

AALBORG UNIVERSITY

# Why Zebrafish (Danio rerio)?

The zebrafish is a popular animal model and its behavior can reveal whether it is stressed, calm, anxious, or anything in between. Therefore, **behavioral analysis** of zebrafish can be a key part of research in drugs, genetics, and more.

### **Behavioral Analysis in 3D**

Most computer vision based methods for behavioral analysis of fish have been developed for 2D due to simplicity. However, critical behavioral traits may be overlooked as fish naturally move in 3D. Therefore, it is paramount that robust 3D trackers are developed.



Example that illustrates occlusion in the front view but no occlusion in the top view.

# **3D-ZeF: A 3D Zebrafish Tracking Benchmark Dataset** Malte Pedersen, Joakim B. Haurum, Stefan H. Bengtson, Thomas B. Moeslund Visual Analysis and Perception Lab, Aalborg University, Denmark



## Approach

We propose a tracking-reconstruction and module-based approach. Object detection and tracking is conducted in both views before the 2D tracklets are associated across the two views and reconstructed as 3D tracklets. The final module associates the 3D tracklets into complete 3D tracks.

Top image ----> Front image ->

2D Object Detection

Illustration of the proposed stereo setup. We have used off-the-shelf hardware for capturing the dataset. Three of the aquarium walls have been coated with semitransparent material to avoid reflections.

2D positions -> 2D Tracklet 2D tracklets -> 2D positions -> Construction 2D tracklets ->

2D Tracklet Between Views

## The First 3D Fish MOT Dataset

The 3D-ZeF dataset consists of eight pair-wise stereo sequences with a frame rate of 60 FPS and a resolution of 2704x1520. Four training sequences with 2-5 fish lasting 15-120 seconds. Four **test** sequences with 1-10 fish lasting 15 seconds each. More than 80,000+ manually annotated bounding boxes and head-positions. Dataset: MOTChallenge.net/data/3D-ZeF20/ <u>Code:</u> bitbucket.org/aauvap/3d-zef/



Example from one of the sequences with a ground truth head-position overlay. The front view is seen to the left and top view is seen to the right.



