

Time to Collision Assignment

Computer Vision

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Time to Collision :

In this assignment, we calculated the time to collision by using the divergence of the image. We know that,

time to collision = $2/\text{div } \mathbf{v}$, if comp. of velocity along image plane = 0
where, $\text{div } \mathbf{v} = u_x + v_y$

So, first I created two videos, in which a square is getting bigger each frame starting from the center of the image. In one of the videos, the rate expanding is double as compared to the other.

Then I calculated optical flow vector using “calcOpticalFlowFarneback” function of opencv, which returns (u,v) for each pixel of image. Then I calculated the x-derivative of u and y-derivative of v, thus I have u_x and v_y for each pixel of the image. Using these, I calculated the total divergence of the image and hence time to collision.

Results:

For the video with higher rectangle expanding rate, time to collision came out to be ~286 and for the other video, it came out to be ~611. These results are very good as the time to collision is almost double which agrees with the double rate of expanding.

Results on webcam video are however very complicated. This is because of number of reasons. First, the webcam is not stable, secondly, controlling the motion of any object manually is very tough. Then because of large noise, the optical flow estimate may not be quite correct which will lead to higher error in its derivatives and which sometimes become numerically unstable. However, results obtained on artificial videos are sufficient to verify the relation between time to collision and divergence.

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