Title
Scalable System Design for Assisted Recall: Leveraging everyday mobile phones and web services

Authors
Kim, Donnie
Peterson, Nicolai M
Kim, Joe
et al.

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Scalable System Design for Assisted Recall: Leveraging everyday mobile phones and web services

Donnie Kim, Nicolai Petersen, Joe Kim, Haleh Tabrizi, Jeff Burke, Deborah Estrin, *Lenore Arab
Center for Embedded Networked Sensing, *School of Medicine, UCLA

Assisted recall services must scale

Digital Memories

- A record if it is to be useful …must be continuously extended, it must be stored, and above all *it must be consulted*

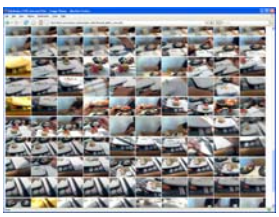
[Vannevar Bush]

Various apps need scalable assisted recall services

- *Human behavior studies* need assisted recall tools that can be administered at low cost to large populations
- *Self-reflection (or memory aid) applications* using records that are easily generated and accessed

To enable selective sharing, enhance data availability, and increase service's usability, we used *web-based* archival and retrieval.

Assisted recall services capture, archive and retrieve a large number of images



While other sensing modalities (e.g. location, audio) could also help recall, images are a key modality.

- Usability
  - –Image capture and viewing must be trouble-free
- Large number of images
  - –User should only have to view a reasonable number of images
  - –System must be capable (speed, capacity) of processing images from a large number of users

Scalable system design leveraging everyday mobile phones and web services

Pursuing an architecture that scales well

- *Everyday mobile phones* instead of specialized hardware
- *Self-viewing* (not 3rd party) to mitigate privacy issues
- *Filtering* bad images and *clustering* repeated images
- Using *web services interface* for flexible/scalable image processing

Image annotation and processing

Detecting *overexposed/underexposed* images:

- Robert's edge detection algorithm
- Standard deviation of the intensity

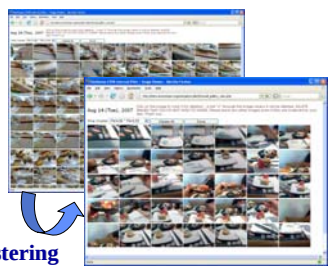
Detecting *blurred* images:

- Based on the frequency content of the images
- Harris corner detection algorithm

Clustering *similar* images

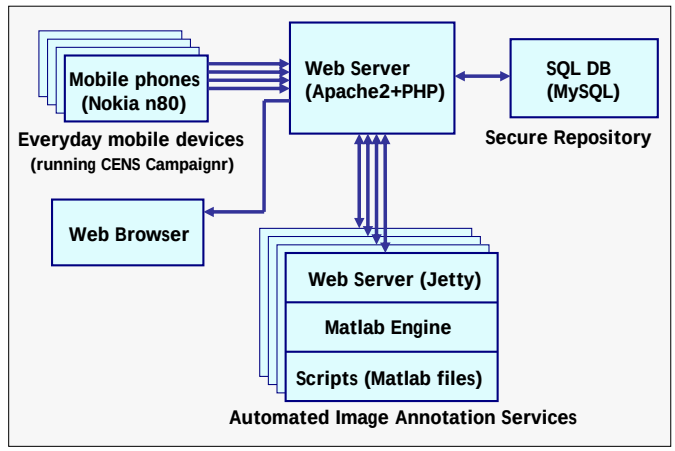
- Uniform time clustering

User Interface



Filtering/Clustering

System Architecture



Pilot Application: Assisted Diet Recall Service

The need for *more reliable dietary assessment* tools has been recognized by the NIH. *UCLA studies* have shown that image display systems increase the accuracy of dietary assessment. Our pilot introduces automated image capture for computer-assisted recall to further increase accuracy.

Energetics Pilot (running by Dr. L. Arab, Aug 6th 2007 ~ present)

Pilot Statistics

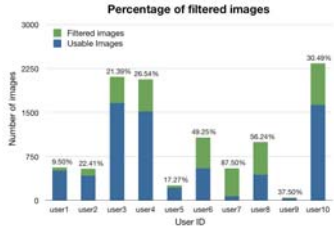
- Total users: 10
- Duration: 35 days (39 hrs)
- Total images: 11090

Eating Episodes

- Total episodes: 110
- Mean duration: 21 min
- Mean number of images: 100.81

Filtering uninformative images

- Dark images: mean intensity
- Burry images: standard deviation of intensity



Future work: Processing, Presentation

- Refinement of image processing techniques
  (e.g. Clustering: based on color using RGB histogram or based on texture using Fast Fourier Transform and low pass filter)
- Parallelization of image processing functions (e.g., Condor)
- Shifting basic image processing to device to relieve upload bottleneck
- Triggering capture rate based on context (e.g., audio, location)
- More sophisticated computer vision to identify images with food