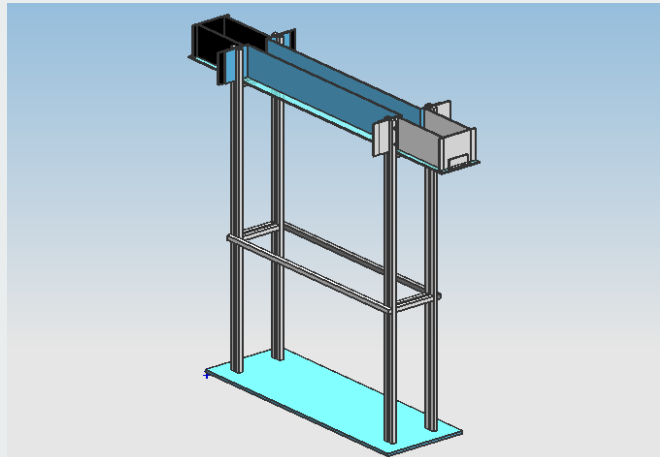# RunwayScan

Features:

- **New for 2010: Ability to operate in Light or Dark conditions, Bi-directional support, Incline feature & more!**
- Complete Gait Analysis software for Walkways
- Software tool applicable on any walkway providing clear ventral view, either in dark or lighted condition
- Shows full animal body clearly at all times
- Captures digital video at high-speed (100 frames per second or more) for 20 seconds or more per capture!
- Provides over 52 Different Measures of Gait!
- Automatically discards unusable portions of videos!
- Manual Override for incorrect foot & stride det.
- Displays a Pressure Map for each foot
- Exports conveniently to Excel, formatted for input into Stats packages, as well as Group Export
- Lists all samples collected per animal and their simple statistics
- Automatic Graphing of Gait Patterns in Export
- Software is trainable to adapt to changing environment
- Result review, Visualization of Acquired Experiments
- Extensive Experiment Database Mgmt Included!
- Batch-mode allows user to run multiple videos successively without human intervention

Measures RunwayScan can provide:

- Stride Time
- Stance & Swing
- Stride Length/Width
- Paw Pressure
- Print Area
- Body-Foot Spacing
- Inter-Foot Spc/BoS
- Running Speed
- Distance Walked
- Stance Graph
- Coupling/Coordination
- Regularity
- Support Times
- Print Length
- Toe Spread
- Intermediary Toe Spread
- Print Angle
- Gait Angle
- Body Rotation & Shift
- Stride Frequency

RunwayScan is a component of our *NeurodegenScan Suite*. RunwayScan system meets the needs for gait analysis of animals. Gait analysis allows highly sensitive, noninvasive detection and evaluation of many pathophysiological conditions, such as those occurring in Spinal Cord Injury, Parkinson's disease, Alzheimer's disease, ALS, arthritis, pain, neuromuscular and skeletal muscle diseases.

RunwayScan system takes video of animal (mouse or rat) walking on a clear walkway either in the dark or using normal light conditions. The video of the ventral view (underside view) of the animal is obtained using one or more high-speed digital cameras. The video essentially captures the foot prints of the animal as they walk/run on the walkway. RunwayScan can work with videos taken from any walkway that allows the capture of its footprints on any video capturing hardware system with a high-speed camera. The RunwayScan device also has a new incline feature available.

RunwayScan can reliably analyze the video, and determine various characteristic parameters that are related to the pathophysiological conditions. These parameters include the stance time (paw on the belt), the swing time (paw in the air), total stride time, stride length, foot contact area size, foot pressure (measured using color intensity levels), body-foot spacing distance (distances between body and feet), foot spacing distances (distance between feet), running speed, stride frequencies, regularity/coordination or foot coupling measures (in-phase or out-of-phase gait patterns of feet), and Foot Print Analysis related measures such as foot print placement rotation angle with body and toe spread factors (splay). Also calculated are brake time (early part of stance until the paw reaches maximum contact) and propel time (latter portion of stance when the paw is propelling the body. RunwayScan also provides Whole Body Movement Information, including information about Body Rotation during walking, Body Shifting (lateral and longitudinal whole body movements) during walking. Body Support information including measures for fraction of time when zero, one, two, three or all four feet are on floor while walking are also provided.

RunwayScan
(Continued from front)

Applications:

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

Results:

- Objective Gait Analysis Results
- Ability to Review collected strides before exporting
- Automatic highlighting of sample outliers for error detection and correction
- Automatic Export to MS Excel
- Complete Experiment Database Management
- Full-list of all samples collected per animal, as well as, summary data for each set of measures output clearly to a separate sheet in an Excel file.
- 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 available high-speed Processor
- 2 GB RAM
- High-speed area scan digital camera
- Large HDD space for storing video data
- Controlled environment lighting conditions

RunwayScan outputs the detailed results of these parameters from analysis into Microsoft Excel files and gives statistical results to meet requirements in the research. Advanced functionalities such as batch mode analysis, group export, direct analysis of AVI captured files, and post-hoc conversion to compressed MPEG videos to save disk-space are available. A sample screenshot of the RunwayScan software is shown below. The stride data is shown on the right for each foot individually. The results are updated as the analysis takes place.
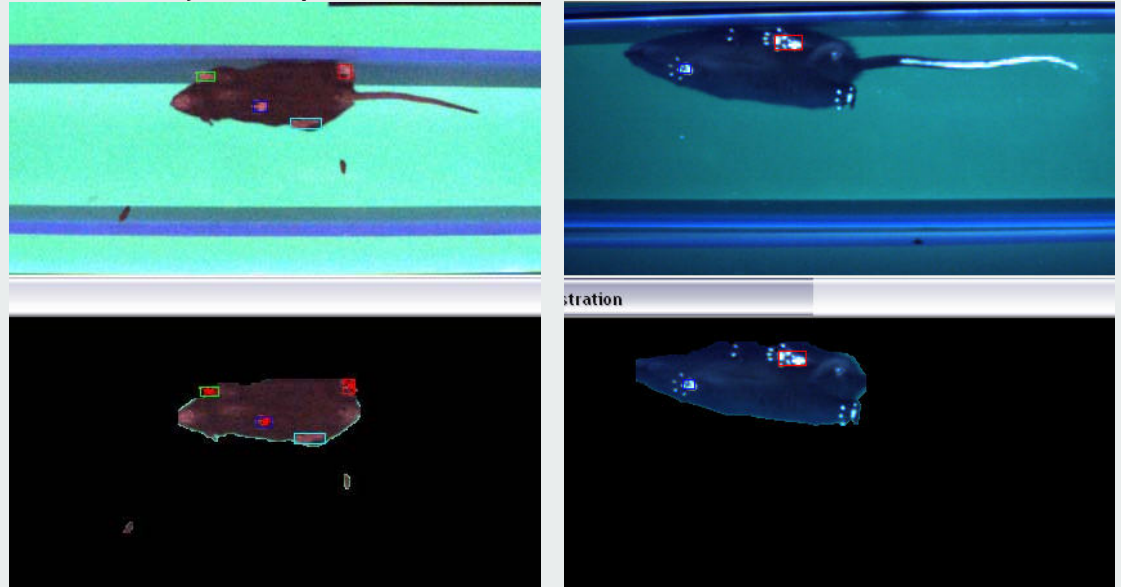
Now released RunwayScan version 2 includes several new features – a) Ability to measure and display Pressure of a foot during contact with floor; b) Ability to automatically detect and delete outliers as well as portions of the video that are not worthy of analysis, c) Ability to change or delete incorrect foot or stride detections, and d) ability to view and export the Ink-Pad like image that shows the placement positions of the various feet.

Stance Graph (Ink-pad Depiction)   **Full Pressure map**

RunwayScan can operate in both normal light conditions and using lights passed through the glass that causes specular reflection that highlights all contact points with the floor. Using either method, pressure can still be measured as shown in figures above.

Unique Capabilities:

- Complete Software Solution
- Analyzes at 640x480 at typical 80-100 frames per sec or even higher possible
- Detects feet in animals with almost similar coat color like Agouti and White mice!
- Works with rodents of all colors/sizes
- Stores video in MPEG with high-compression for optimal use of disk space and for re-analysis
- Provides a Comprehensive set of gait measures
- Export Stance Graph (a timing diagram of the foot stances and the foot contact size information) and the Ink-Pad image showing the foot placement positions
- Ability to automatically flag outliers for further review and discard unusable portions of video

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Clever Sys Inc.
The Behavior Recognition Company

Photo Credit: Bill Branson
Medical Arts & Photography Branch
Office of Research Services, NIH

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