

Homework #3: Worm Tracker

HCI / CprE / ComS 575: Computational Perception

Out: Feb 16, 2010

Due: Mar 4, 2010

One lab on campus is studying the effects of different drugs on small worms. The worms are placed inside micro channels that have different drug concentrations in them. The drugs affect how the worms move (sometimes they slow down, sometimes they speed up, and sometimes the amplitude of their oscillations changes).

Five worm videos are posted on the class web page. The videos were shot from a microscope because the worms are really tiny. The zoom factor may be different between the different videos. Your task is to write OpenCV (or Matlab) code that analyzes these videos to solve the following tasks.

Task 1: Track the trajectory of a single worm (use Video 1 only). Output another video that shows only the worm on a black background. Also, draw the trace of the worm in red and add it to the video as well. The trace should be relative to the center of the worm (or relative to the center of the bounding box placed around the worm).

Task 2.a: Modify your code for Task 1 to track only the single worm placed in the top channel in Video 2. This video has a different zoom factor than the previous one. You can set a region of interest (ROI) and ignore all other worms for this task.

Task 2.b: Calculate the speed of the worm in the top channel in Video 2. Use pixels per 10 frames as the units for the speed. Print this value in the output video.

Task 2.c: Approximate the shape of the worm in the top channel with a sinusoid (or with a 3-rd degree polynomial). For each frame of video 2 print the amplitude and the wavelength of the worm (in pixels). Print these values the output video.

Task 2.d: Modify your code to track all worms in all channels in Video 2. Output another video that shows only the worms and their traces.

Task 3: Track all worms in all channels in Video 3.

Task 4 (Extra Credit): Track all worms in Video 4.

Task 5 (Extra Credit): Track all worms in Video 5. This video has different light conditions than the previous four videos.

The videos are posted on the class web page:

http://www.ece.iastate.edu/~alexs/classes/2010_Spring_575/HW/HW3/