Spatial Vector Matching and Composite Temporal Constraints Based Multi-Person 3D Pose Reconstruction in Volleyball Games

**Background**

Volleyball Video

**Proposals**

- **Basic Framework**
  - Input: Volleyball Video (4 Views)
  - Output: Multi-Person 3D Pose

- **P1:** Spatial Vector Matching Based Upper Body Joints Correction
  - Conventional
  - Proposed: Joint Classification Based Temporal Filter Using Optical Flow
  - Before Temporal Smoothness, detect overlap Joint and Normal Joint

- **P2.1:** Joint Classification Based Temporal Filter Using Optical Flow
  - Joint Position
  - Optical Flow
  - In Four Cameras Views
  - Normal Points
  - Low Overlap Point
  - High Overlap Point
  - Remove

- **P2.2:** Joint Angle Regulation Constrained Joint Searching
  - Joint Angle Regulation (degree)
  - Joint Angle Change Tendency
  - Raise Hand
  - Pull Up
  - Jump
  - Block
  - Pull Down

**Experiment result**

<table>
<thead>
<tr>
<th>Item</th>
<th>Basic Framework</th>
<th>P1+P2.1</th>
<th>P1+P2.1+P2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCK [%] @ 100mm</td>
<td>Upper 76.67</td>
<td>82.01</td>
<td>87.37</td>
</tr>
<tr>
<td></td>
<td>Lower 88.00</td>
<td>92.03</td>
<td>94.17</td>
</tr>
<tr>
<td></td>
<td>Total 81.20</td>
<td>86.02</td>
<td>90.09</td>
</tr>
<tr>
<td>PCK [%] @ 30mm</td>
<td>Upper 62.79</td>
<td>66.53</td>
<td>74.14</td>
</tr>
<tr>
<td></td>
<td>Lower 75.50</td>
<td>76.67</td>
<td>82.30</td>
</tr>
<tr>
<td></td>
<td>Total 67.87</td>
<td>70.3</td>
<td>77.41</td>
</tr>
</tbody>
</table>

**Conclusion**

This work achieved accuracy averagely 90.09% for percentage of correct key points (PCK) 100mm and 77.41% for PCK 30mm.