

# 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 in 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 fata

ities. A burden for society, financially and emotio  
ally. Various studies show that approximately 35% of all  
traffc accidents are due to human errors in observation,  
reception, recognition, estimations and decisions.  
f the visual information presented to the road-user c  
ontains 'boobytraps' you can't blame the road-use

when he or she makes mistakes that endanger traffic  
safety. Starting from the user demands we deri

ed 8 criteria a road-scen

has to match. These criter

a are:1 quantity of information2 contin

uity of information3 anticipation sight and opti

aguidance4dom

nance of scene el

ments in accordance with their functi

n5 scene-structure6 recog

izability of r

ad-scene elements7 orientation opportunities8 attractivi-  
tyIn order to examine whether a road design -in the desig  
ing phase- has the right visual characteristics to me  
t the expectations of road users a visualisationtechniqu  
is required. The scale model is one of the techniques  
still very frequently used for road-scene research purpos  
s. The most frequen

ly used scale is 1:100. Practical limits are 1:50 and  
1:500. A direct impression of the road-scene in the mode  
is obtained with the aid of a periscope. Photographs  
an be made at the correct eye level with a special prism  
tic camera. Studying static images can be very useful. It-  
is much more realistic however to have a dynamic rep  
esentation of the road-scene. That is why Ri

waterstaat developed an endos

opeçalledTheViascope'. **SPECIFICATIONS OF THE VI-  
ASCOPE**TheViascopeisacomputercontrolledroad-scenèi  
ulator. It is a device which enables traffic-eng  
neers to move a periscope attached to a camera thro



*Figure 3*

*Figure 4*



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 roadsurroundings 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 television programmes, 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 platforms to prevent all experience and expertise on scale models and endoscopy from evaporating. This is a serious 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 techniques in building scale models; new materials, optimising light and dark situations, moveable objects, sound, weather conditions. And we have to improve the endoscopes; stability, angle of vision, looking up, background facilities 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.

