Motion Based Prediction with Tracking after Failure Method and Racket Feature Based Likelihood for 3D Racket Tracking in Ping-Pong

Research background

- Target: accurate ping-pong racket tracking in 3D space for the position, orientation and motion

Problems in 3D ping-pong racket tracking

- Complex motions
- Lack of enough visible views
- Variation of racket colors and shapes
- Lack of features for racket motion

Proposals

- Initialization
- Posterior distribution
- Resampling
- Failure?
- Yes
- Observation
- P3: Racket feature based likelihood
- No

Overall structure of framework

State vector = (racket motion, position, orientation, velocity)

- Motion based normal prediction
- Single view based prediction after tracking failure
- Racket feature based likelihood
- Preserve particles with high likelihood
- Line fitting by least-squares method
- Generate a cylinder window around the line

Experiment result

Table 1. Evaluation for success rate of position and orientation

<table>
<thead>
<tr>
<th></th>
<th>P3</th>
<th>P1+P3</th>
<th>P1+P2+P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success frame number</td>
<td>3007</td>
<td>3216</td>
<td>4330</td>
</tr>
<tr>
<td>Success rate</td>
<td>66.78%</td>
<td>71.42%</td>
<td>96.16%</td>
</tr>
</tbody>
</table>

Table 2. Evaluation for success rate of motion

<table>
<thead>
<tr>
<th></th>
<th>P1+P2+P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success frame number</td>
<td>4205</td>
</tr>
<tr>
<td>Success rate</td>
<td>93.38%</td>
</tr>
</tbody>
</table>

Conclusions

- After applying our proposals, the success rate of position and orientation tracking achieves 96.16% and the success rate of motion tracking achieves 93.38%.