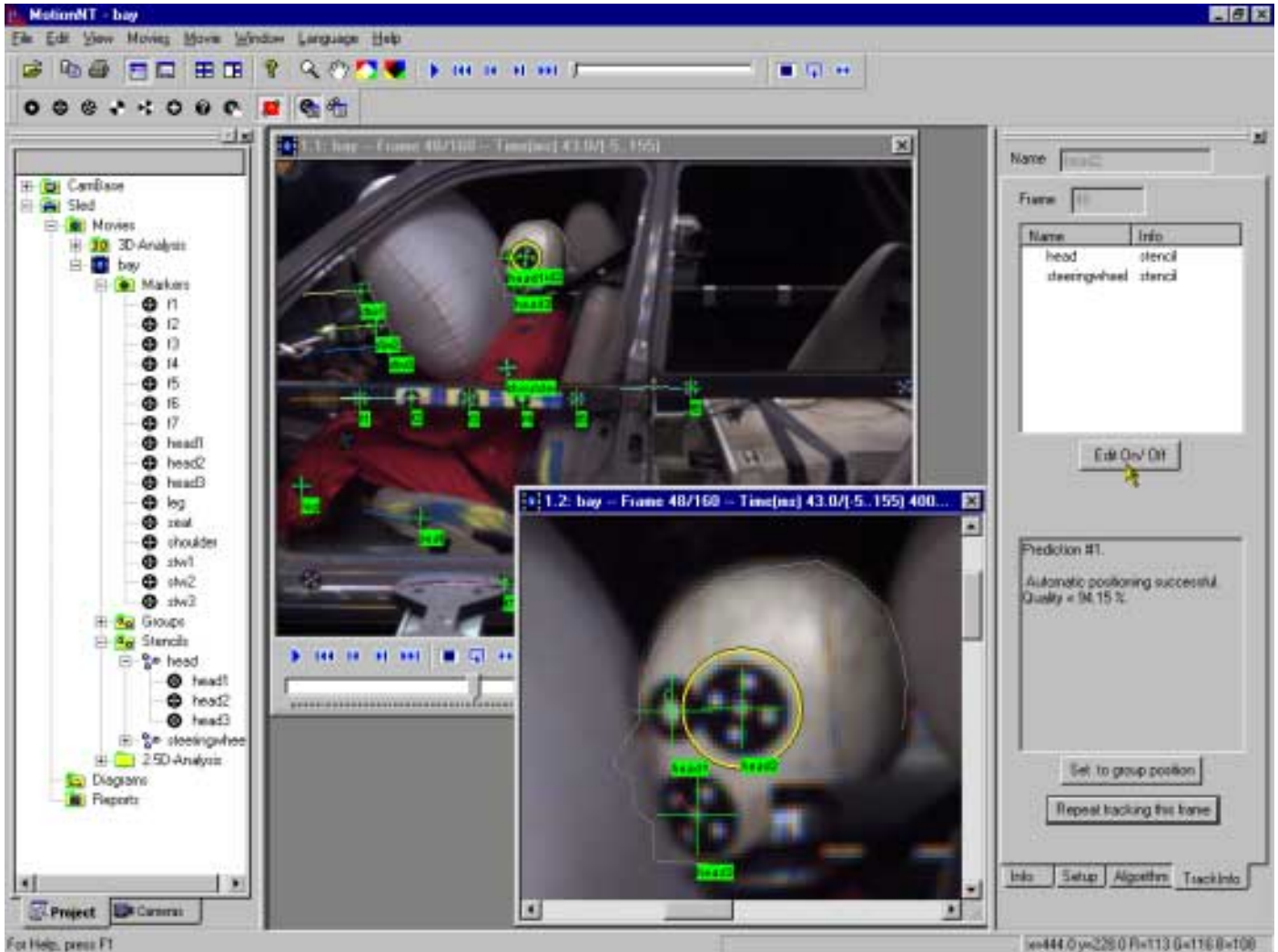


MOTION ANALYSIS



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Computer Supported Analysis of
Fast Movements



Features of MOTION Analysis

- Includes base system MOTION Server for convenient viewing of image-sequences
- Intuitive handling with drag-n-drop support and mouse based selection and editing in the viewing window
- Quick and easy definition and set-up of markers with only one mouse-click
- Fast and robust tracking of special markers (1 point, MXT-5 and 6 point) and any other objects (esp. quadrant, 6 segment and cross marker) with subpixel accuracy
- Simultaneous editing of one sequence and tracking of another sequence
- Any number of views per sequence, each with individual size and zoom; focusing on one marker possible
- Clear data structure with MME-project tree

Functions



Definition of a Session

- Load, edit and save projects based on the MME-file format
- Input of
 - ★ Test and session data
 - ★ Film and/ or recording features
 - ★ Calibration data
 - ★ Firm-specific report data
- Adding of any movies to one project

Scanning of Images

- Support of most movie formats
- Monochrome or color scans
- Automatic recording of time information from film, video or high speed system
- Control of and transmission from electronic high speed recording system (option)
- Digitizing of image sequences from analog video sources (scanner) via frame grabber (option)

Image Processing

- Highly qualitative and proven Signum-algorithms for color preprocessing of Bayer and Photosonics movies.
- Noise reduction, edge enhancement
- Contrast and intensity correction
- Change of hue and saturation
- White balance and black level functionality
- Gamma and histogram equalization
- Mirroring and rotation of images
- Resize

Definition of Marker

- Easy definition and set-up of markers for "still" (reference) and "moving" objects
- Fast and automatic positioning of special markers (1-point, 5- and 6-point MXT)
- Fast, automatic and orientation tolerant tracking of any rotating object (esp. quadrant, 6 segment and cross markers) with subpixel accurate correlation method
- Grouping of marker for extrapolation of invisible details
- Definition of contours and combination with marker (stencil method)

Tracking of Objects

- **Manually**
The positions are defined interactively for every single image by cursor. The system proposes the coordinates by linear prediction. In zoomed view mode adjustment with subpixel accuracy is possible.
- **Semi-automatically**
The positions are measured automatically. If a marker cannot be located using the selected tracking algorithm, several facilities for drop-out handling are available. If these fail, too, the tracking is interrupted and the user is informed about the reason of the drop-out. Tracking can be continued after editing the problematic markers.
- **Automatically**
The sequence is evaluated automatically without any need of an interaction. If the tracking of an marker fails and neither grouping nor linear extrapolation over a predetermined number of images can help, the processing

of this marker will be aborted (without affecting the other marker). Later on, this object can be handled separately, i.e. by interactive redefinition and continuation of tracking.

Correction of Trajectories

- Easy, interactive correction of single positions of a curve by drag-n-drop or mouse clicks in editing mode, resp.
- extremely easy correction of not recognized marker
- Verification of the results by graphic display or numerical listing in data window

Display

- Simultaneous playing of any number of movies
- Any number of views for each movie, zoom can be adjusted by mouse-scroll
- Optional overlay of marker, name or trajectories
- Coloured highlighting of marker or of their state, resp.
- Export of movie with overlay

Calibration

- Time calibration: fixed or variable raster
- Still or moving coordinate system
- 3D from single view: object-wise correction of parallaxes
- Camera calibration/ correction of optical distortions with CamBase (option)

Analysis

- Shift with respect to a marker or an image
- Extensive facilities for display of diagrams: choice of several trajectories, different functions ($x&y$, s / t , v / t , a / t , display simultaneously)
- Output of images and / or diagrams to printer
- Display of statistics (min-max, mean and std.deviation)

Evaluation of Curves

- Free evaluation of time curves
- Arithmetical combination of curves
- Integration and differentiation with tunable filter
- Usage of marker angle or calculation of angles between marker
- Output of results on screen or to printer
- Digital data interface

Archives of Results

- Storage of image data
- Management of result data and diagrams
- Access to different standard devices:
 - ★ Harddisk and floppy disk
 - ★ Image archive
 - ★ Transfer via network
 - ★ CDROM / DVD