



Revolutionizing
Behavior Research



FootFaultScan

Features:

- Specialized Foot Fault and Locomotion Behavior Analysis System
- Works with the TopScan platform
- Integrate seamlessly with other Top View Analysis
- Can also work as an independent hardware device only, without video
- Full color-analysis
- Shows full animal body clearly at all times
- Provides two major types of behavior data: Foot Fault Data & Locomotion Data
- Exports conveniently to Excel, formatted for input into Stats packages
- Statistics can be exported across Groups of animals
- Result review, Visualization of Acquired Experiments
- Extensive Experiment Database Management included!
- Batch-mode allows user to run multiple videos successively without human intervention

Measures FootFaultScan can provide:

- FootFault Count
- FootFault Frequency
- Distance Traveled
- Speed
- Zone Visits
- Zone Time Spent
- Latency to enter zone

FootFaultScan is the new name for our existing Parallel Rod apparatus and software system. It includes a Parallel Rod hardware device and associated software that measures up to 3 behaviors: foot faults which are measured by a touch sensor underneath the parallel rod floor, locomotor activity measured by video analysis from the top, and partial foot faults that are detected using a side-view camera. The system is available with chambers of different sizes for mice and rats.

The parallel rod floor test and apparatus have been designed as a measure for ataxia in mice and was created as a replacement for the rotarod test, because more active mice demonstrated a higher ability to make errors independent of their actual coordination. In an effort to control these errors and allow for the simultaneous measurement of locomotor activity the parallel rod test was developed. Since then, it has been demonstrated as an excellent assessment tool for analyzing mouse behaviors in reference to the vestibular system or parts of the proprioceptive system (Kamens & Crabbe, 2007). Researchers can index ataxia by combining the two measures (foot drops per cm traveled x 100) in an effort to control for individual differences in activity.



Research questions about gait, balance, proprioception, muscle strength, multiple sclerosis, stroke, hyperthermia, drug and alcohol intoxication can all be explored using the parallel rod test.

The floor of this device is made up of a series of parallel rods with constant spacing. Normal animals should have the ability to place their paws on the rods while moving around inside this device. Normal animals should have enough dexterity to minimize the number of foot faults or foot slips. A foot fault occurs when the placement of the foot is not on the rod itself; instead, the foot dips in the space between two rods. A metal plate is present beneath the parallel rod floor, which when made contact with the foot, outputs a signal to the computer which records this foot fault.



FootFaultScan

(Continued from front)

Applications:

- Spinal Cord Injury
- Parkinson's Disease
- Alzheimer's Disease
- ALS
- Arthritis/Pain
- Neuromuscular diseases
- Skeletal muscle diseases
- Ataxia

Results:

- Objective Foot Fault Data normalized with Locomotion Activity Data
- Automatic Export to MS Excel
- Complete Experiment Database Management
- Summary data for each measure for each defined events
- Group Export available that allows multiple animals' data to be exported to a single Excel sheet allowing easy Group or sub-group analysis

Requirements:

- Windows-based PC
- Intel High-speed Processor
- Special Videocard for realtime analysis
- Large HDD space for storage
- Video-multiplexer for multi-camera feed

FootFaultScan system can be configured at 3 different feature levels: (1) a basic counter system which does not require a camera, simply uses the touch sensor to count the number of contacts over time. It outputs the number of contacts, frequency, duration of each contact, total contact time, etc.

(2) a system that takes video of the animal (mouse or rat) in the chamber from the top that allows quantification of the locomotion information which, in turn, can be used to normalize the foot fault count data. For example, if an animal never moves, it is understandable that it may have very few foot faults, while another animal that has moves around a lot may also have the same small number of foot faults;

(3) a more advanced system that utilizes a second camera from the side pointed at floor level that can be used to determine partial foot-fault events where the foot drops beneath the floor but never makes contact with the floor. The counter would surely miss these partial foot-fault events, but, the side camera will be able to detect these events.

FootFaultScan can reliably analyze the video and determine various characteristic locomotion parameters such as distance traveled, speed and zone visits. A sample screenshot of the **FootFaultScan** software is shown below. Every Foot Fault (Foot Slip) is recorded as an event, including length of each foot fault, frequency, etc. This allows the user to study the relationship between limb activity and locomotion activity.

Arena Status

Arena	State	Start	Stop	Duration	Comment
1	Analyzing	0"		146.33	In

Illustration

Event

ID	From	To	Length	Event
1	0"	2'26"	146.3	Area:Mouse 1 Center In Box
2	2"	2"	0.3	FootSlip (High On ParPo...
3	6"	6"	0.2	FootSlip (High On ParPo...
4	9"	9"	0.3	FootSlip (High On ParPo...
5	15"	15"	0.2	FootSlip (High On ParPo...
6	25"	25"	0.4	FootSlip (High On ParPo...
7	47"	48"	0.3	FootSlip (High On ParPo...
8	57"	57"	0.2	FootSlip (High On ParPo...
9	1'22"	1'22"	0.2	FootSlip (High On ParPo...

Result

Event Statistics	Social Distance Statistics	Signal	Debug Information							
Arena	Criteria	Bouts	Duration	%	Latency	Dist(mm)	V(mm/s)	Elong	TAngleSum	AverAngle
1	Area:Mouse 1 Center In Box	1	146.33	100	0.00	952.27	6.55	2.02	484.29	3.31
1	FootSlip (High On ParPo...	8	2.20	1.5	2.53	18.07	8.21	2.18	31.63	14.38

After analysis, **FootFaultScan** can output the detailed results of these parameters as Microsoft Excel files, which allows the user to do further analysis through statistical analysis software like SAS or SPSS. Complete experiment database management function is provided for large group study. Advanced functionalities, such as visualization and post-analysis, batch mode analysis, group export, export video clips corresponding to specific detect event, record are available.

Unique Capabilities:

- Complete Hardware and Software Solution
- Works with rodents of all colors/sizes
- Analyzes up to 720x480 at 30 frames per sec
- Records video into storage during analysis