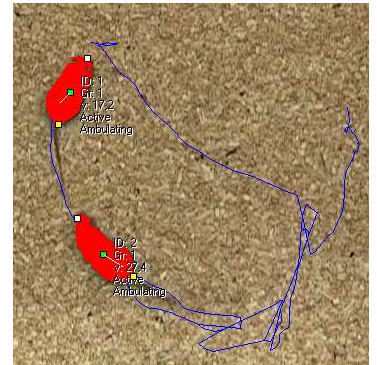




The all inclusive tracking solution

Tracking several animals with nose, body and tail detection

The tracking software *Viewer* enables you to record and track an animal automatically in an experimental setup designed according to your individual requirements. The animals bodies are detected with a complex contrast filter method. The point of mass, as well as the nose and the tail of the animal, is determined. This enables the system to calculate the orientation of the animal. This is very important to measure inspection times (object recognition), exploration behavior, sniffing or complex social interaction experiments (aggressive and submissive behavior as well as active and passive contacts).



Zones

The zone definition function is very useful if you would like to observe, quantify, or compare the behavior of an animal in one or more defined areas. You can create zones with different forms and grids with columns and rows. You can use the zones also for starting and/or stopping an experiment or to control external hardware when the animal enters a zone by using built in output channels.

Data acquisition

Based on the x/y coordinates, different parameters are calculated and presented in real time during the experiment: Time, track length, experiment duration, velocity, velocity classes (user definable), ambulation (user definable), activity/inactivity (user definable) and the distance to each zone.

For each zone created, the following parameters are gathered:

Velocity, track length, length of stay, number of entries, head waggings, head stretches, freezings and activity.

Data Analysis

All data are analyzed and presented in real time in different diagrams and graphs that can be exported and printed in different formats. Also all acquired data can be exported in various file formats for further analysis.

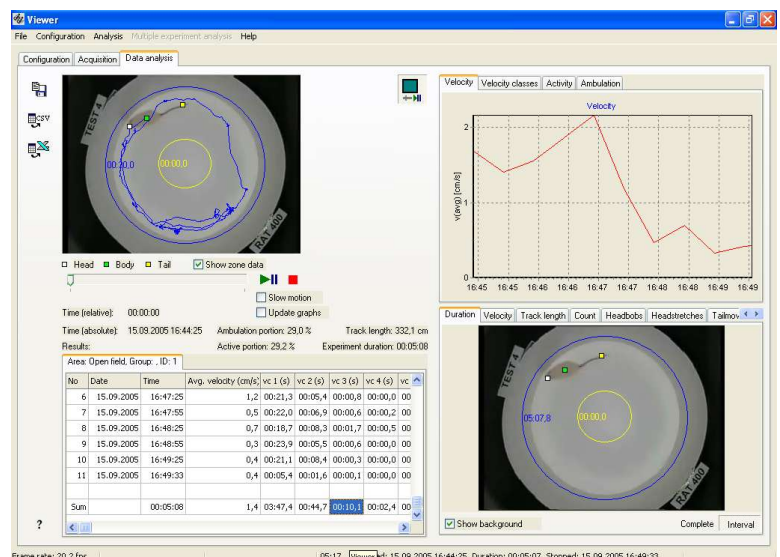
Once you acquired data you can reanalyze these data with other settings and parameters without conducting the whole experiment again. It takes only seconds to reanalyze old data.

Simultaneously to the tracking experiment the camera signal can be recorded and stored as a digital movie file.

Experience

We do three-point-tracking since several years and we have a lot of experience in the algorithms that are necessary to track one or several animals at the same time. But not only the techniques that are used for three-point-tracking are important. It is also important to analyze the acquired data in a way that really provides additional information.

Based on our experience we have developed many algorithms for extracting different behaviors like head stretching, head wagging, freezing, circling, tail moves and complex social interaction parameters like active and passive contacts, aggressive and submissive behavior.



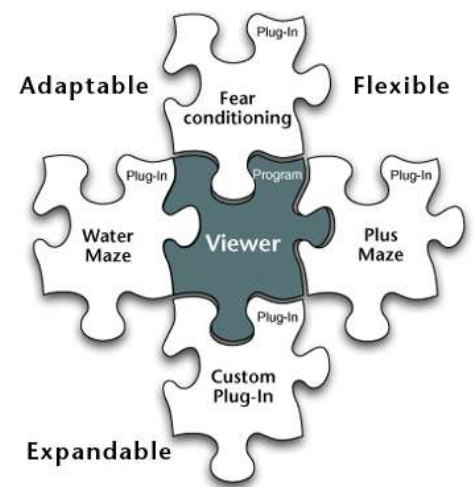
The Plug-In solution

Viewer is a very flexible tool and offers a variety of parameters, graphs and data displays.

However it cannot cover everything in the standard version and that's why we invented the Plug-Ins for our tracking software.

Either for standardized experiments (e.g. water maze) or for your special experimental setup we offer Plug-Ins that provide even more parameters in the configuration and different tables and graphs in the analysis.

The Plug-In solution offers you flexibility and extensibility and will improve your productivity. We develop and design new Plug-Ins together with you, our customers.

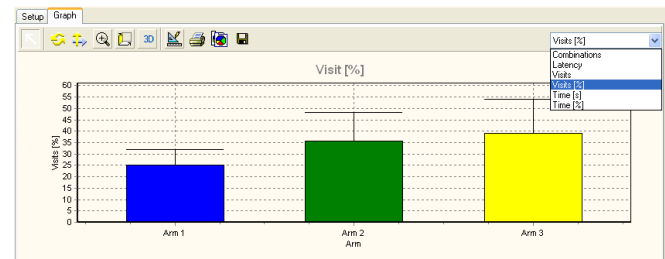


Y Maze, Plus Maze, Radial Maze, Water Maze

For mazes we provide special plug-ins that are tailored to the data analysis for each different maze.

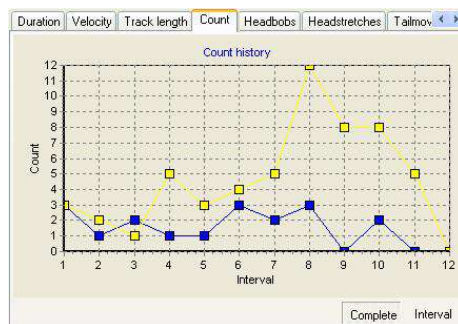
In addition, not only the results for a single experiment are displayed but for experiment series and groups. You can easily sort your data into different groups and compare the pooled data within the Viewer software.

You do not need to export data to get statistics and group analyses.



Object Recognition

To perform an object recognition experiment with a tracking software, it is necessary that the software is capable to detect not only the center of mass of the animal but also the nose and the tail. Otherwise it would not be possible to ensure that the animal has inspected the object with its nose. The Viewer tracking software tracks all three points of an animal (nose, center of mass, tail). But even if the nose of the animal is within the zone there is a difference. And we make sure that you can detect the difference with our solution.



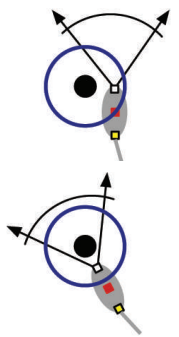
We not only measure how often the nose is close to the objects.

We also factor in the orientation of the animal when the nose is in the zone.

As you can see in the two figures, there are situations when the nose is in the zone but the animal does not look at the object.

We take that into account.

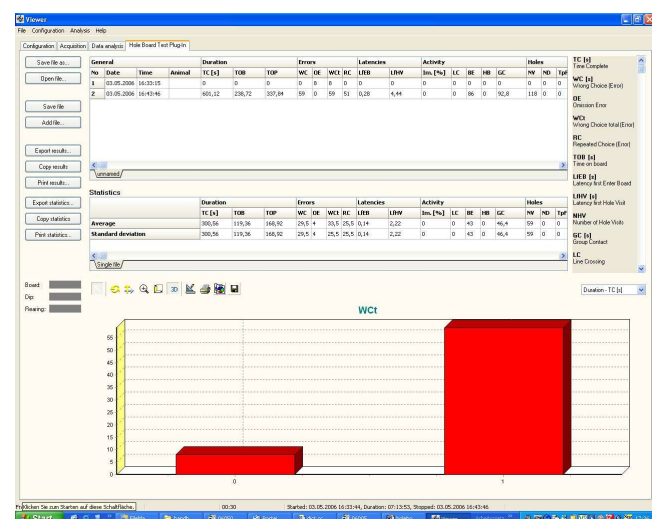
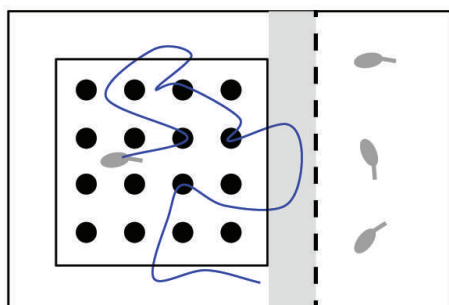
In addition, we also use the velocity (max. velocity allowed during inspection) and the time spend close to the object (min. time required) to decide whether the zone entry has been an inspection or not.



Modified Hole Board Test

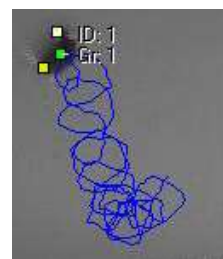
With the Modified Hole Board Plug-In, combined with rearing and nose dip light beams all parameters of the MHBT can be acquired automatically:

Board Entries, Group Contact, Head Bobs, Immobility, Line Crossing, Latency first Enter Board, Latency first Hole Visit, Number of Dips in holes, Number of Visits, Rearing On Board, Omission Error, Rearing On Periphery, Repeated Choice error, Time Complete, Time On Board, Time On Periphery, Time per Food Intake, Wrong Choice error, Wrong Choice total.



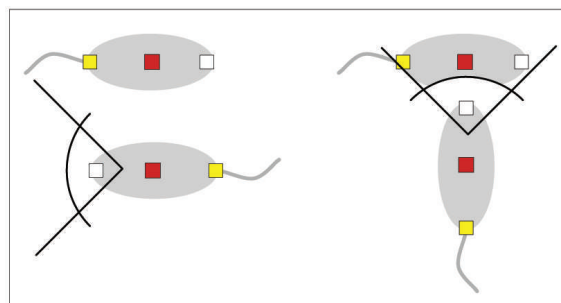
Rotation behavior

Nowadays rotation or circling behavior is mostly analyzed manually or with special hardware that impairs the behavior of the animal. With the Viewer software, you can measure this behavior just with a video camera. Based on the three points we track and analyze the rotation behavior, providing not only the number of rotations, the direction, velocity, diameter and the angle. Again, graphs and statistics are included in the plug-in.



Real Social Interaction

Measuring social behavior is a complex task. It is indispensable necessary, that you know the orientation of an animal (the nose, body and tail position). To provide you much more than just contact times in a social interaction test, we analyze the time pattern of the orientation of the individuals to each other. With this detailed analysis, we calculate the following parameters: Number and duration of contacts, active and passive contacts, aggressive and submissive behavior, following, chasing behavior, anogenital contacts. Based on the three-point-tracking (nose, body, tail) we can clearly distinguish between a simple passing on the left side (passive contact) and an active contact on the right side. The Viewer software knows the orientation of the animal so it can measure an active approach indisputable.



Active & Passive contacts

Sniffing behavior for example is defined by orientation of one animal being in sight of the corresponding animal. During this time the active animal moves its head while retaining the same position of its body. This behavior is counted by our software as an active contact. If only one animal is sniffing, the behavior of the other individual is counted as a passive contact.

Aggressive & Submissive behavior

If an animal shows aggression, the body is moving much more than the head but does not change that much in its position, for example during biting. The submissive animal shows an avoiding behavior by moving away and looking away. With help of these definitions we score in addition to active and passive contacts aggression behavior and submissive behavior.

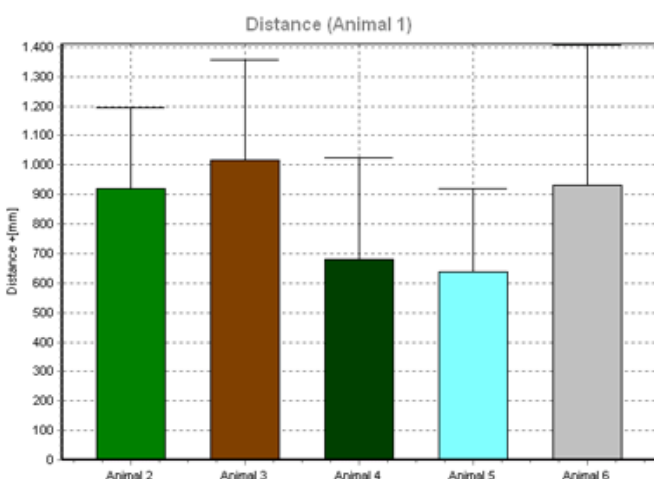


Figure 1

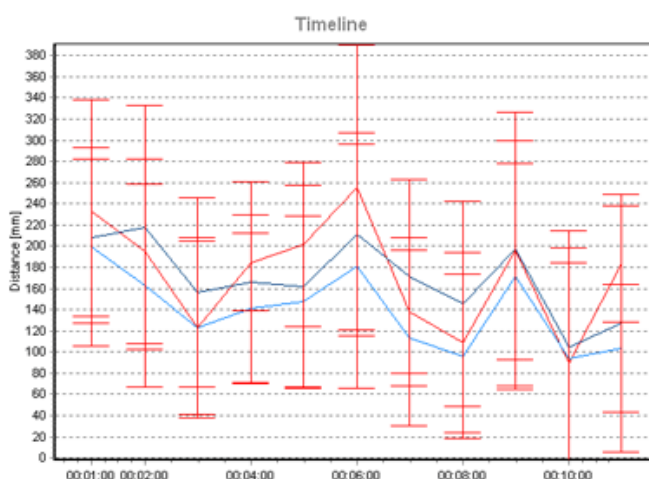


Figure 2

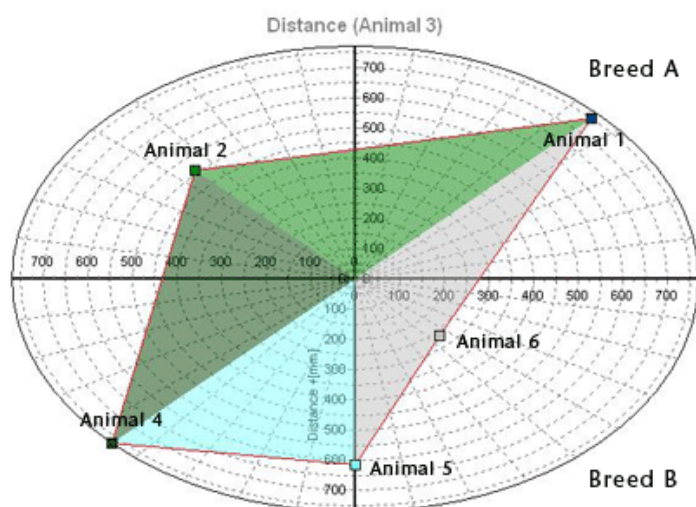


Figure 3

User story

The three figures show the results of a customer who investigates the social contact behavior of several animals of two different breeds and is interested whether there is a difference of social contact behavior within each breed or across the breeds. Six animals - two breeds with three animals each - are tracked simultaneously in a big arena. The Viewer software distinguishes the different animals and breeds automatically, there is no need to mark the animals.

Figure 1: Average distance of animal 1 to the other animals.

Figure 2: Average distance between the breeds over time.

Figure 3: Average distance of animal 3 (center) to the animals within the same breed (A, upper half) and the other breed (B, lower half of the circle).

All graphs are made with the *Viewer* tracking solution.

All inclusive

One version fits all. We provide one version of the software that you can use for all your experiments. There is no need to compare feature tables before you know what Viewer version you need and you can be sure that you don't need to buy another version if you want to do other experiments sometime in the future.

Some of the Viewer basic features**Tracking**

The software can be used to track animals in several arenas simultaneously. Viewer can also track several animals in one arena, recognizing the nose, body and tail position for each single animal without marking the animals.

Posture Analysis

Due to the fact that we collect the x/y coordinates of three points (nose, body and tail) our software can automatically detect and count behaviors like head wagging, head stretches, tail moves, freezing, rotation behavior, etc..

Zones

The zone definition function is very useful if you would like to observe, quantify, or compare the behavior of an animal in one or more defined areas of the experimental setup. You can create zones with different forms and you can use grids with columns and rows. You can use the zones also for starting and/or finishing an experiment or you can use them as triggers to control external hardware. Thus it is possible to set up automated training and learning experiments.

Data Acquisition & Data Analysis

All data and graphs are presented in real time enabling you to see directly what is going on during the experiment. The software provides customizable interval data showing the values for each interval or for all intervals over time. The data can be exported to other applications. Further individual data analysis can be conducted. The automatic export function for MS® Excel or XML is integrated.

All diagrams and graphs generated during the experiment are saved in the vector graphic format (wmf) thereby making them easy to integrate and work with in other programs. After having conducted an experiment, the movements of the animal can be redrawn as a trajectory in either defined time windows, or for the entire duration of the experiment.

Analysing large amounts of data

In combination with our *PhenoFinder* solution it is very easy to analyze many result files, pool data, perform cross correlations and perform multidimensional data analysis. The *Viewer* result files can be used natively in this application and all data that are available in a result file can be used to find and sort your data.

Digital video encoding included

You do not want to fill another locker with video tapes?

With the Viewer software you can directly encode your experiment to a digital video file in real time. There is no special hardware required. Easy to do, easy to store and easy to handle.

Recalculate old data with new parameters

Now you can easily recalculate old tracking data with new parameters.

Since the software stores all acquired data within the result file you can now reanalyze old data based on a new configuration.

Load a result file, change the configuration (e.g. modify the zones) and reanalyze the data. It takes only seconds. Thus you can also use your old data if a new question appears.

Useful for many behavioral experiments

The "Viewer" tracking software can be used for many different experiments like all kinds of mazes, open field tracking, object recognition and novelty scan. It is a kind of a swiss army knife for behavioral phenotyping.

Further information

Please do not hesitate to contact us for further information (see below).

We would be happy to discuss your requirements with you and provide the best solution possible for your individual needs.

We offer screen sharing sessions where we show you the system in action and demo versions are available, too.