Social Interaction Monitoring
qSIM

PHENOSYS
Technology for Behaviour Analysis

INTRODUCTION

Scoring social interactions between mice is both important for quantifying the social phenotype and at the same time most labor intensive.
The qSIM combines several technologies for a novel, fully automatic method of scoring social interactions between two individual mice.

A thermal camera is used for video recording of the animals. The identity is established and continuously verified by reading out subcutaneous RFID tags. The processing software fuses this information, determines the animal positions as well as the orientation, and classifies the behavior type.

qSIM observation cage with thermal camera and RFID detectors
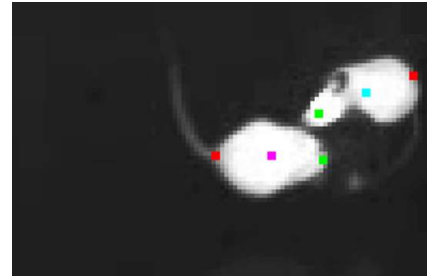
Thermal camera image with animal identity and position annotation

Classification Scheme

The social behavior is classified into 25 categories. Multiple event types can occur simultaneously.

Static Events
➢ Contact events, e.g. oral-oral, side-by-side …
➢ Relative position events, e.g. being behind, back-to-back …

Dynamic events
➢ First order, e.g. approaching, following …
➢ Second order, e.g. approach to contact, escape from contact …
➢ Third order, e.g. move to contact and escape …

Repertoire of social interactions is based on *de Chaumont et al., Nature Methods (2012).*

Social Behavior Examples

7: small distance
9: **B** behind **A**
15: follow

7: small distance
12: **B** goes to **A**
17: **B** to **A**; contact
23: **B** to **A**; B escapes

Contact Event Classification

Belly — Head — Beginning of the tail

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1. Contact	4. Oral-Genital Contact B-A
2. Oral-Oral Contact	5. Side-by-Side parallel
3. Oral-Genital Contact A-B	6. Side-by-Side antiparallel

Workflow Description

➢ Placement of two mice into the observation cage
➢ Simultaneous recording of:
  ➢ Thermal image
  ➢ RFID detection events
➢ Data fusion of video and RFID data:
  ➢ Animal contour recognition and vectorization
  ➢ Confirmation of identity using RFID forward/backward data
➢ Classification of social interaction events
➢ Export as data and annotated video file

Applications

➢ Individual sociability quantification
➢ Short term studies, first encounter
➢ Long term studies, social behavior
➢ High throughput social phenotyping
➢ Disease models for autism and mental disorders
➢ Pharmacological studies

Example Data
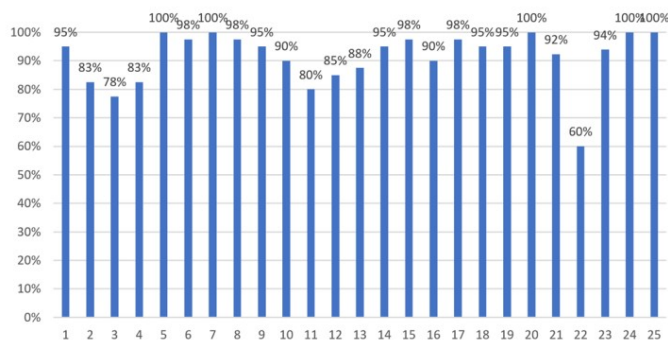
Human vs. computer scored events. Correct classification was above 80% for most actions and often above 90%.
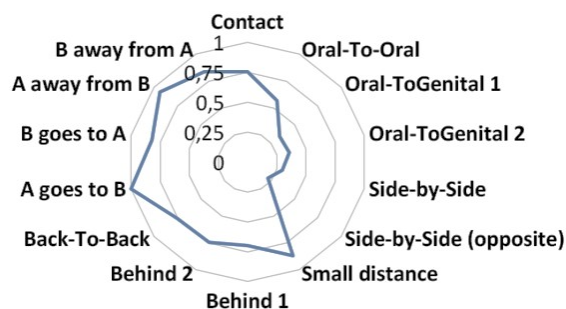
Sociability ratios of FVB compared to C57BL/6 mice (static events)