Parameters tuning for fish tracking

Parameters

Parameter	Meaning
max_cosine_distance	Threshold to determine the objects' similarity by ReID. The higher the value, the easier it is to assume it is the same object
nn_budget	a value that indicates how many previous frames of feature vectors should be retained for distance calculation for each track.
max_age	Maximal allowed age for a track (A_max parameter in deepSORT paper)
max_iou_dist	maximal IOU distance between bounding boxes
n_init	Number o consecutive detections to open a tracker

Verified detections – apply function that reject detections which are on the boundary or outside the ROI.

The model used for the detection algorithm are summarized in the following table:

Name	Details
model3_ROI_Mar1_2023.tflite	Model for new video with ROI, trained on 40 images over 10000 epochs
model5_ROI_Mar2_2023.tflite	Model for new video with ROI, trained on 40 images over 9000 epochs
model6_ROI_Mar2_2023.tflite	Model for new video with ROI, trained on 40 images over 15000 epochs
model7_ROI.tflite	Model for new video with ROI, trained on 40 images of clean container, over 9000 epochs

Results

Directory with annotations: fish_second_from_right

Model: model3_ROI_Mar1_2023.tflite

max_cosine_distance	nn_budget	max_age	max_iou_dist	n_init	Number of trackers	Coverage for annotated track (thd=50 pixels)
0.4	None	12	0.5	4	174	241/816
0.4	None	12	0.5	3	267	282/816
0.9	None	12	0.5	3	264	293/816
0.9	1	12	0.5	3	266	293/816
	None		0.1			No detections
0.9	None	12	0.8	3	299	307/816
0.9	None	12	0.8	6	122	186/816

Model: model5_ROI_Mar2_2023.tflite (40 images, 9000 iterations)

max_cosine_distance	nn_budget	max_age	max_iou_dist	n_init	Number of trackers	Coverage for annotated track (thd=50 pixels)
0.9	None	12	0.8	3	272	483/816
0.9	None	24	0.8	3	too-many irrelevant trackers	576/816
0.9	None	24	0.8	3	201	514/816 (63%)
0.9	None	24	0.8	3	164	526/816 (64%), verified detections

Model: model6_ROI_Mar2_2023.tflite (40 images, 15000 iterations)

max_cosine_distance	nn_budget	max_age	max_iou_dist	n_init	Number of trackers	Coverage for annotated track (thd=50 pixels)
0.9	None	24	0.8	3	167	515/816 (63%) verified detections

Test specific configurations on all annotations

In this section we test a specific configuration on annotations of all fish that present in:
.\data\video\VIDEO_20230223_133606599_annotation

Configuration details
max_cosine_distance: 0.9
nn_budget: None
max_age: 24
max_iou_dist: 0.8
n_init: 3
verified detections
Network name: model5_ROI_Mar2_2023.tflite (40 images, 9000 iterations)

	Annotation directory	**Tracks per fish**	**Coverage for annotated track (thd=50 pixels)**
1	fish_bottom_right	15	382/816 = 0.47
2	fish_first _from_right	11	396/816 = 0.48
3	fish_first_left	7	324/816 = 0.39
4	fish_second_from_left	12	392/816 = 0.48
5	fish_second_from_right	14	526/816 = 0.64
6	fish_third_from_right	12	250/816 = 0.31
	Total:	71	2270/(816*6) = 0.46

Total number of tracks: 164

Configuration details
max_cosine_distance: 0.9
nn_budget: None
max_age: 24
max_iou_dist: 0.8
n_init: 3
verified detections
Network name: model6_ROI_Mar2_2023.tflite (40 images, 15000 iterations)

	Annotation directory	**Tracks per fish**	**Coverage for annotated track (thd=50 pixels)**
1	fish_bottom_right	17	394/816 = 0.48
2	fish_first _from_right	11	415/816 = 0.51
3	fish_first_left	9	332/816 = 0.41
4	fish_second_from_left	8	406/816 = 0.49
5	fish_second_from_right	17	515/816 = 0.63
6	fish_third_from_right	10	263/816 = 0.32
	Total:	72	2325/(816*6) = 0.47

Total number of tracks: 167