Motivation

Imaging thousands of specimens in many biodiversity samples is time-consuming and requires experienced personnel. Efficient tools for assessing invertebrate samples are urgently needed. Ideally they should yield image training sets for convolutional neural networks.

DiversityScanner: First Generation

Video

DiversityScanner with 1, 2, 3: Linear axes; 4: Petri dish; 5: Microplate; 6: Overview camera, 7: Detail camera [1].

- Sorting, imaging, measuring, and classification robot for small invertebrates (< 3 mm)
- Detail camera (1.3 MP) for specimen images
  - Small amount of data and fast processing
  - Possible loss of image information for classification and taxonomic work due to low resolution

DiversityScanner: Workflow

- Taking overview image
- Taking detail image
- Position detection
- Transfer specimen to microplate for DNA barcoding
- Dispersing the specimen
- Picking up the specimen
- Positioning pipette over identified specimen
- Insect classification
- Dispersing the specimen

DiversityScanner 4K: Camera Setup

Identification to species level requires more detailed images. Therefore we equipped the DiversityScanner 4K with a new camera setup:

- High resolution (12 MP) camera with a small pixel size (1.55 µm x 1.55 µm) for very sharp images and focus tunable lens (Optotune, Switzerland) for focus stacking
- Enables high quality fully automated imaging of invertebrates in ethanol

DiversityScanner 4K: Focus Stacking

Different focus levels

Far

Close

Focus stacking

References