



Revolutionizing  
Behavior Research



# SeizureScan

SeizureScan is a specialized product for automatically studying epileptic seizure behaviors of rodents in a home cage. SeizureScan automatically analyzes video of a rodent in a cage (home cage or any other specialized cage) from the side similar to the way HomeCageScan does, and outputs various occurrences of seizures in the animal.



This automated method for analysis of epileptic seizures in real-time or from lengthy continuous digitized video has been achieved using state-of-the-art digital video analysis technologies based on the semiology of the seizures. SeizureScan has an easy-to-use interface that allows a user to quickly input the required data and begin the analysis. Once the analysis has been started, the user need not be present. Upon completion, the system gives a detailed output with various detected seizures and some statistics.

The latest version of SeizureScan has the ability to operate in one of two modes: Short-Term/Acute Mode or Long-term/Chronic Mode. In the Short-Term/Acute mode, typical of a PTZ test, the animal is monitored for a short duration, say, 30 min or so. During this time, the progress of seizure activity from normal behavior (P0) to Behavior Arrest (P1), to Twitches (P2), to Forelimb Clonus (P3), to Generalized Clonic Seizures (P4), to Jumpy/Bouncy Seizures (P5), to Tonic Extension (P6) are analyzed. In the Long-Term Chronic mode, where seizures can be analyzed over extended periods of time, SeizureScan detects seizures of 3 types that are classified using the Racine scale – P3, P4 and P5 class seizures, with P3 seizures being relatively mild seizures to P5 seizures being the most violent.

Validation studies with mice in the Short-Term mode have shown high correlation with human scoring. Automation of this test now makes unconstrained high-throughput screening possible for the first time! Validation studies in rats under Chronic Mode have shown that both sensitivity and specificity have been optimized to approximately 80% levels simultaneously. Sensitivity levels can be increased by adjusting a few detection parameters in such a manner that false negatives are substantially minimized, while tolerating a slight increase in false positives, which can easily be filtered out using built-in manual-review based filtering tools.

## Features:

- **New for 2009: Version 2** released that can operate in **Short-Term/Acute** or **Long-term/Chronic** modes
- Fully automated Video-based Seizure Analysis System
- Side-view based analysis allows analysis on stacked cages or racks!
- Real-time or offline
- Continuous 24-hour or greater recording capable
- Easy plug-n-play functionality
- No user intervention required during experiment
- Full ability to review detected results and delete false positives
- Can split video into small video files on the fly!
- Detailed statistics about behaviors that occurred during the experiment
- Automated Binned Data and Advanced Behavior Sequencing Analysis
- Validated to be more than 90% accurate with respect to human scoring
- High-Throughput capable with 4 cages simultaneously
- Full color-analysis
- Automatic adaptation to changing environment, day/night changes
- Result review, Visualization of Acquired Experiments
- Batch-mode allows user to run multiple videos successively without human intervention

## Behaviors SeizureScan can detect:

### Short-Term/Acute

- Normal Activity (P0)
- Behavior Arrest (P1)
- Twitch (P2)
- Forelimb Clonus (P3)
- Tonic/Clonic (P4)
- Jumpy/Bouncy (P5)
- Tonic/Stretched (P6)

### Long-Term/Chronic

- P3 Seizure
- P4 Seizure
- P5 Seizure



## SeizureScan

(Continued from front)

### Applications:

- Epileptic Seizure Study
- PTZ Test Study
- Trembling Behavior Study
- Sudden Movement Detection Studies

### Results:

- Objective Seizure Detection Results
- Automatic Export to Excel
- Complete Experiment Database Management
- Summary of All Occurred Behaviors and their Durations
- Circadian Plots for each behavior
- Binned data at user-defined bin intervals
- Second-order Behavior Sequencing Analysis!

### Product Options:

- High-Throughput Option (H Option)
- Realtime Option (R Option)
- High-Throughput Realtime Option (HR Option)

### Requirements:

- Windows-based PC
- Intel High-speed Processor
- Special Videocard for realtime analysis
- Large HDD space for storage
- Good lighting conditions
- IR-switchable camera or red-light for night
- Video-multiplexer for multi-camera feed

SeizureScan can also be integrated with an EEG system so that SeizureScan displays the real-time synchronized EEG data on the SeizureScan interface. The EEG data scrolls automatically as the video advances during analysis. Clicking on a point in EEG will immediately locate corresponding video frame, vice versa. Since the video signals and the EEG signals are correlated in time, cues from one can be applied to the other to achieve synergy between the two channels of data.

This will be a powerful tool for scientists as the ability to screen animals for seizures automatically can be a tremendous resource. SeizureScan can be combined with HomeCageScan into a single system thereby allowing detection of not only seizure activity, but all the other behaviors that HomeCageScan can detect. This allows the user to determine what the animal was doing when it is not having a seizure.

Moreover, with multiple cameras hooked up to SeizureScan systems, the number of cages analyzed simultaneously can be increased further.

The screenshot shows the SeizureScan software interface. The main window displays a video of a white mouse in a cage. Below the video is an illustration of the mouse with a green outline. To the right of the video are two data tables: Behavior Sequence and Posture Sequence. The Behavior Sequence table lists behaviors such as 'Rear up To Partially Reared', 'Remain Partially Reared', 'Come Down From Partially Reared', 'Stationary', 'Walk Slowly', 'Remain Low', 'Turn', 'Remain Partially Reared', 'Walk Slowly', 'Come Down From Partially Reared', 'Turn', 'Rear Up', 'Rein RearUp', and 'Remain Low'. The Posture Sequence table lists postures such as 'Partially Reared', 'Cuddled Posture', 'Horizontal FrontalView', 'Cuddled Posture', 'Horizontal FrontalView', 'Cuddled Posture', 'Partially Reared', 'Rear Up Posture', 'Partially Reared', 'Partially Reared', 'Rear Up Posture', 'Partially Reared', 'Cuddled Posture', 'Partially Reared', 'Rear Up Posture', 'Partially Reared', 'Cuddled Posture', 'Horizontal FrontalView', and 'Partially Reared'. The interface also includes a control panel on the left with various settings and a timeline at the bottom.

Many advanced features are incorporated, including supporting full color analysis, automatic adapting of changing environment, automated handling of day/night switches, variable speed playback of specific video segment for specific detected behavior, etc. Complete Turn-key systems including all necessary Hardware and Software are available. Custom design of your environment to facilitate analysis, including lighting condition setup, IR/red light setup, cage enclosures, video integration, and video-feed to computer is also available.

### Unique Capabilities:

- Complete Hardware and Software Solution
- Seizure Detection Capability
- Analyzes 640x480 at 30 frames per sec
- Detects animals in low contrast also!
- Works with rodents of all colors/sizes
- Integrates with other devices/bio-signals/EEG.
- Records video into storage during analysis