ELCOVISION 10 – The Universal Tool in Traffic Accident Analysis

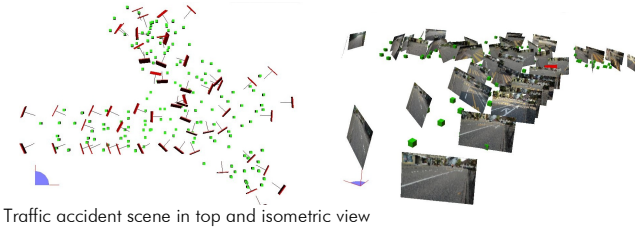
ELCOVISION 10 is used in traffic accident analysis since more than 20 years in many countries. Here we show in a few examples how traffic accident surveying is done very efficient and fast with ELCOVISION 10.

The first step in the accident analysis is photographing the scene. We suggest that the traffic accident scene is pictured twice: First with the cars and all the debris in place and a second time with the cars and debris removed so that hidden parts of the skid marks also are clearly visible in all images.

For traffic accidents in cities e.g. accidents within a small area mainly terrestrial images are used. However we recommend that the images are made from an as high as possible point of view. Most police officers use a small ladder or hold the camera over the top of their heads. The whole area is pictured in a systematic way: one image from the left side of the street, one from the middle and one from the right side of the street:

Left middle and right image with a 5m surveying rod as scale information

This is done for every 10 or 15m. Using this approach it is nearly impossible to miss an important part of the accident scene by mistake.



Traffic accident scene in top and isometric view

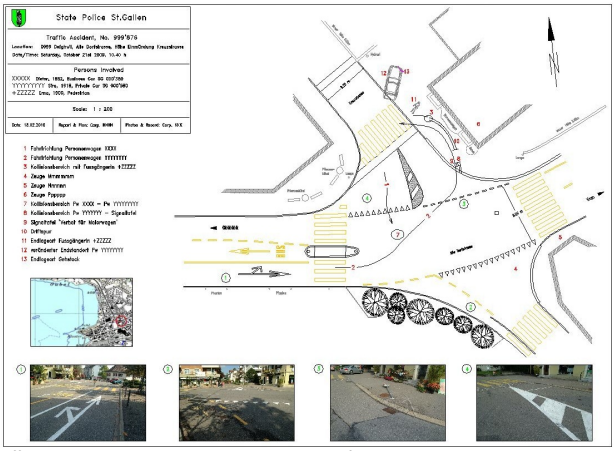
Traffic accidents scenes on highways (Autobahn) tend to be very big, more then 350m of skid marks and debris are unfortunately not uncommon. Some police departments use helicopters or battery powered remote controlled drones to make a series of low altitude aerial images covering the whole scene. This approach is typically much faster than taking terrestrial images and helps clearing the scene very fast in order to reopen the highway as soon as possible.

It is also possible to combine terrestrial images with aerial images into one photo block. This opens the opportunity to do high precision measurements in some parts of the scene, like deformation analysis of car parts.

Normally there is only a little preparation work necessary at the accident scene: Most police departments mark important parts of the accident like the begin and end of skid marks with a colored chalk spray in order to see them more easily on the pictures.

For the scale information various methods are used: In small area accidents one or more surveying rods are commonly used: They are placed at the scene during the photographing of the scene.
In huge accidents scenes a few control points are measured with high precision total stations. If a GIS (Geographical Information System) is available control points out of the GIS are also commonly used.

After taking the images they are typically filed at the police department. Only if necessary, e.g. the case goes to court the images are evaluated and a drawing of the scene is generated. For example in Switzerland typically only one out of ten traffic accidents is actually evaluated. This unique characteristic of ELCOVISION 10 saves a considerable amount of time and money for the investigating police force.
This evaluation is the basis of further investigations like the precise calculation of the speed of vehicles based on the length of the skid marks.



Traffic accident scene: Drawing and analysis of skid marks

Short summary of the advantages of ELCOVISION 10 in traffic accident analysis

- Very short time on the scene: The images are normally taken in a very short time: Typically 30 min when using terrestrial images, less than 10 min when using aerial images.
- All measurements can be repeated in the future. Forgotten measurements can be done at any time in the future. No other measurement method can do this.
- The actual measurement and evaluation work is done in the office.
- Very high accuracy: Typical accuracy is 0.5cm – 2 cm depending at the used camera. ELCOVISION 10 knows for each and every measured point the accuracy and can specify therefore the maximum measurement error. No other measurement method can do this that easily.
- All measurement are continuously logged for further reference.
- All measurements can be reevaluated at any time in the future and they can be proven to be correct and accurate. No other measurement method can do this.

ELCOVISION 10 Technical Data and Function Overview

Image Recognition and Image Processing

Reads and writes almost all known digital image formats

Full automatic raw-file converter with automatic image optimizing for maximum image quality

Integrated image processing module with color and contrast adjustment, gamma correction etc.

Optimized image display in the measurement magnifier for easy and precise measurement even in underexposed or overexposed image parts.

Réseau Measurement

Full automatic réseau measurement of digital images

Full automatic réseau measurement of réseau images of metric cameras with automatically chosen transformation: affine, helmert, projective or polynomial

Digital Rectification ELSP

Definition of 2D-rectification planes with known rectangles or arbitrary distance squares with 5 known distances

Definition of 2D-rectification planes by perpendicular and parallel lines and at least one known distance

Linking of 2D-rectification planes among themselves and also linking them into the 3D-space using 3D-control points

Definition of balanced 3D-rectification planes using 4 or more 3D-control points

Arbitrary trimming of the rectification planes with automatic determination of the circumference and the area of the resulting rectification plane

Optional lens distortion correction

Automatic rectification as many as desired rectification planes into a digital single picture e.g. an orthophoto

Full automatic generation of 3D-rectification planes from AutoCAD surface models

Full automatic transferring of 3D-rectified textures into AutoCAD

Automatic Image Measurement Modes

Automatic measurement of réseau crosses with sub pixel precision

Automatic measurement of targeted points with sub pixel precision

Automatic measurement of corners and edges

Measuring assistance by epipolar lines

Methods of Orientation

Arbitrary definition of the system of coordinates: Local by distances and/or control points, or with control points within a superior system of coordinates

Full automatic photo orientation

Single and two photo orientation
Multi photo orientation

Bundle adjustment with up to 1000 pictures and simultaneous camera calibration

Orientation of full spherical images

Definition of 3D Planes

Balanced spatial plane by 3 or more 3D-points

Definition of parallel planes by points or with arbitrary distance to other planes

Definition of perpendicular planes to arbitrary other spatial planes

Measuring Methods for Point Measurement and CAD Plugin

Rectification Measurement

Mono Photo Measurement: Intersection of a measuring beam with a 3D-plane

Two Photo Measurement: Balanced spatial intersection of two measuring beams

Multi Photo Measurement: Balanced spatial intersection of two or more measuring beams

Stereoscopic Measurement: Epipolar transformation of non stereoscopic images into a stereo image pair and displaying them with various methods like LCD shutter or anaglyph images.

Measurement from full spherical images

CAD Integration

Seamless integrated into the following CAD Systems, all drawing functions of the CAD become measurement functions

AutoCAD: Version 14 - 2010
IntelliCAD 2000
BricsCAD V10

Additional CAD Functions

Superimposition of the CAD drawing into the digital images

Draw perpendiculars with one single measurement

Measuring and drawing of single segmented lines

Simultaneous measuring and drawing of 3D-trimmed lines

Simultaneous measuring and drawing of 3D-balanced lines

Simultaneous measuring and drawing of UCS aligned lines

Circle intersection construction function

Drawing of 3D-circles and circular arcs with three 3D-measurements with plausibility check

Drawing 3D-rectangles with three 3D-measurements with plausibility check

2D-projection of a drawing into any plane

Optimized merging of single lines into 2D-polylines and 3D-polylines

Integrated 3D-surface modeler generating waterproof surfaces from 3D-clouds of points and 3D-line drawings

Built-in generating of contour maps from surface models

Special measuring functions for inserting blocks with automatic block adjustment

Special measuring functions for measuring cylinders and right parallelepipeds

Supported Operating Systems

Windows 95/98/ME
Windows NT 4.0/2000/XP/Vista/7

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