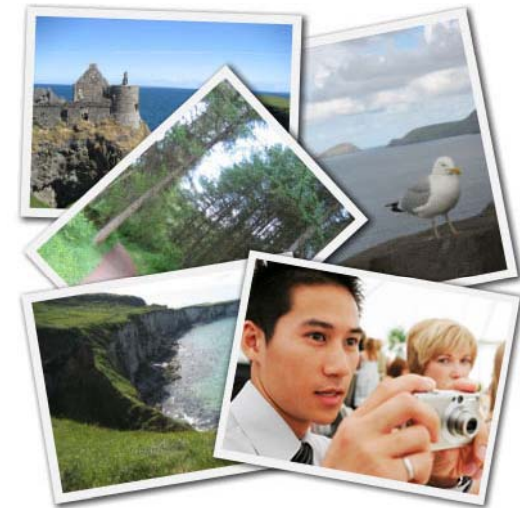


Epitome – A social game for photo album summarization

Ivan Ivanov, Peter Vajda, Jong-Seok Lee, Touradj Ebrahimi

Multimedia Signal Processing Group
Ecole Polytechnique Federale de Lausanne, Switzerland

- Number of photos taken in our daily life is increased
- **Social networks** – friends, family and colleagues can access photos
- Use **photos to tell story** of some important events in the life
- **Summarization** – get a quick overview of a set of photos
- **Gaming** provides a new way of motivating people to make the subjective data acquisition interesting and enjoyable
- From the game you can expect your friends to do summarization



Why game?

3

- Humans are best at solving some types of problems
- Humans like to play games
- Build a game that is
 - *Fun to play*
 - *Solves a hard problem – photo album summarization*
 - *Collects research data*



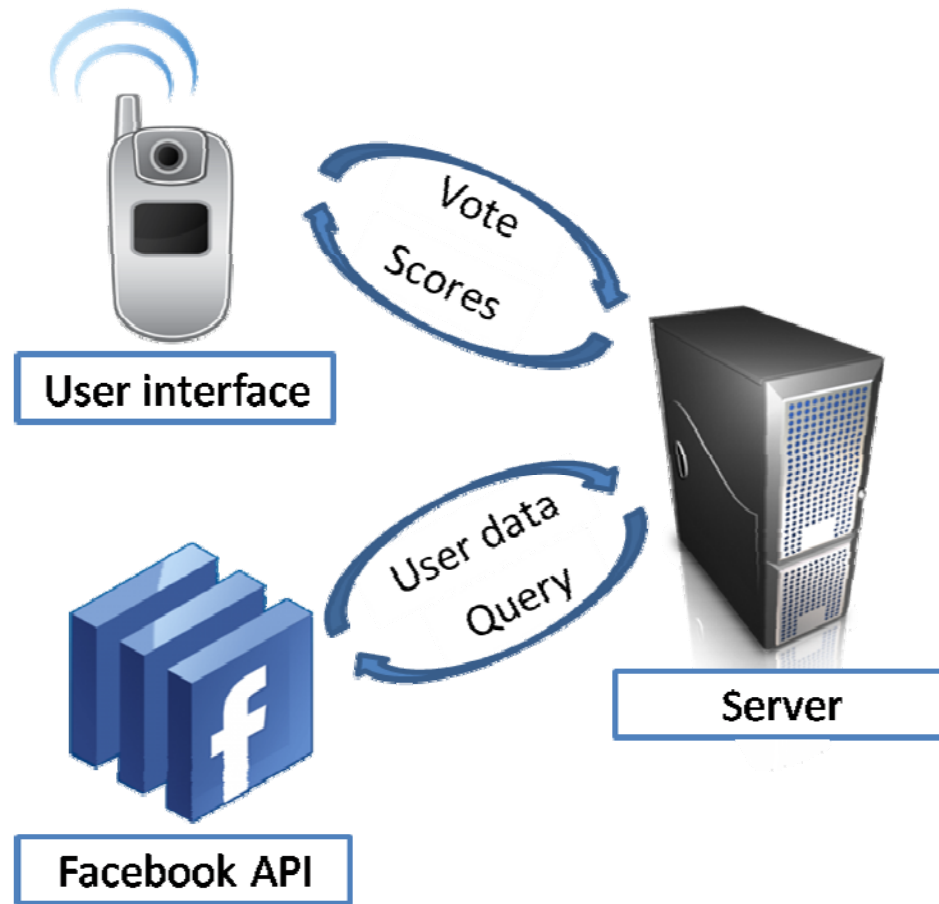
Von Ahn & Dabbish, CHI 2004

Why on a mobile phone?

4



- **Social game “Epitome”**
- **Album summarization** – selecting a set of photos from a larger collection which best preserve the visual information of the entire collection
- Implementation **on a mobile phone**
- Show only a limited number of images which can be fit into one mobile screen
- Game – **enjoyable, pleasant, funny**
- The goal is to see whether showing a reduced set of images is enough to summarize a large number of images in one album



How players play?

7

**“Select the Best!”
game**

Player 1



Entire Facebook
album



<i>BestCount</i>	0	0	0	0	0	0	1	0	0	0	0
<i>BestFreq</i>	0	0	1	1	1	1	1	1	0	0	0

$$Importance = \frac{BestCount}{BestFreq}$$

How players play?

8

**“Select the Best!”
game**

Player 2



Entire Facebook
album



<i>BestCount</i>	0	0	0	0	0	0	1	0	1	0	0
<i>BestFreq</i>	0	0	1	1	2	2	2	2	1	1	0

$$Importance = \frac{BestCount}{BestFreq}$$

How players play?

9

**“Select the Best!”
game**

Player n



Entire Facebook
album

											
<i>BestCount</i>	1	0	1	2	0	2	3	2	1	0	1
<i>BestFreq</i>	5	6	6	9	9	9	9	8	7	5	5

$$Importance = \frac{BestCount}{BestFreq}$$

How scores are calculated?

10

**"Select the Best!"
game**

Player



Entire Facebook
album



<i>BestCount</i>	1	0	1	2	0	2	4	2	1	0	1
<i>BestFreq</i>	5	6	6	9	9	10	10	9	8	6	6
<i>Importance</i>	0.2	0	0.17	0.22	0	0.2	0.4	0.22	0.12	0	0.17

Importance =

BestFreq

+1 point

How players play?

11

**“Split it!”
game**

Player 1



Entire Facebook
album



<i>SegmCount</i>	0	0	0	0	0	1	0	0	0	0	0
<i>SegmFreq</i>	0	0	1	1	1	1	1	1	0	0	0

$$\text{Segmentation} = \frac{\text{SegmCount}}{\text{SegmFreq}}$$

**“Split it!”
game**

Player 2



Entire Facebook
album



<i>SegmCount</i>	0	0	0	0	0	1	0	0	0	0	1	0
<i>SegmFreq</i>	0	0	1	1	2	2	2	2	1	1	0	0

$$\text{Segmentation} = \frac{\text{SegmCount}}{\text{SegmFreq}}$$

**“Split it!”
game**

Player n



Entire Facebook
album

<i>SegmCount</i>	0	1	0	1	0	3	3	2	1	2	0
<i>SegmFreq</i>	5	6	6	9	9	9	9	8	7	5	5

$$\text{Segmentation} = \frac{\text{SegmCount}}{\text{SegmFreq}}$$

How scores are calculated?

14

**“Split it!”
game**

Player



Entire Facebook
album



<i>SegmCount</i>	0	1	0	1	0	4	3	2	1	2	0
<i>SegmFreq</i>	5	6	6	9	9	10	10	9	8	6	6
<i>Segmentation</i>	0	0.17	0	0.11	0	0.4	0.3	0.22	0.12	0.33	0



Segmentation =

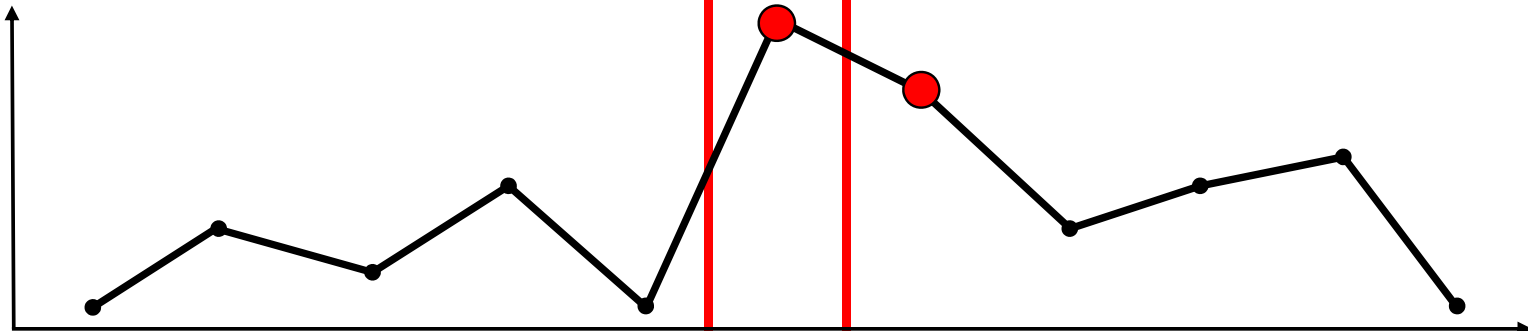
SegmFreq

+1 point

Entire Facebook album



Segmentation value



Importance value

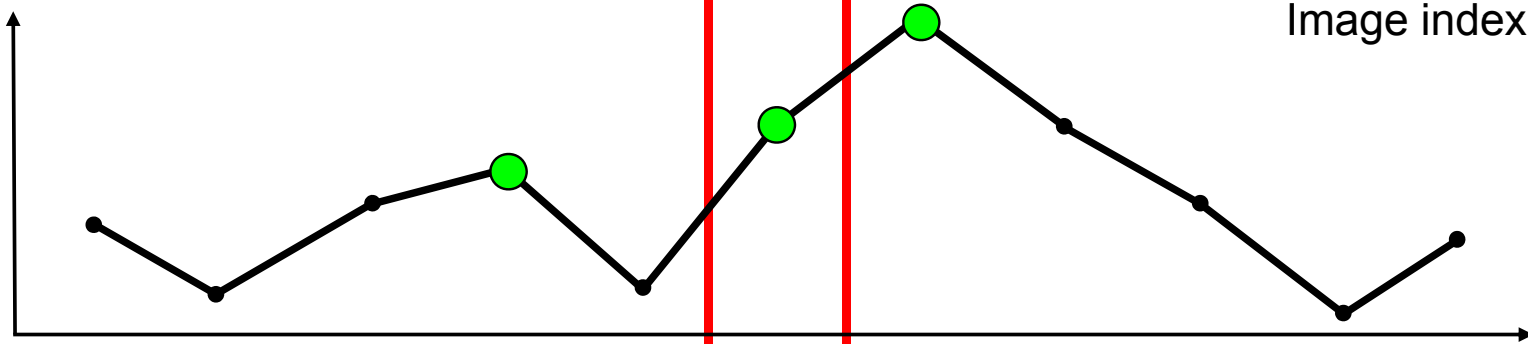


Image index

Image index

The most representative photos



Play the game!

16



- Dataset**

- “HP Challenge 2010: High Impact Visual Communication”
- 6 datasets
- 120 photos

dataset 1



dataset 2



dataset 3



dataset 4



dataset 5



dataset 6



- 63 participants (61% males and 39% females, aged 18–65, with different backgrounds and cultural differences)
- **Collection of the ground truth data**
 - *Select 5 the most representative photos of the whole album (20 photos), while looking at all photos of that album*
- **Experiment 1 – “Split it!”**
 - *Perform a segmentation of the reduced image collection by splitting it into two parts which have distinct semantic meanings*
- **Experiment 2 – “Select the Best!”**
 - *Select only one, the most representative photo of the reduced collection*
- Experiments 1 and 2 simulate playing with our game

Evaluation of user performance

19

One
Facebook album



P l a y e r s	 $Best_1$	0	0	0	1	0	0	1	1	0	0	0
	 $Best_2$	0	1	0	1	0	0	1	0	0	0	0
	 $Best_3$	0	0	1	1	0	0	0	1	0	0	0
	 $Best_4$	0	0	0	0	1	1	0	1	0	0	0

Player 1



$Score_1 = 4$

Player 3



$Score_3 = 2$

Player 2



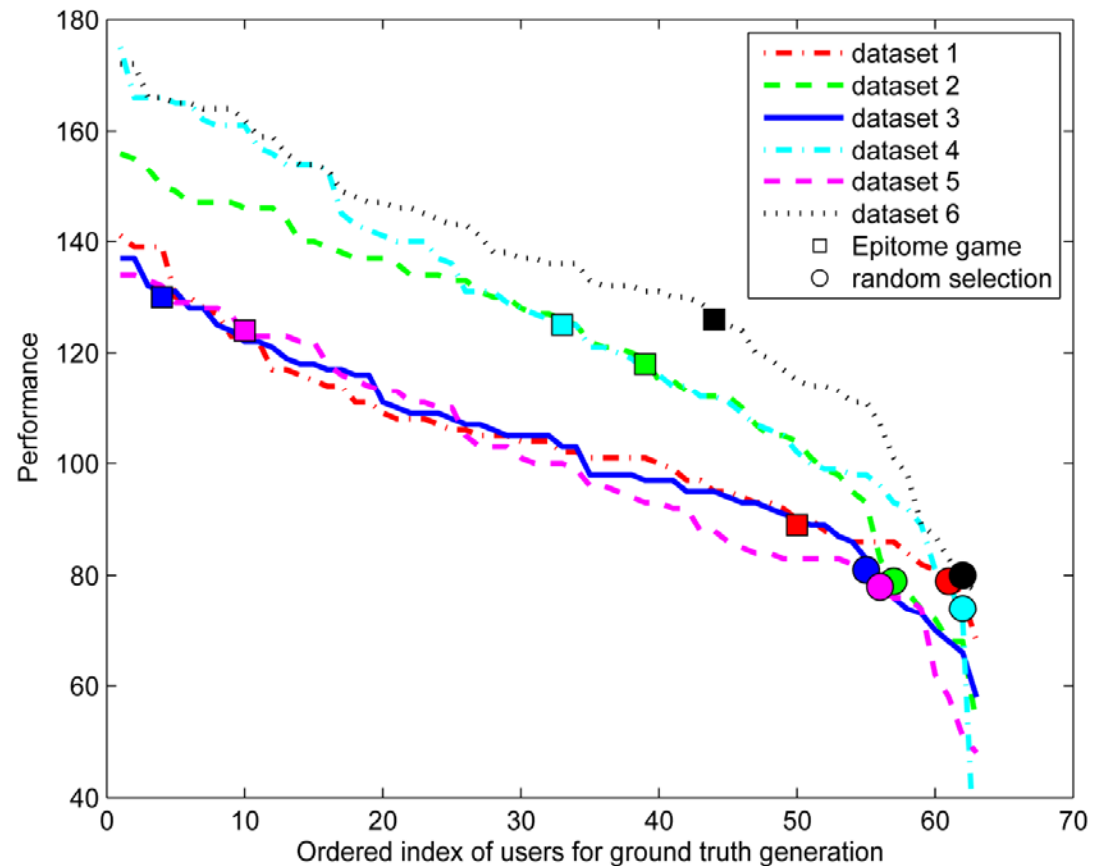
$Score_2 = 3$

Player 4



$Score_4 = 2$

- The distribution of the participants' performance



Max performance = 315

- The most representative photos selected by the proposed method



- Two **social games** for an **album summarization** on **mobile phone**: “Select the Best!” and “Split it!”
- These games concentrates on small tasks: **selection of the most representative photo** of a reduced set of images and **partitioning** of the reduced set into two distinct parts
- In average, our summarization game achieves 80% of the best performance of different participants
- The summarization sequence of photos can be used to create a **collage** of one album, a **cover** for an album, or to be included in a **photo book**



Thank you for your attention!

Ivan Ivanov, PhD student, EPFL
ivan.ivanov@epfl.ch