Exploring Design Directions for Wearable Privacy

Katharina Krombholz*, Adrian Dabrowski*, Matthew Smith**, Edgar Weippl*

*SBA Research, Austria
**University of Bonn, Germany

USEC Mini Conference 2017
How can privacy preferences be communicated towards (wearable) cameras?
... in situations where people are constrained in what they can carry or wear?
Existing approaches

• No mass-market solution available
• Approaches from related literature
  • not applicable in such a scenario
  • intrusive
  • do not meet the context-dependent nature
Methodology

• Define 3 conceptual (“meta-”) PETs from related work
• Conduct qualitative interviews in the public places
  • Beach
  • Café
• Google Glass served as example technology to provoke participant reactions
Conceptual PETs
Privacy App

• based on SnapMe [1], and Faceblock [2]
• Uploads pictures to a centralized service
• Individuals on pictures are identified via co-location and (optional) face recognition
Privacy Fabric

• based on *Respectful Cameras* [3] and P3F [4]
• Fabric patterns to encode privacy policies
• Pattern recognition
• No digital artifact required
Privacy Bracelet

• half-way point between app and fabric
• served as middle ground during interviews to contrast between the other two
• bracelet with a button
• emits signal to cameras in the surroundings
User Study
User Study

- Field sessions (beach/café)
- Qualitative semi-structured interviews
- 20 participants
  - 9 male, 11 female
  - age: 19-42, median: 25
  - no participant was working in an IT-related field!
Results
Technology Familiarity

• Everyone had a rough idea of Google Glass
• 17 participants immediately associated a camera with the device
Privacy Considerations

• Discomfort and irritation (12)
• Am I being recorded? (11)
• Vexation, concerned about mass surveillance (6)

“If someone wore it [Google Glass] in front of me, I’d definitely ask him to take it off.” (P13)
Privacy Considerations

• neutral feeling, have gotten used to cameras, but context is important (8)

“In general, I don’t really care about privacy. But I would not want to be filmed drinking during a party.” (P17)

“[…] Maybe Glass performs face recognition in the background and transmits the information about the recorded people to the NSA. This would make every Glass-wearer an unintended little helper of the NSA.” (P19)
## PETs Preferences

<table>
<thead>
<tr>
<th>Privacy App</th>
<th>Privacy Fabric</th>
<th>Privacy Bracelet</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>2€</td>
<td>Common clothing price</td>
<td>10-200€</td>
</tr>
</tbody>
</table>

→ No trend differences (beach/cafe)!
PETs Preferences (and Concerns)

• Bracelet
  • Ease of use, convenience, visibility
  • Does not require smartphone, OSN

• App
  “The server behind the app bothers me just as much [...].” (P15)

• Fabric
  • Personal styling preferences
  • Difficult to adjust to the context
  • Little understanding of how this could work
Discussion
<table>
<thead>
<tr>
<th>Name</th>
<th>Produktionsart</th>
<th>Muster-Erstellung</th>
<th>Watermarking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argyle Burlington-Karo</td>
<td>zweigleit</td>
<td>Farben, Muster als geometrische Formen, Viertel- oder Dreieck-Muster, geometrische Ornamente, Textur</td>
<td>breit</td>
</tr>
<tr>
<td>Border Tartan</td>
<td>zweigleit</td>
<td>Farben, Muster als geometrische Formen, Viertel- oder Dreieck-Muster, geometrische Ornamente, Textur</td>
<td>gestrichen</td>
</tr>
<tr>
<td>Check</td>
<td>zweigleit</td>
<td>Farben, Muster als geometrische Formen, Viertel- oder Dreieck-Muster, geometrische Ornamente, Textur</td>
<td>gestrichen</td>
</tr>
<tr>
<td>Plain (Piad) Tartan</td>
<td>zweigleit</td>
<td>Farben, Muster als geometrische Formen, Viertel- oder Dreieck-Muster, geometrische Ornamente, Textur</td>
<td>gestrichen</td>
</tr>
<tr>
<td>Camouflage</td>
<td>print</td>
<td>Wappen, Muster als geometrische Formen, Viertel- oder Dreieck-Muster, geometrische Ornamente, Textur</td>
<td>breit</td>
</tr>
</tbody>
</table>
P3F.at

- Technically feasible (we implemented a matlab prototype)
- BUT: users do not understand how the communication between the camera and the fabric works and therefore have little trust.
Photographer vs. Bystander

• Participants were allowed to try the device
• ... and they liked it.
• Privacy concerns vanished!
Feasibility Considerations

• “Recht am eigenen Bild” → Right of persons to their own image representation
• Legal foundation
• Robots.txt
Beyond visual recording

• Smart environments, smart home, industry 4.0
• Sensors are everywhere!!
Take-Home Message

• PETs should work regardless of a specific location (beach is a challenging environment!)
• Sense of control: a simple button to push
• Technical feasibility vs. user acceptance
Questions?

kkrombholz@sba-research.org