APPLICATION OF ENDOSCOPY IN ROAD-DESIGN

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Within the Dutch Ministry of Transport a special Division on Transport and Traffic Research is occupied with all aspects concerning mobility and traffic safety on a national level. Research and advice on the quality of the road-infrastructure is one of the main topics.

For road-design a set of very detailed guidelines have been developed. Construction and reconstruction of parts of the high-way-network are tested against these guidelines. In this matter the actual road-user takes a central place. In the design-phase of a project on road-infrastructure contributions of a number of experts are taken into account. Expert-opinions on elements of the road-design result in a overall road-design.

The road-scene of the overall-design is tested against visual requirements for safe driving, from a drivers point of view. Goal is to give advice on improvement of the visual quality of the road design. Research in this field is now carried out by Grontmij Consulting Engineers, mainly under authority of the Ministry of Transport.

Key-word is Improvement of Quality. Who is going to notice? Who will benefit from it? Of course it is a comforting thought for road-owners and designers to know they won’t have to be ashamed for what they have come up with. Primary goal is that ‘We the people’ are provided with a high-standard road infrastructure.

The road-scene research section studies the quality of the visual information as presented to the roadusers. We try to create visual circumstances in which drivers will be able to perform their driving task is a proper way. When the visual representation in the brain differs from reality, you have a serious problem. A traffic safety problem,
Figure 1

Figure 2
with casualties and fatalities. A burden for society, financially and emotionally. Various studies show that approximately 35% of all traffic accidents are due to human errors in observation, perception, recognition, estimations and decisions. If the visual information presented to the road-user contains ‘boobytraps’ you can’t blame the road-user when he or she makes mistakes that endanger traffic safety.

Starting from the user demands we derived 8 criteria a road-scene has to match. These criteria are: 1 quantity of information 2 continuity of information 3 anticipation sight and optimal guidance 4 dominance of scene elements in accordance with their function 5 scene-structure 6 recognizability of road-scene elements 7 orientation opportunities 8 attractiveness.

In order to examine whether a road design -in the designing phase- has the right visual characteristics to meet the expectations of road users a visualisation technique is required. The scale model is one of the techniques still very frequently used for road-scene research purposes. The most frequently used scale is 1:100. Practical limits are 1:50 and 1:500. A direct impression of the road-scene in the model is obtained with the aid of a periscope. Photographs can be made at the correct eye level with a special prismatic camera. Studying static images can be very useful. It is much more realistic however to have a dynamic representation of the road-scene. That is why Rijkswaterstaat developed an endoscope called ‘The Viascope’. 

**SPECIFICATIONS OF THE VIASCOPEThe Viascope is a computer-controlled road-scene simulator. It is a device which enables traffic-eng
image of sequences of road-scenes, as they are intended to be presented to future roadusers.

The Viascope has following components:

- a steel frame, 8 x 4 x 2 meters, in which scale models are positioned;
- a camera and a periscope, mounted to the ceiling of the frame;
- a sensor that maintains a constant eye-height;
- a unit to control speed, course, eye-height, etc;
- a monitor, showing the image from a position in the
scale model;
– a computer to calculate coordinates and positions;
– a video-recorder (U-matic, betacam);
– a video-recorder (vhs);
– 12 lamps of 2000 watt each.
– airconditioning

A scale model is placed on a table with a moveable top. In the control unit the operator takes place on an actual car seat, behind a steering wheel, a accelerator and brake pedal. The monitor in front of him represents the wind-screen. On a dashboard are a speedometer and some switches to adjust eye-height, angle of vision etc.

Accelerator and steering wheel are connected to a central computer, which translates the signals into actual changes in X- and Y-coordinates of the camera. Through a little mirror, attached to the periscope and the camera, the image of the road is presented on the monitor. The images are recorded on video. Changes in the road-scene on the monitor are a direct result of actions that are carried out by the operator. It is an interactive system, that is why we call it a simulation, not animation.

The Viascope is a road-scene simulator and should not be mistaken for a driving simulator. A validation research showed that the way people “drive” in the Viascope is in no way comparable to the way they drive on a real road, with actual traffic, a complex driving task and all sorts of feed-back. The Viascope provides experts with sequences of images which they evaluate. The Viascope can be used to assess the way people will experience a road, designed like the model in question. Experiencing roads and road surroundings is a phase preceding driving behaviour. Suggestions for improvement are based on this concept and criteria for visual quality while driving a passenger car.

APPLICATIONS

The Viascope was introduced in 1988. Since then a number a road-scene research and visualisation activities have been undertaken. The Viascope is used for various
projects other than road-design, e.g. architecture, video-
and televisionprogrammes, expositions and museums.

A videotape that gives an impression of the way in
which the Viascope was used in the last years was showed
to the audience.

THE NEAR FUTURE

As I pointed out before activities concerned road-scene
research and aesthetics are privatised. The Viascope is
still owned by the Ministry. The Ministry takes care of
housing and maintenance of the Viascope. When we
analyze the actual use made of the Viascope we have to
come to the conclusion that the market for endoscopy in
the field traffic and transport engineering is small and
getting smaller all the time. In The Netherlands the
demand for scale models is getting more and more
restricted to presentationmodels only. The market for
new techniques in computer graphics and virtual reality
is increasing rapidly. Visualising and moving through the
non-existing world is becoming a matter of Megabytes
and processors. The opinion at the Ministry, at several
universities and at research institutes is that the future for
scale models and endoscopy is limited more and more.
Even though this is a sad situation you cannot really argue
with this point of view.

The EAEA and this Conference are excellent plat-
forms to prevent all experience and expertise on scale
models and endoscopy from evaporating. This is a seri-
ous threat certainly in Holland. Perhaps I am getting a bit
melodramatic but if we want to survive we have to
combine our experience and expertise. We have to look
for new ways to improve ourselves. New ways in tech-
niquesinbuilding scalemodels; newmaterials, optimising
light and dark situations, moveable objects, sound, weather
conditions. And we have to improve the endoscopes;
stability, angle of vision, looking up, background facili-
ties and combination of different photo- and
videotechniques. All this against reasonable costs. This is
a bit of an ordeal. In this way we are making our product
more and more expensive while Megabytes are getting
cheaper and cheaper. But if the world of tomorrow is visualised in head-mounted displays only we will lose an important dimension.

I have to end this contribution with stating that I am no longer in the situation to take part in all these ideas. As a private consultant I have to keep the customer satisfied. In other words we are delivering what clients ask. Our clients’ demand for scale models and viascope-products is rapidly decreasing. The Ministry explicitly asked me to look for ways to find new exploit for our viascope among other experts. So, if the market for endoscopy is more stable in your part of the world and there are people among us who find the viascope an interesting machine, please contact me, for I might well be able to sell it to you.

Having been active in the field of traffic engineering and road architecture, using scale models and the viascope almost daily, it is with pain in my heart that I have to admit that there is no future for the viascope, nor at the Ministry, nor at Grontmij.