function pos = trackingFly(videoPath)

%track the walking path of a fruit fly

% videoPath: the path of the video to be analyzed

% pos: a structure containing the coordinates of the walking path

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vobj = VideoReader(videoPath);

nFrames = vobj.NumberOfFrames;

Fs = vobj.FrameRate;

height = vobj.Height;

width = vobj.Width;

grayVid = zeros(height,width);

vidFrame = read(vobj, 1);

vidFrame = rgb2gray(vidFrame);

figure; imshow(vidFrame)

title(‘Please select the area for analysis’)

bw = roipoly; % to select the area for analysis

for iFrame = 1:Fs:nFrames

vidFrame = read(vobj, iFrame);

vidFrame = double(rgb2gray(vidFrame));

vidFrame = vidFrame.\*bw;

grayVid = grayVid + vidFrame;

end

vidMean = grayVid/(length(1:Fs:nFrames));

vidMean = (vidMean-min(vidMean(:)))/(max(vidMean(:))-min(vidMean(:)));

pos.x = zeros(nFrames,1);

pos.y = zeros(nFrames,1);

for iFrame = 1:nFrames

vidFrame = read(vobj, iFrame);

colorVidFrame = vidFrame;

vidFrame = double(rgb2gray(vidFrame));

vidFrame = vidFrame.\*bw;

vidFrame = (vidFrame-min(vidFrame(:)))/(max(vidFrame(:))-min(vidFrame(:)));

dFrame = vidFrame - vidMean;

bwFrame = dFrame>.1;

bwFrame = bwareaopen(bwFrame,15);

bwFrame = bwmorph(bwFrame,'close');

bwFrame = bwmorph(bwFrame,'dilate');

bwFrame = bwmorph(bwFrame,'close');

bwFrame = bwareaopen(bwFrame,50);

[x,y] = find(bwFrame);

pos.x(iFrame) = mean(x);

pos.y(iFrame) = mean(y);

bwBoundary = bwmorph(bwFrame,'remove');

colorVidFrame(:,:,1) = uint8(double(colorVidFrame(:,:,1)) + (255\*bwBoundary));

imshow(colorVidFrame)

pause(0.1/Fs)

end

figure;

plot(pos.x,pos.y)