Face Processing in Social Networking Services

NTIA Privacy Multistakeholder Process:
Commercial Facial Recognition Technology
March 25, 2014

Olga Raskin
Manager, Identity Research

Copyright © 2014
IBG, A Novetta Solutions Company
IBG at a Glance

- IBG has conducted independent biometric testing since 1996
- Hundreds of thousands of man-hours in biometric research, design, and integration (e.g. fingerprint, face, iris recognition)
- Expertise in emerging modalities, sensors, and software
- Cutting-edge expertise in virtual, online, and electronic identity technologies, concepts, and platforms
- Extensive commercial and government customer base
Background

- IBG evaluates online face processing technologies, capabilities, and performance
- While online face processing is the largest commercial use of biometrics, its performance and capabilities are not well-understood
Face Processing Functions

- **Detection**
  - Automated location of one or more faces in an image

- **Cropping**
  - Extraction and presentation of an image’s facial region

- **Recognition**
  - Search of a face image against enrolled face images to identify potential matches

- **Grouping**
  - Automated organization of face images into sets based on appearance similarity

- **Tagging**
  - Automated or facilitated process of assigning names to faces in online photos
Face Processing Myth: Image Quality

**Myth**
Face recognition requires high-quality images

**Reality**
SNS face processing systems can detect and match low-quality faces
Profiles, faces with low inter-ocular distance, bad lighting
Faces acquired through different classes of camera

**Future**
Matching and detection technologies should continue to improve
(though other factors are involved)
Face Processing Myth: Online Face Searches

**Myth**
You can conduct a “global” face search against the whole Internet

**Reality**
No, you cannot
Most online face images are not searchable (private, not shared)
Searches are within one’s contacts / friends
Sites that offer 1:N searches against public images lack identity data

**Future**
Facebook, Google have shown no interest in enabling open searches
Other entities are surely saving every public and/or accessible face image for future use
Relevant Face Processing Technologies

- Facebook
  - By far the largest “consumer” usage of biometrics
  - Rich social graph available to deliver improved tag suggestions

- Google+
  - Google's SNS, for which face processing was activated in December 2011
  - Potential for expansion of face processing to services such as search, Android, location, and YouTube

- PittPatt
  - Founded in 2004 by members of the Carnegie Mellon University Robotics Institute
  - Acquired by Google in 2011; no longer in development
  - Used by government agencies to process low-quality images
Milestones in Online Face Processing

- September 2008: Google adds FR to Picasa Web Albums
- September 2009: Google releases Picasa 3.5 with FR
- January 2009: Apple releases iPhoto '09 with FR
- September 2010: Facebook rolls out group face tagging
- June 2011: Facebook rolls out Tag Suggestions worldwide
- July 2011: Google acquires PittPatt
- September 2010: Apple acquires Polar Rose
- December 2011: Google rolls out Find My Face
- October 2012: Google acquires Viewdle
- June 2012: Facebook acquires Face.com
- September 2012: Facebook disables Tag Suggestions in EU
- January 2013: Facebook re-enables Tag Suggestions in US
- February 2013: Facebook deletion of face templates in EU confirmed
Dataset Processing

- IBG created software that automates photo submission and results parsing for and Facebook / Google+. Otherwise the process is manual, burdensome, and error-prone.
- SOCIAL-ID: photos collected by IBG as well as from public sources.
- SOCIAL-GT: customized testing software that interacts with online face processing sites and services; used by analysts for adjudication.

**Flowchart:**
- Logs into SNS
- Uploads SOCIAL-ID datasets
- Parses face detection and grouping pages
- Obtains face coordinates and groups from HTM files
- Writes outputs to SOCIAL-GT

**Stats:**
- 180 Datasets
- 37,778 Photos
- 47,048 Detected Faces
- 3,875 Grouped Faces
Face Grouping Performance

- Correct grouping rates are similar for the three services
- PittPatt has a slightly lower error rate than Facebook or Google+
- For datasets with a pronounced primary identity, approximately 19 out of 20 groupings will be correct
Google+ correctly groups 500-600 more Primary Subject faces than PittPatt and Facebook, respectively, while incorrectly grouping only 60-70 more faces.
Conclusions

- Searches are predominantly in-network
- Online face processing services can achieve correct grouping rates above 90% on challenging images
  - Not reliant on frontal poses, neutral expressions, even illumination, etc.
- Online face processing is improving
  - Algorithms may be tuned based on user input (e.g. tagging/grouping confirmations)
  - Possible enhancements to core face processing technologies
Contact Information

Olga Raskin
IBG, A Novetta Solutions Company
oraskin@novetta.com