Real-time image tracking system based on Stereoscopic vision

Keywords: Stereo vision, Trajectory prediction, Web interface, Robot Operating System (ROS)

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Introduction

- This project uses the table tennis robot as the research platform and uses the image processing technology to identify the position, rotation of the table tennis ball. We use the ball information to predict the ball trajectory, and calculate the hitting position of the ball.
Camera coordinates of the point $P_{\text{camera}}$ ($P_{x_{\text{camera}}}$, $P_{y_{\text{camera}}}$, $P_{z_{\text{camera}}}$) corresponding to the left and right eye images were $(u_l,v_l)$ and $(u_r,v_r)$. Stereo vision is the use of geometric relations with the image on the left and right eyes of the parallax to calculate the depth of field $P_z$. Figure is shown the schematic diagram of stereoscopic vision.
Trajectory prediction

- To calculate the flight trajectory of a ball by the formulas.

\[
\begin{align*}
X_i &= C_{x0} + C_{x1} \times t_i \\
Y_i &= C_{y0} + C_{y1} \times t_i \\
Z_i &= C_{z0} + C_{z1} \times t_i - \frac{1}{2} \times g \times t_i^2 \\
\end{align*}
\]

, \ i = 1 \ldots n
Web interface (1/2)

- HSV
- Image processing
- Threshold value
Web interface (2/2)

Ball center

Ball distance

- Red Obj: (-87, 124) LR: Right
- Distance: 24

- Blue Obj: (0, 0) LR:
- Distance: 999 Angle: 999

- Yellow Obj: (0, 0) LR:
- Distance: 999 Angle: 999
Experiment (1/2)

- Left and right eye ball center
  - Two images of each interval of 20 milliseconds
## Experiment (2/2)

- Trajectory predicts the position of each point in time.

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Conclusion(1/2)

- We first set and calibrate the two cameras. And then use the stereo vision technology to process the image to get the ball posture. A trajectory prediction formula is used to find the flight trajectory of ball. We use the new ball posture to change the trajectory parameters to make the prediction of trajectory more accurate.
Conclusion(2/2)

- Trajectory prediction of ball.
Reference


Thank You for Your Attention!