

ADAPTIVE VISUAL SUMMARY OF LIFELOG PHOTOS



FOR PERSONAL INFORMATION MANAGEMENT

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SENSECAM: WHAT IS IT?

SenseCam is a **wearable digital camera** you hang around your neck, with various sensors:

- Light sensor
- Passive infra-red sensor
- Accelerometer (X-Y-Z axes)
- Ambient thermometer

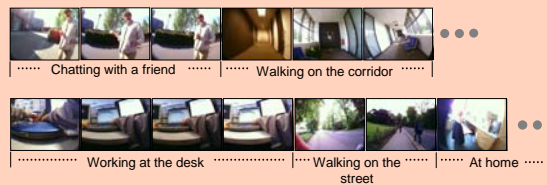


Wearing a SenseCam: its fish-eye lens maximises the field-of-view

It automatically takes photos along with storing data from the above sensors as you go about your daily business, **passively capturing** to chronicle your day into a visual archive of photos and associated sensor data.

WHAT DOES IT GENERATE?

Passive capture usually results in a large number of photos. SenseCam generates **about 3,000 photos on an average day** (640 x 480 resolution), although the exact number depends on what kind of activity the wearer did that day.



THE PROBLEM: ACCESS

It's good to have visual archive of a day... BUT the large number of photos means it's difficult to access them, for example:

- I want to quickly review what happened yesterday... How can I flip through all 3,000 photos without spending too much time?
- I want to find that particular person I met a few days ago... How can I find it from the archive of thousands of photos?

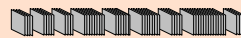


AUTOMATIC PHOTO PROCESSING

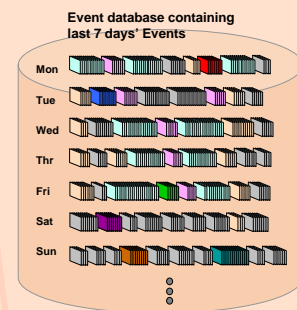
SenseCam Images of a day (about 3,000)



Event Detection

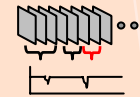


Event-Event Comparison



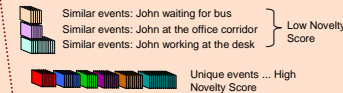
An "event" is a period of a day when something specific happened, e.g. a meeting in an office, a short chat with a colleague in the corridor, having lunch, drive a car, are all examples of an event.

By comparing neighbouring photos (adjacent and n-ary distance) in terms MPEG-7 features (colour, texture, shape, etc.) and spatiograms, **event boundaries** are detected.



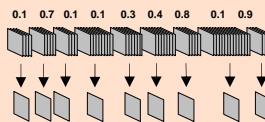
To determine the importance (or uniqueness) of each of the events of the day, we use past 1 week's event database.

By calculating the average feature vectors within each event and comparing them, **event-event similarity** among all events is established. An event that has many highly similar events are routine events that happen regularly throughout the week. Events that are not similar to any other events are the unique events that are deemed novel.



The system **adaptively re-ranks the Novelty Score** of each event within that day as the day's events come into the event database using a 7-day window.

Landmark Image Selection



The average feature vectors for each event calculated above are then compared to each of the photos within the event, and most similar photo is selected as a **landmark image**, a photo that visually represents the event.

Browser composition



Twenty events with highest Novelty Score are initially chosen for the interactive browser. Each event bears:

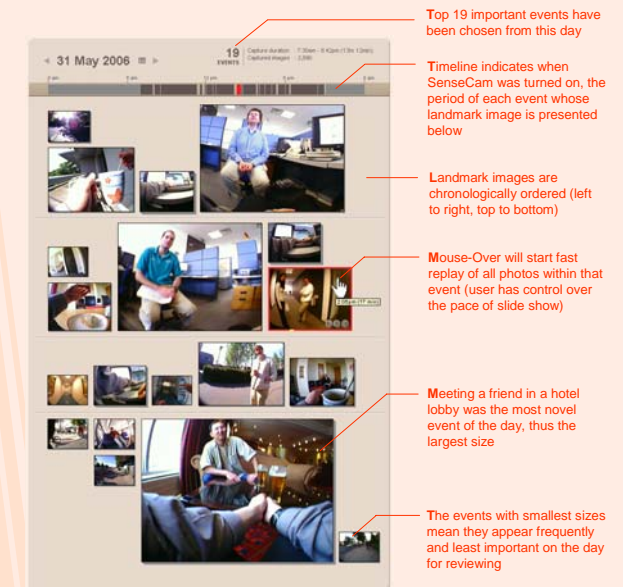
- Landmark image
- Novelty Score
- Time and duration

Each landmark image is re-sized based on the Novelty Score, and displayed in temporal order, resulting in a visual summary of the most important events of the day.

INTERACTIVE BROWSER

The Interactive Browser is an automatically composed SenseCam browser, providing an **efficient review of thousands of photos** from a given day. In composing the browser, we use schemes for the following factors:

- Number of events to be presented
- Size of each photo (# different sizes)
- Layout (where each photo is to be placed)



Top 19 important events have been chosen from this day

Timeline indicates when SenseCam was turned on, the period of each event whose landmark image is presented below

Landmark images are chronologically ordered (left to right, top to bottom)

Mouse-Over will start fast replay of all photos within that event (user has control over the pace of slide show)

Meeting a friend in a hotel lobby was the most novel event of the day, thus the largest size

The events with smallest sizes mean they appear frequently and least important on the day for reviewing

FUTURE WORK

- We are working on the scaling issue by building up the collection of photos to test our techniques on months of images
- We are testing higher-level semantic features such as **face detection** to filter out non-person events from the events with people involved.