AerialMPTNet: Multi-Pedestrian Tracking in Aerial Imagery Using Temporal and Graphical Features

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Aerial image sequence acquisition

Person tracking (Marienplatz, Munich)

Statistical data analysis
Challenges and Contributions

- Multiple pedestrian tracking is complex → Automatic methods, e.g., CNNs
- Aerial imagery pedestrian tracking datasets and methods are lacking!

Contributions:

- **AerialMPT**:
  - Large aerial multi-pedestrian tracking dataset
  - Will be released

- **AerialMPTNet**:
  - CNN-based aerial multi-pedestrian tracking network
  - Outperforms other traditional and DNN-based tracking methods
AerialMPT Dataset

- By DLR’s 3K camera system mounted on a helicopter:

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<table>
<thead>
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<tbody>
<tr>
<td># Sequences bahm</td>
<td>14 (8 Train/6 Test)</td>
</tr>
<tr>
<td># Frames</td>
<td>307</td>
</tr>
<tr>
<td>Avg. length</td>
<td>21.9</td>
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<tr>
<td># Annotations</td>
<td>44,740</td>
</tr>
<tr>
<td>Avg. annotation/frame</td>
<td>145.7</td>
</tr>
<tr>
<td>Frame rate</td>
<td>2 fps</td>
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- Contributions over KIT AIS:

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<tr>
<td>Better resolution</td>
<td>8-13 vs. 12-15 cm/pixel</td>
</tr>
<tr>
<td>Better image quality</td>
<td>Contrast, illumination</td>
</tr>
<tr>
<td>More sequences</td>
<td>14 vs. 13</td>
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<tr>
<td>More frames</td>
<td>1.6 X</td>
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<tr>
<td>Longer sequences</td>
<td>21.9 vs. 14.1 frames</td>
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<tr>
<td>More annotations</td>
<td>1.4 X</td>
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Sample frames from AerialMOT
AerialMPTNet

SMSOT-CNN (Baseline)

AerialMPTNet

ICPR2020
Results

- Results on AerialMPT:

  ![Ablation study results for the MOTA metric.](image)

  Ablation study results for the MOTA metric.

- Example tracking:

  ![MOTA of AerialMPTNet vs. the traditional and DNN-based methods.](image)

  MOTA of AerialMPTNet vs. the traditional and DNN-based methods.

  ![Example tracking](image)

  Karlsplatz, Munich

  Marienplatz, Munich
Thank you for your attention!

For any questions, please contact reza.bahmanyar@dlr.de