Ubiquitous and Mobile Computing
CS 528: TagSense

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What is TagSense?

TagSense is a first step towards automatic Image Tagging in order to speed up future image retrieval.
The Problem

Let's Say You Have a Few Pictures…
The Problem: Reality

Reality is slightly different…
Why TagSense?
How it Works
How it Works

- Wifi Ad-hoc Network Created
- All Phones Record Sensing Data
- Send Data to Camera Man to Process
How it Works

- Duke Wilson Gym
- Indoor
- Playing
- Music
- Chuan
- Romit

**When?**
- Clock
- GPS
- WiFi

**Where?**
- GPS
- WiFi
- Comp
- Light s.

**What?**
- Acc
- Gyro
- Mic
- Cloud

**Who?**
- ??
How to get “Who”

We only want information on people in the photo…
How to get “Who”

- Accelerometer Based Motion
- Complementary Compass
- Correlating Picture and Accelerometers
Accelerometer Based Motion

![Graph](image-url)
Complementary Compass
Correlating Picture and Accelerometers
How to get “Who”
To evaluate TagSense, a real life experiment is conducted with 8 Google Nexus One phones, in which one phone is used as a camera while other phones are carried in pocket. When a picture is clicked, the camera triggers and gathers sensor data over the WiFi ad-hoc mode.

The evaluation is done to answer the following questions:

- How well does TagSense tag people compared to approaches based on face recognition.
- How does human behaviour in different scenarios affect the individual tagging methods (posing, compass, motion) employed by TagSense.
- How well can TagSense recognize activities and context.
Tagging People

![Chart showing correct and incorrect tagging by TagSense and iPhoto.]
Tagging People

![Bar chart showing the number of people correctly included and wrongly excluded by TagSense and Picasa across different picture IDs.](image)
Tagging People - Metrics

The goal of a tagging scheme is to achieve high precision, high recall, and low fall-out.
Performance of different TagSense methods under different scenarios.
Performance comparison of TagSense with iPhoto and Picasa for name based image search.
Tagging Activities and Context

\[
\text{precision} = \frac{|\text{Tags by Humans} \cap \text{Tags by TagSense}|}{|\text{Tags by TagSense}|}
\]

\[
\text{recall} = \frac{|\text{Tags by Humans} \cap \text{Tags by TagSense}|}{|\text{Tags by Humans}|}
\]

Figure 13: Assessment of tags given by TagSense.
Tag Based Image Search

Table 1: Performance of tag based image search

<table>
<thead>
<tr>
<th>Name</th>
<th>Avg. Relevant</th>
<th>Avg. Irrelevant</th>
<th>Hit rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>User 1</td>
<td>2.75</td>
<td>4.85</td>
<td>0.85</td>
</tr>
<tr>
<td>User 2</td>
<td>5.6</td>
<td>1.8</td>
<td>0.65</td>
</tr>
<tr>
<td>User 3</td>
<td>4.05</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>User 4</td>
<td>4.05</td>
<td>2.35</td>
<td>0.7</td>
</tr>
<tr>
<td>User 5</td>
<td>2.55</td>
<td>1.6</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Figure 14: The measure of satisfaction of a user of TagSense based image search system.
Limitations of TagSense

- TagSense vocabulary of tags is quite limited.
- TagSense does not generate captions.
- TagSense cannot tag pictures taken in the past.
- TagSense requires users to input a group password at the beginning of a photo session.
- TagSense methods for tagging people are complex.
Future of TagSense

- Smartphones are becoming context-aware with personal sensing.
- Smartphones may have directional antennas.
- The granularity of localization will approach a foot.
- Smartphones are replacing point-and-shoot cameras.
Conclusion

- Mobile phones are becoming inseparable from humans and replacing traditional cameras. TagSense leverages this trend to automatically tag pictures with people and their activities.
- TagSense uses three different methods based on posing, compass and movement to identify people in a picture.
- TagSense has lower precision and comparable fall-out but higher recall as compared iPhoto/Picasa.
ANY QUESTIONS?
References

- https://tctechcrunch2011.files.wordpress.com/2013/02/photopile-erik-kessels2.jpg