Overview of matlab files

CreateFISHdataStruc.m (Run only this file - calls all other functions!)

Functions called by CreateFISHdataStruc.m:

find_rot_angle.m
Merge.m
MergeBF.m
return_side.m
return_body_outlines.m
return_clustered_L.m
return_dist_matrix.m
return_eye_outline.m
return_fish_length.m
return_front_coor_Std.m
return_front_coor_T.m
return_front_coor.m
return_L_divided.m
return_spine_coor_Std.m
return_spine_coor_T.m
return_spine_outline.m
smoothBW.m

Make sure that current matlab folder is: 'Matlab_files_and_sample_images'

Important note!
The script CreateFISHdataStruc.m require the following matlab toolboxes to run:

- Matlab statistics toolbox
- Matlab imaging processing toolbox

Functions called only inside other functions:

return_clustered_C.m
return_gradmag_gray.m
return_labeled_voronoi.m
return_met_events.m
return_object_voronoi_points.m
return_varying_thresh.m
return_Y_coor.m
return_sub_listL.m
smooth_boundary.m

Steps of the construction of the data structure 'FISH'

- Step 1: Initialize the data structure FISH and read in original images
- Step 2: Rescale brightness of BF, GFP and RFP images based on average background intensity
- Step 3: Flip images of fish which has nose to the right and save in rounds(1)
- Step 4: Find approx. outline of fish bodies and save in rounds(1)
- Step 5: Rotate, translate and crop all images and save in rounds(2)
- Step 6: Find more accurate outline of fish bodies and save in rounds(2)
- Step 7: Find spine outlines and end of spine landmark point and save in rounds(2)
- Step 8: Find eye outlines and eye center of mass landmark and save in rounds(2)
- Step 9: Find boundary landmark points. Do left-right side transforms. Save transformed images in rounds(3)
- Step 10: Make merged versions of left/right side images and saving in rounds(3)
- Step 11: Find transform functions for making all three time point images overlay
- Step 12: Use transform functions found in previous step for making all three time point images overlay. Save transformed images in rounds(4)
- Step 13: Subtract auto-fluorescence, segment images and save in rounds(4)
- Step 14: Remove objects which are no longer there in the next time point…
- Step 15: Find pairwise distance matrix for all connected regions in segmented images and use this to cluster close objects
- Step 16: Separate objects which has merged due to melanoma growth since last time point…
- Step 17: Find average fish shape of entire data set and transform to this shape
- Step 18: Applying transform functions found in previous step to all images and save in finals
- Step 19: Saving data structure FISH in current directory as **FISH_data_struct.mat**

Overview of data structure ‘FISH’

- FISH( ) (one for each fish in the data set)
  - .fishID (unique string containing info on this fish)
  - .batch (string with fish batch number, ‘BATCH 1’ or ‘BATCH 2’)
  - .implantSize (string with number of cells injected into fish, ’1x10^5’, ’5x10^5’ or ’1x10^6’)
  - .location (string with injection location, ‘DORSAL’ or ‘VENTRAL’)
  - .times( ) (3 time points, day 1 day 7 and day 14)
    - .originals (original raw images)
      - .bf1 (bright field image nose facing right)
      - .bf2 (bright field image nose facing left)
      - .gfp1 (GFP image nose facing right)
      - .gfp2 (GFP image nose facing left)
      - .rfp1 (RFP image nose facing right)
      - .rfp2 (RFP image nose facing left)
    - .finals (final segmented and transformed (TF) images transformed to standard (std) fish shape)
      - .bf (merged bright field TF to std shape)
      - .gfp1 (GFP image right side TF to std shape)
      - .gfp2 (GFP image left side TF to std shape)
      - .rfp1 (RFP image right side TF to std shape)
      - .rfp2 (RFP image left side TF to std shape)
      - .bw (black white segmented image TF to std shape)
      - .body (black white fish body TF to std shape)
      - .spine (black white fish spine TF to std shape)
      - .eye (black white fish eye TF to std shape)
      - .pure (signal minus auto fluorescence TF to std shape)
      - .L (labeled and clustered segmented image TF to std shape)
      - .L_divided (labeled, clustered and divided segmented image TF to std shape)
    - .rounds( ) (holds 4 intermediate image stages. E.g. rounds(3) left-right TF images. rounds(4) across 1,2,3 time points transformed images)
      - .bf1 (bright field image right side)
      - .bf2 (bright field image right side)
      - .gfp1 (GFP image right side)
      - .gfp2 (GFP image left side)
      - .rfp1 (RFP image right side)
      - .rfp2 (RFP image left side)
      - .bw (black white segmented image)
      - .body (black white fish body)
      - .spine (black white fish spine)
      - .eye (black white fish eye)
      - .pure (pure signal (GFP minus auto fluorescence))
      - .L (labeled and clustered segmented image)
      - .L_divided (labeled, clustered and divided segmented image)
    - .transforms (image transformation functions)
      - left_rightTF1 (nonliniar transforms function for right side to average of left and right body shape of same fish in one time point)
      - left_rightTF2 (nonliniar transforms function for left side to average of left and right body shape of same fish in one time point)
      - lengthScaleTF (liniar transforms function, scaling and rotation to average length of same fish over time 1,2,3))
      - time123TF (nonliniar transforms function to average shape of same fish over time 1,2,3)
      - lengthScaleTF2 (liniar transforms function, scaling and rotation to std fish length)
      - standardFishTF (nonliniar transforms function to std shape)