

Three Years of SenseCam Images: Observations on Cued Recall

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Our Original Thoughts...

To effectively provide memory retrieval cues using SENSECAM we need to automatically:

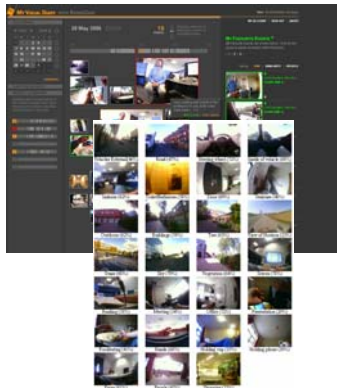
- *Group similar images into distinct “events”*
- *Suggest more “interesting/distinctive” events*
- *“Associate” related events*
- *Provide potentially additional retrieval cues from other sources*

A Remarkable Collection

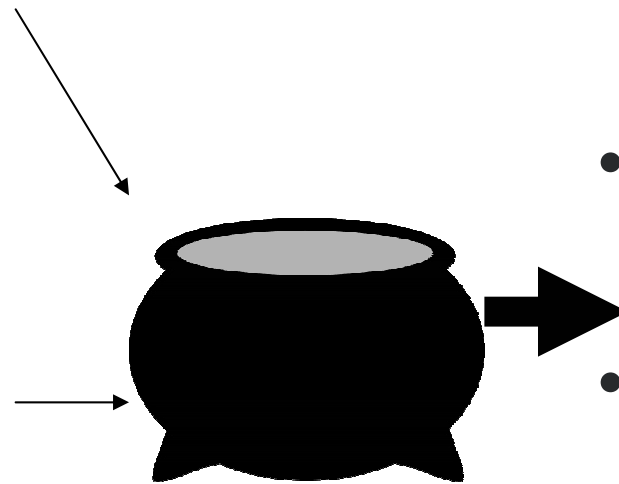
- **How does SenseCam effect “normal” people?**
–Most early “gentlemanly” research was carried out on healthy subjects, we try going back to that with SenseCam
 - **1 healthy subject -> 2.5 years of SenseCam images (May '06 – Dec '08)**
2,579,455 images (3,080/day) = 29,301 events (35/day)
 - **average duration = 14 hours 22 minutes**
- 846 days captured (90.2%), 92 days missing data (9.8%) due to missing sensor files**

IT + Memory Researchers = ???

A complete Lifelog
collection



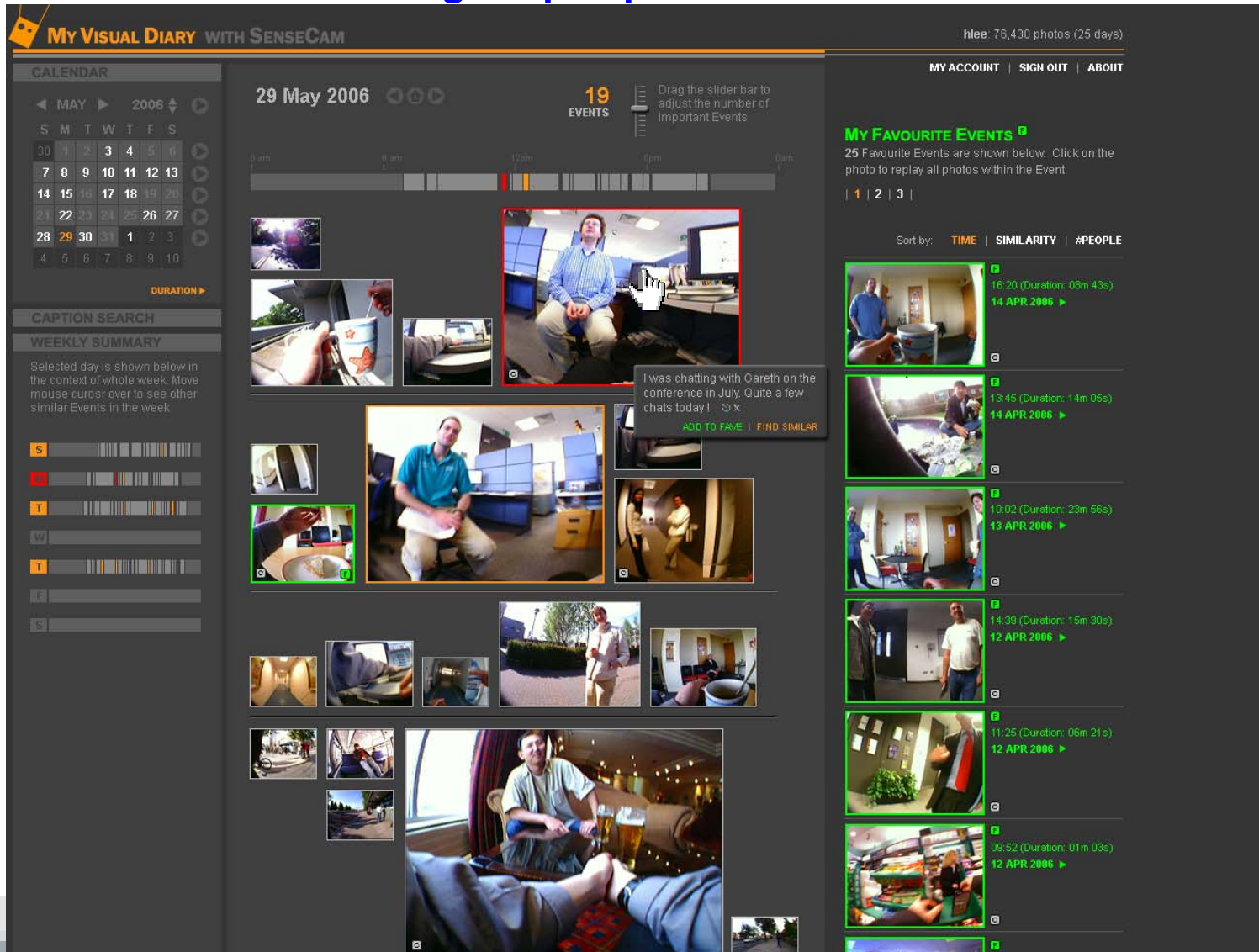
Memory Expertise



- change in memory perspective
- browser search performance
- Browser importance performance
- Influences on recollective experiences

Change in Perspective

Search effectiveness ... Change in perspective



My Visual Diary WITH SENSECAM hlee: 76,430 photos (25 days)

CALENDAR
MAY 2006
S M T W T F S
30 1 2 3 4 5 6
7 8 9 10 11 12 13
14 15 16 17 18 19 20
21 22 23 24 25 26 27
28 29 30 31 1 2 3
4 5 6 7 8 9 10

29 May 2006 **19 EVENTS**
Drag the slider bar to adjust the number of Important Events

MY FAVOURITE EVENTS
25 Favourite Events are shown below. Click on the photo to replay all photos within the Event.
1 | 2 | 3

Sort by: **TIME** | SIMILARITY | #PEOPLE

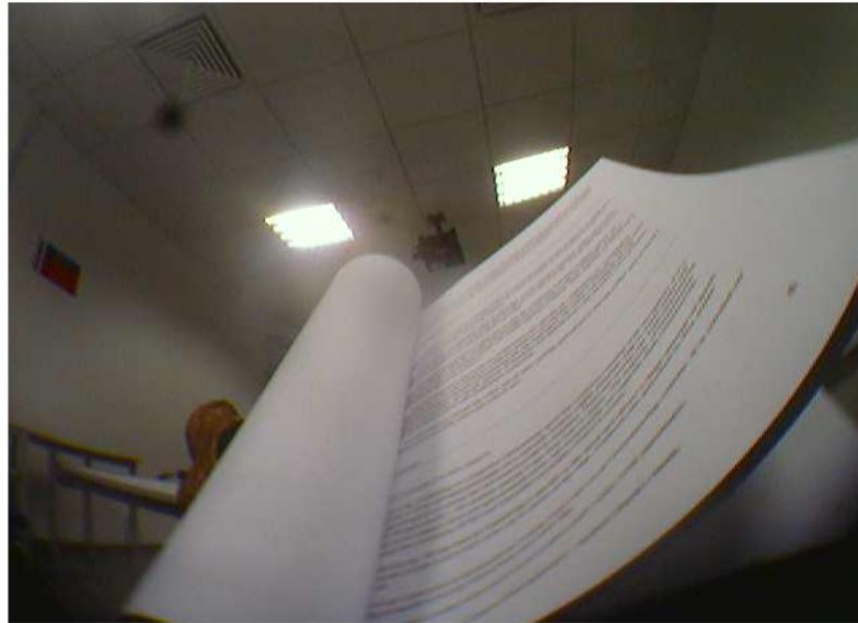
- 16:20 (Duration: 08m 43s) 14 APR 2006
- 13:45 (Duration: 14m 05s) 14 APR 2006
- 10:02 (Duration: 23m 56s) 13 APR 2006
- 14:39 (Duration: 15m 30s) 12 APR 2006
- 11:25 (Duration: 06m 21s) 12 APR 2006
- 09:52 (Duration: 01m 03s) 12 APR 2006

I was chatting with Gareth on the conference in July. Quite a few chats today!

ADD TO FAVE | FIND SIMILAR

Important Events

Note: just single 'keyframe' image shown to user!!!



Recollection			Personal Importance							Novelty						
Remember	Familiar	Don't Know	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Comment										NEXT						
Reading paper																

Recollective Experiences – Keyframe only

Note: just single 'keyframe' image shown to user!!!



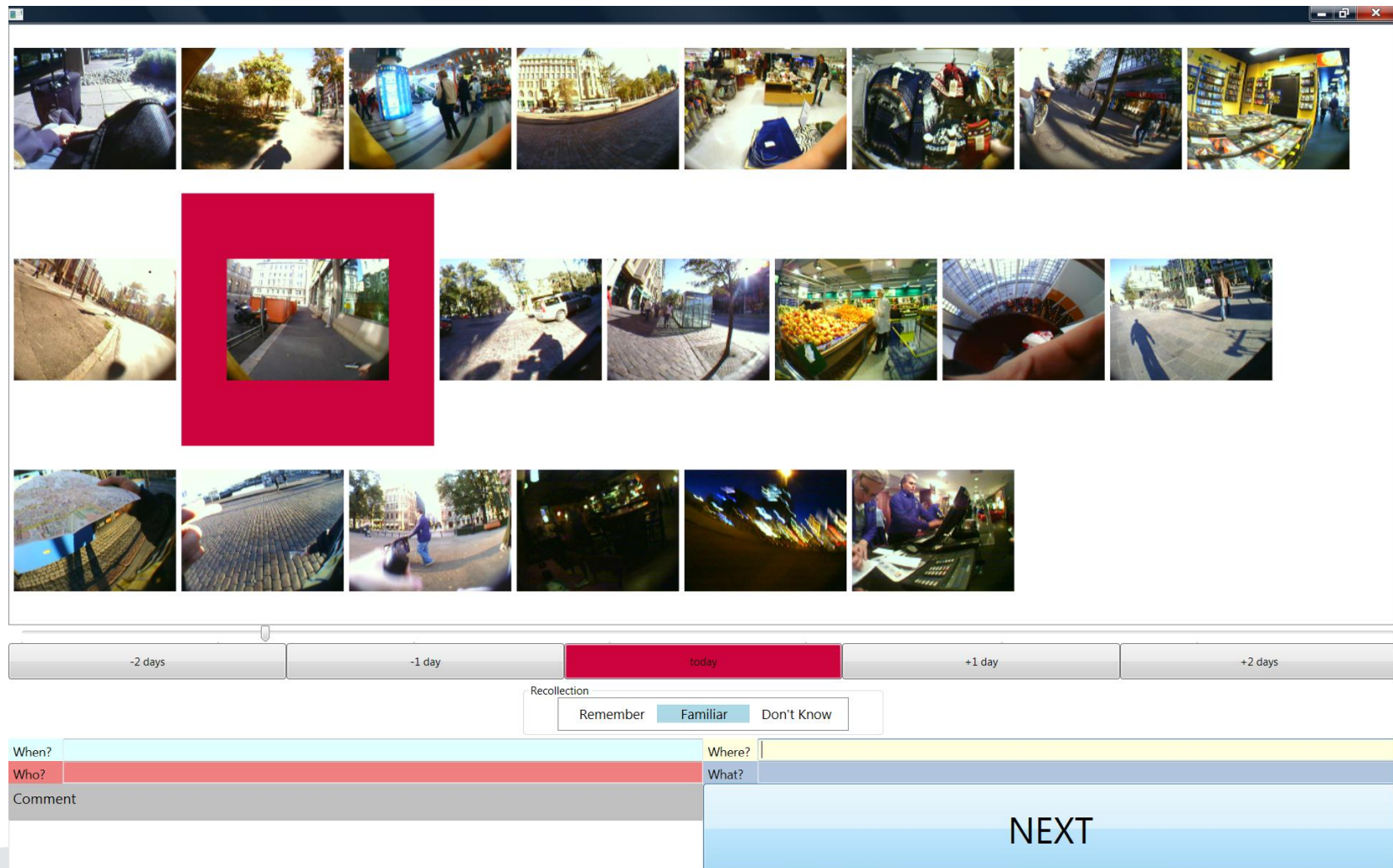
Recollection

Remember Familiar Don't Know

When?	Christmas	Where?	shopping centre, Dublin
Who?	me + friend	What?	shopping
Comment			
	NEXT		

Recollective Experiences – KF + extra

2 conditions: Surrounding KF only ... Surrounding KF + images in event



-2 days -1 day **today** +1 day +2 days

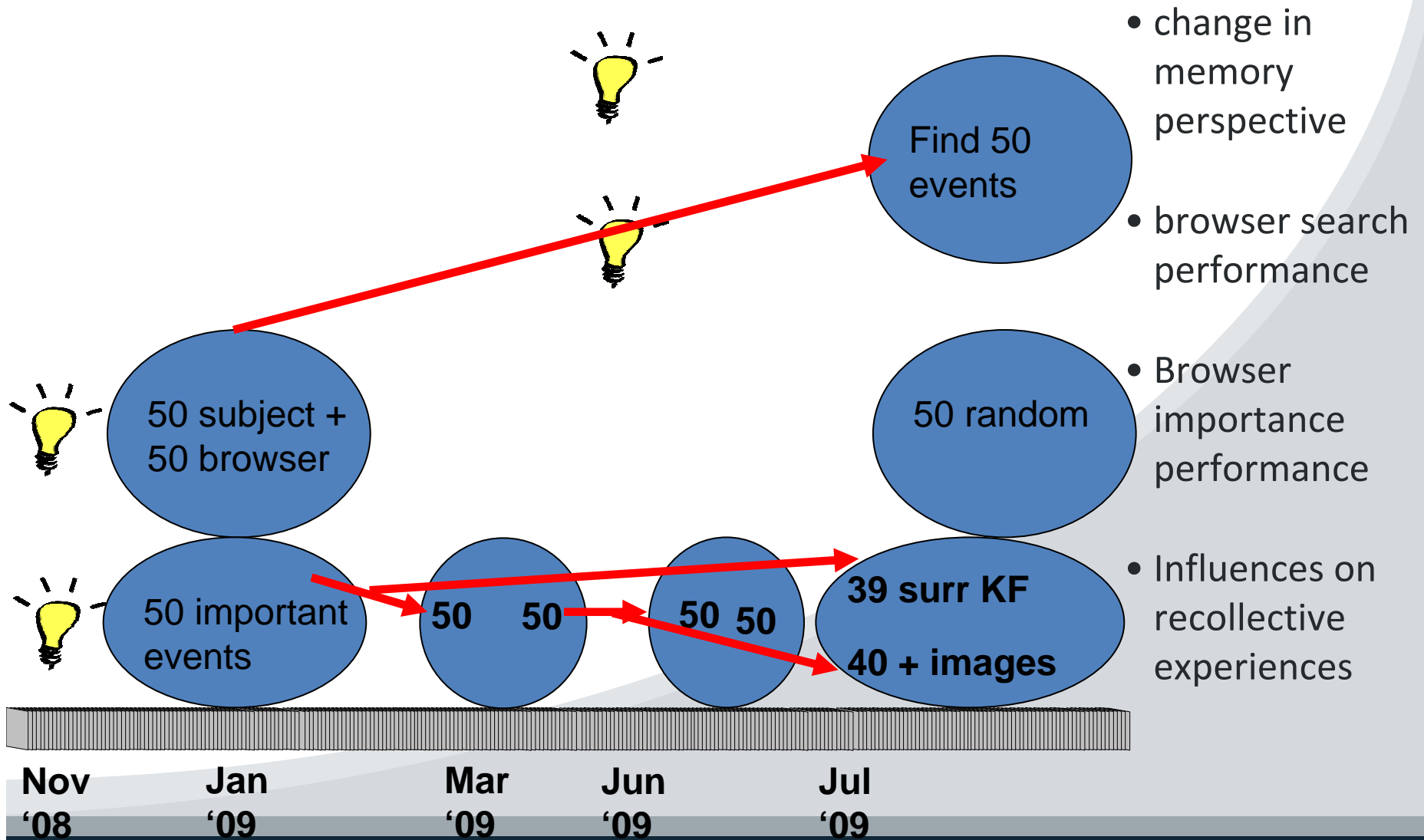
Recollection
 Remember Familiar Don't Know

When? _____
Who? _____
Where? _____
What? _____

Comment _____

NEXT

Experimental Timeline



Perspective Change + Browser Search



- A frustrating experience for the subject – no meaningful “changing of perspective” information gathered
- In 2 hours, only able to find 12/50 target events
- One interesting occurrence of the subject merging 2 separate events (2 weeks apart) into 1 single event
- Predominantly searching based on ‘the when’ axis appears to limit the user

Important Events

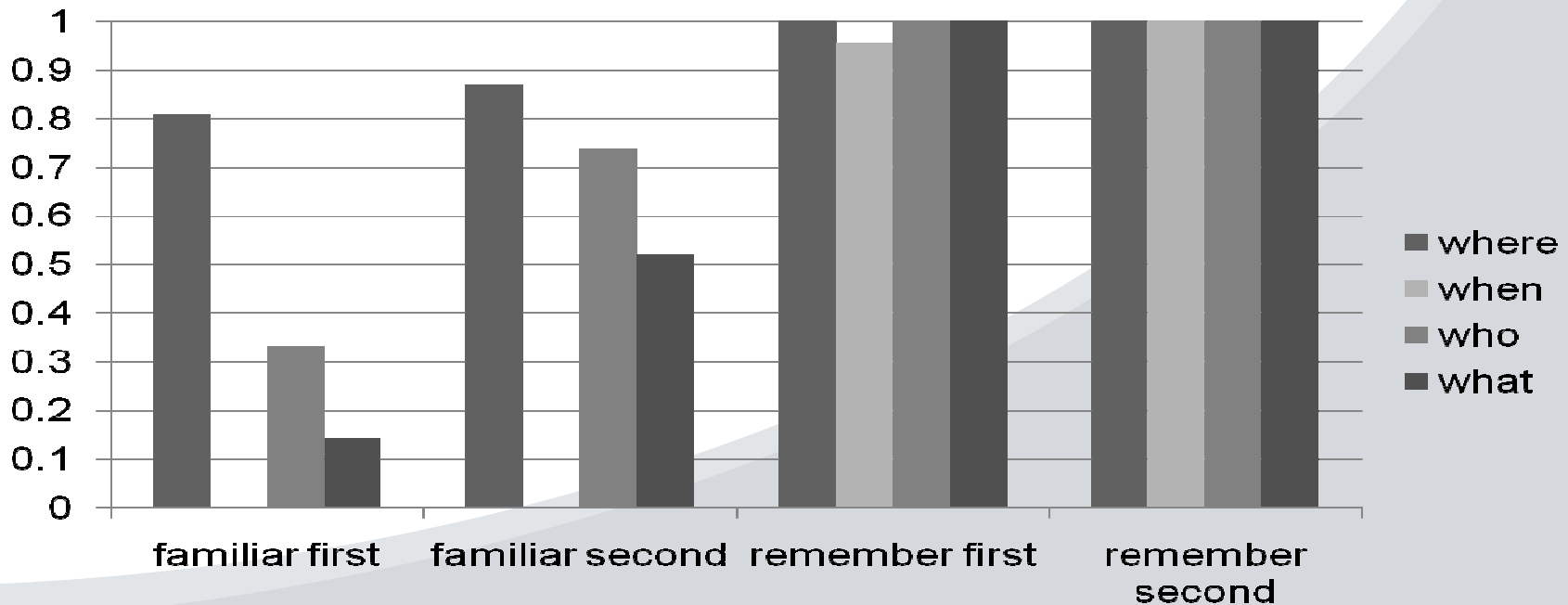
- ‘subject memories’ (50x) vs browser events (54x) vs random events (50x)
- Subject’s ratings indicate that novel events are more personally significant ($p < .001$)
 - Ties in nicely with prior memory research
- Subject memories >> Browser events >> Random events
 - For both novelty and personal significance (all, $p < .01$)
- Browser important events produce better recollection
 - 28% of browser events were ‘R’ vs. 14% of random events
 - Only 5% of browser events were ‘DK’ vs. 18% of random events

Recollective Experiences –KF Only

Original consistent judgements on 'keyframe' image only (79/100):

	R	F	DK
R	30	6	0
F	6	42	0
DK	6	3	7

Subject able to report much more information for 'R' items than 'F' items



Recollective Experiences – KF + Extra



- Working with surrounding keyframes ... 8% of 24 items boosted to 'R'
- Surrounding KF's + image detail ... 32% of 25 items boosted to 'R'
- 'F' events that still remained 'F' ... surrounding keyframes greatly improve ability to make estimates on the 'when'
- Subject could provide information on the surrounding events to an 'F' event in question
 - Even with the benefit of surrounding keyframes + ability to view event images ... the human mind can't access memories of event in question

Recap

- **Perspective** - Interesting instance where subject merged two separate events into one in memory
- **Search Performance** - 'The When' axis of retrieval can be supported via surrounding events, which helps shift some 'DK'/'F' events to 'R'
- **Importance Performance** - Browser events > Random
- **Recollective Experiences** - Many mundane events appear to decay from the memory

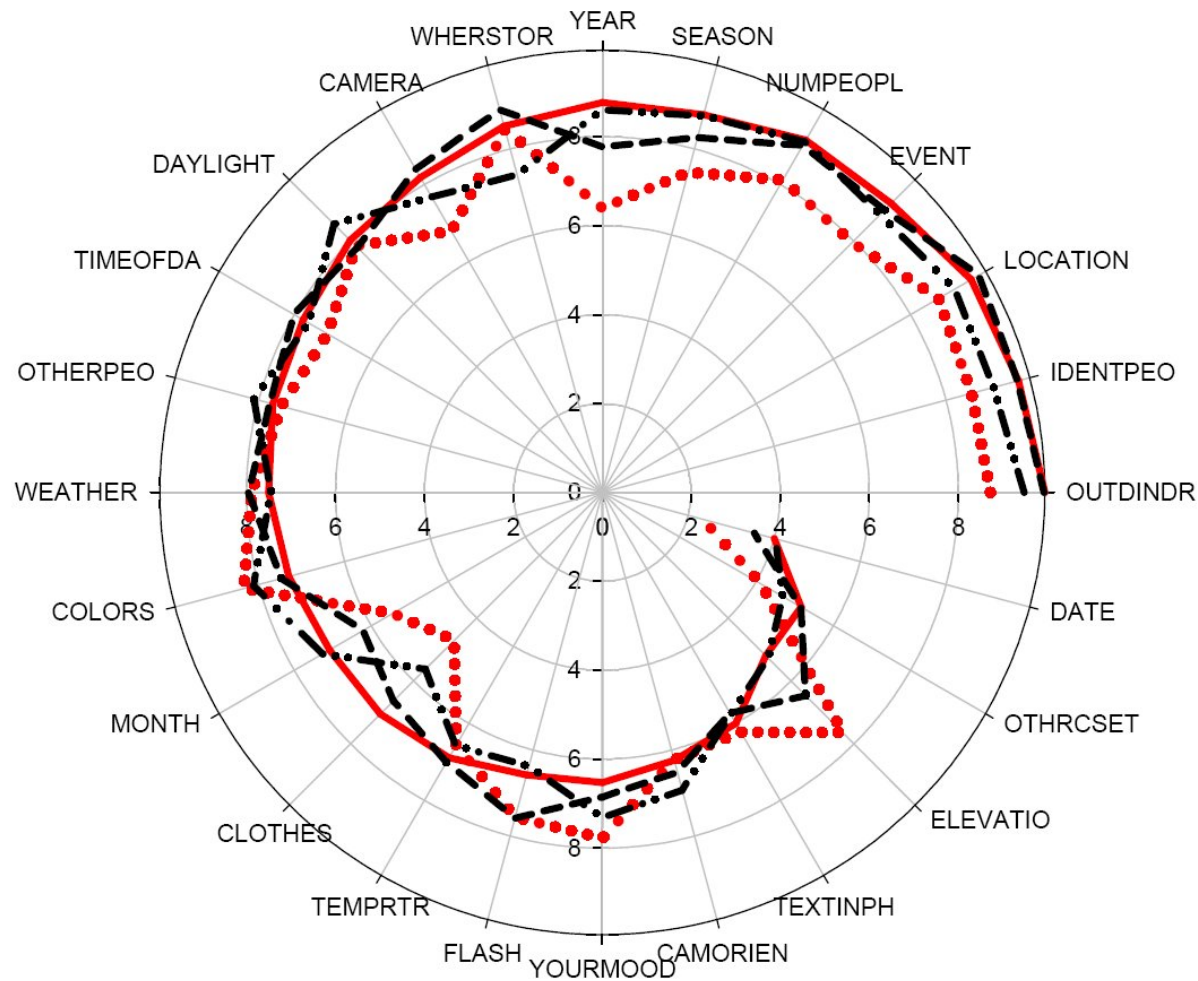
A more broad reflection

- **Some of our early guesses were good:**
 - *Storing by events* mimics the human mind
 - *Important browser events* are much better than simple random guesses
 - Displaying all *keyframe event images of each day* supports the user in accessing memories of a given event

Where next?

- Redesign browser to support **search** of events on multiple axes, rather than just ‘the when’. Then re-run “**change of perspective**” experiments
- User generated events can provide training data to improve browser choice of **important events**
- Repeat ‘R’/‘F’/‘DK’ **recollective experience** experiments all on one sitting on 150 events ... alleviates concerns of looking at similar events for a 2nd time

Support 'when' retrieval axis



“Context data in geo-referenced digital photo collections”, Naaman et. al. ‘04

Multidisciplinary Collaboration is Key



The computing science viewpoint:

- We're good at working with huge amounts of data
- We love thinking of new ways to make the data accessible
- However we need guidance on what data to make available, and on what is useful and important to memory/ health/lifestyle researchers

Multidisciplinary Collaboration is Key



- Memory research has driven computing research, which has driven hardware/device research
- New technologies + computing techniques will allow new memory/health/lifestyle research too
 - *how well do people estimate the ‘when’ of events?*
 - *how much time do people spend walking in the park?*
 - *how do people change their perspective when seeing the cold truth of data? Etc.*

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further information:

<http://www.clarity-centre.org/sensecamwiki>

<http://www.cdvp.dcu.ie/SenseCam>

<http://www.computing.dcu.ie/~adoherty>

(case sensitive)