Objective: Parts identification using “Fingerprint of Things” image matching

- Background: Growing demands for traceability of industrial products and their internal parts
- Tagging or marking is not allowed for many inside parts due to size, cost or their functionality

Solution: biometrics-like ID by image matching

- Non-additive and zero-cost: useful ID for inside parts
- Matching FoT images enables identification and authentication without tagging nor marking

Problem: Matching numerous random patterns under geometric changes

Conventional methods = alignment + correlation

- \( N(\text{Large}) \) alignments required online for 1 query

Proposed method: Fourier-Mellin Band-Limited Phase (FMBLP) Correlation

- Fourier-Mellin phase correlation: Position, scale and rotation invariant image matching
- Direct matching based on correlation between query- and DB- FMBLP features without alignment
- FMBLPs of DB images are extracted offline: Online process is much faster than conventional methods

FAST matching of random patterns under geometric changes is needed

Proposed method

<table>
<thead>
<tr>
<th>Methods</th>
<th>[sec]</th>
<th>EER [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Align + BLPOC</td>
<td>62.0</td>
<td>0</td>
</tr>
<tr>
<td>FMP correlation</td>
<td>4.09</td>
<td>2.15</td>
</tr>
<tr>
<td>Proposed: FMBLP</td>
<td>0.136</td>
<td>0</td>
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</tbody>
</table>

Experiments: 1-vs-1,210 matching in only 0.136 seconds and 100% accuracy

- Captured 1,210 pairs of images including position, scale and rotation changes
- \( \geq 450 \) times faster than conventional method and perfect identification accuracy

Target object: metal shafts

Online processing time for 1-vs-1,210 matching and Equal Error Rates

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