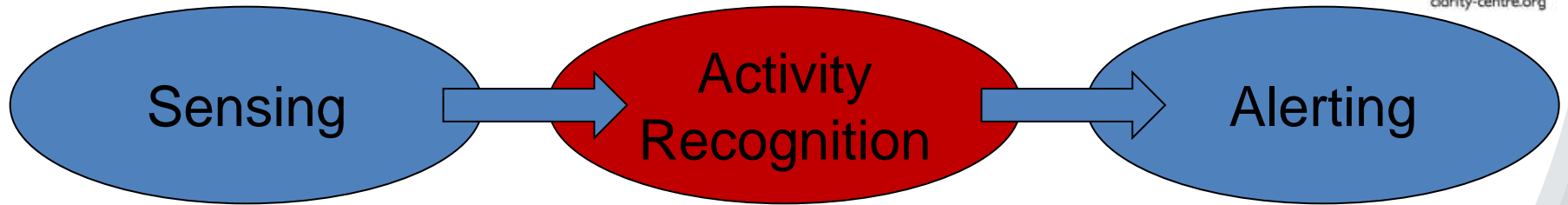


25mm

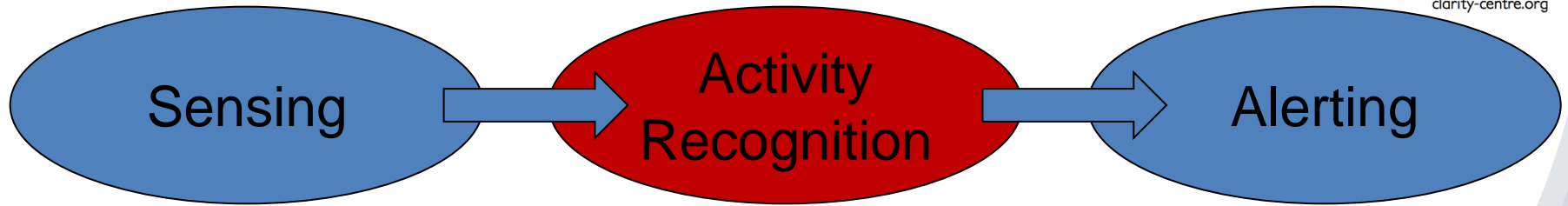


Tyndall WIMU
Wireless
Inertial
Measurement
Unit

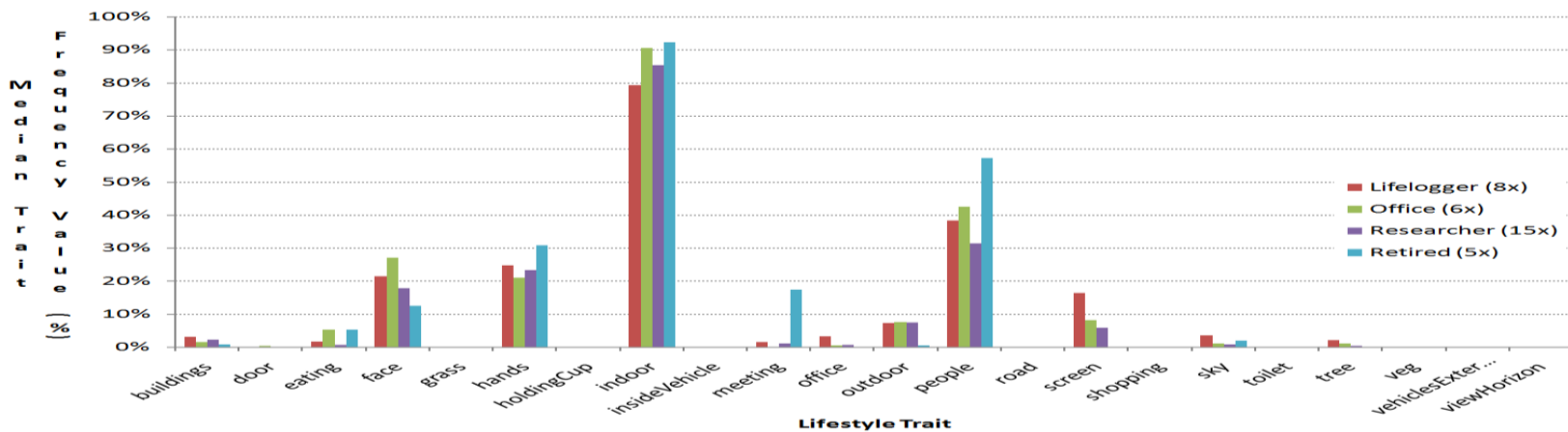
3D Human Motion Reconstruction



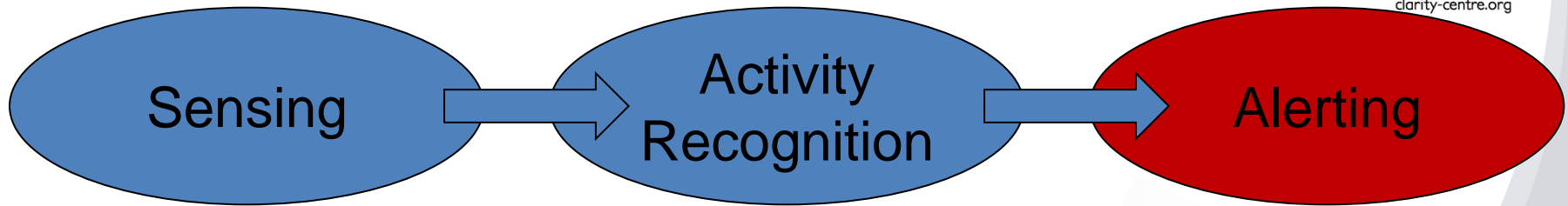
“Lifelog” Images – what we see...



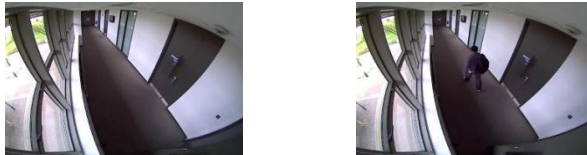
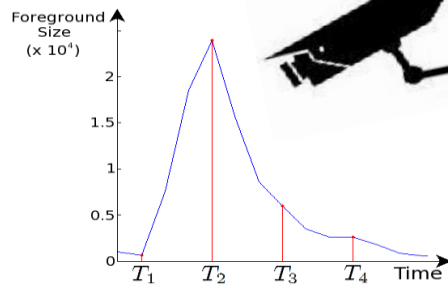
- 22 “activities”
- Validated on 33 people
- 1+ million minutes of daily life



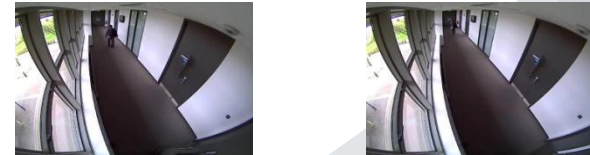
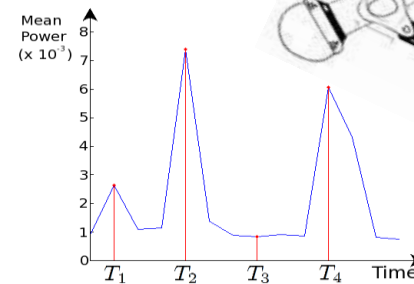
CCTV Unusual Event Detection



Video

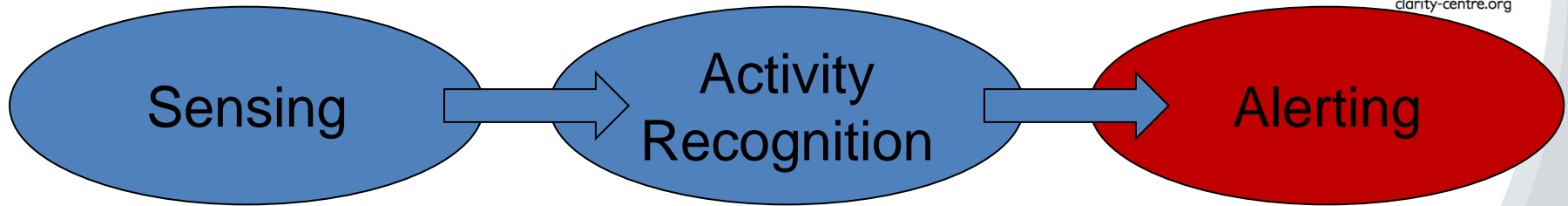


Audio



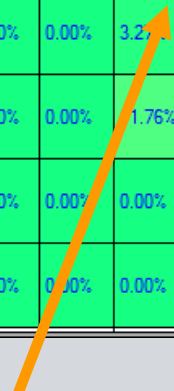
Scenario	duration	AU	VI	FU	AND	OR
Two people fighting	15sec	✓	✓	✓	✓	✓
Phone ringing	13sec	✓	✗	✓	✗	✓
Someone putting a poster on the wall	4min 15sec	✓	✓	✓	✓	✓
Shouting and fighting	15sec	✓	✓	✓	✓	✓
Climbing on the window sill and jumping off	10sec	✓	✓	✓	✓	✓
Running to the lab	30sec	✓	✗	✓	✗	✓
Tearing the poster from the wall	40sec	✓	✓	✓	✓	✓
Bullying/intimidation	1min 05sec	✓	✓	✓	✓	✓
Waving to the camera	15sec	✓	✓	✓	✓	✓
Screaming	2sec	✓	✓	✓	✓	✓

Passive Electricity Sensing



- 3,391,443 sensor readings reduced to 520 showers
- Average duration = 8 minutes (min = 3 min, max = 27 min)
- 8am Tuesday morning is peak time

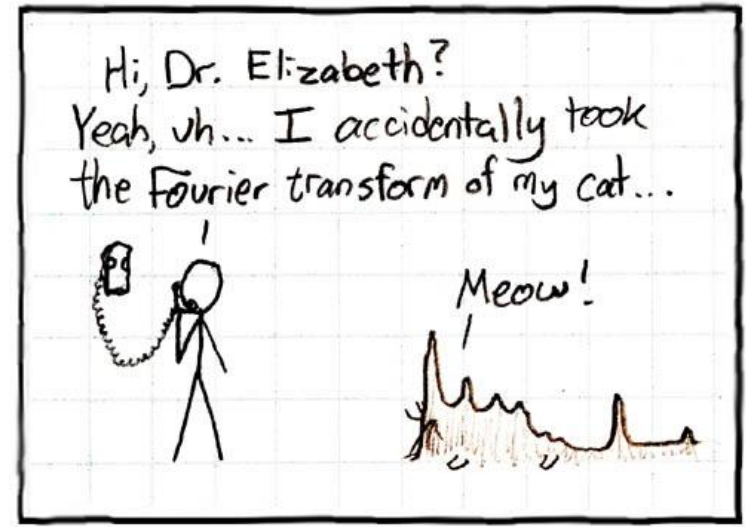
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Mon	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	9.15%	26.14%	53.59%	49.02%	75.16%	66.67%	54.90%	33.99%	25.49%	0.00%	10.46%	1.96%	4.58%	7.19%	11.76%	0.00%	0.00%	2.61%
Tue	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.19%	50.33%	100.00%	64.71%	37.91%	57.52%	0.00%	37.25%	5.88%	6.54%	6.54%	1.96%	5.88%	0.00%	0.00%	3.27%	11.11%	0.00%
Wed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	9.15%	61.44%	79.08%	52.29%	49.67%	38.56%	31.37%	18.30%	6.54%	11.76%	2.61%	9.15%	11.11%	7.19%	0.00%	0.00%	3.92%	0.00%
Thu	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.27%	77.12%	60.78%	96.73%	56.21%	58.17%	19.61%	33.33%	22.22%	9.15%	14.38%	0.00%	0.00%	13.07%	7.19%	8.50%	3.27%	0.00%
Fri	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.76%	46.41%	64.05%	64.05%	13.07%	30.72%	16.34%	31.37%	19.61%	3.27%	33.99%	25.49%	0.00%	0.00%	8.50%	1.96%	0.00%	0.00%
Sat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	13.73%	29.41%	33.33%	13.07%	33.99%	85.62%	79.08%	50.33%	29.41%	33.33%	14.38%	5.88%	5.88%	4.58%	0.00%	7.19%	3.27%
Sun	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	18.30%	18.95%	13.73%	43.14%	32.03%	50.33%	25.49%	30.07%	18.30%	28.76%	24.18%	4.58%	0.00%	7.84%	7.84%	4.58%	0.00%



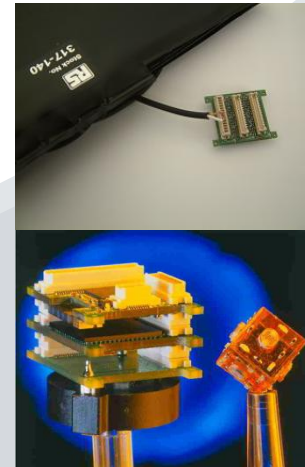
Morning Shower

Reflection...

1. Sound Fundamentals



2. Unobtrusive Sensors ... intuitive interaction

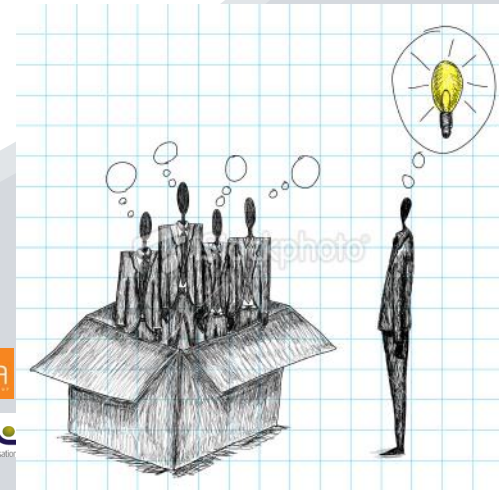


Reflection...

3. Learn from real-world users



4. Embrace ideas from others



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www.clarity-centre.org

*CLARITY has lots of expertise
Always seeking collaboration*

