



Case Study Eye Tracking: Subliminal Gaze Guidance

In order to determine the effectiveness of gaze guidance on visual performance, SMI has developed a new gaze guidance technology based on SMI's high speed low latency remote eye tracking system, RED250, and has conducted a study on driving safety. This was part of the "GazeCom" EU research project.

BACKGROUND

The goal of the "GazeCom" EU research project was to determine the impact of gaze guidance on effective communication.

Renowned partners were:

- University of Lübeck, Institute for Neuro- and Bioinformatics
- Justus Liebig University of Giessen
- University Medical Centre Groningen
- Katholieke Universiteit Leuven
- University Politehnica Bucuresti

"GazeCom" covered a broad range of tasks of varying complexity including basic research in understanding of visual perception and brain function and applied experiments.

www.gazecom.eu

The project was funded by the European Commission (contract no. IST-33816) within the Information Society Technologies (IST) priority of the 6th Framework Programme Future and Emerging Technologies (FET).

CHALLENGE

We can attend to a limited number of events at a time. Therefore, guiding a viewer's gaze to information of higher importance has the potential to improve our visual communication capabilities.

In order to effectively influence our focus of attention gaze guidance systems need to respond in real-time to a persons' gaze behaviour.

SOLUTION

Our contribution to gaze guidance is the integration of SMI's high speed low latency remote eye tracking system into intelligent displays. Guiding cues on these displays are presented to the viewer in real-time depending on his or her actual gaze position.

To determine whether gaze guidance based on this technology can increase driving safety, SMI conducted a study in an experimental driving simulator.

CONCLUSIONS

In the driving study, visual guidance provided by the gaze contingent display technology reduced the number of accidents. Most participants reported that gaze guidance was not consciously noticed. It worked subliminally.

The "GazeCom" project has shown that real-time gaze guidance realized with SMI eye tracking technology helps users to deploy their limited attention resources more effectively.

BENEFIT

The technology developed within the "GazeCom" project has the potential to increase visual performance in a broad range of applications where we need to communicate effectively.

For example, gaze guidance can be used to transfer expert knowledge to novices and to improve performance in tasks where safety is critical.



Prof. Barth, University of Lübeck:

"...The GazeCom project has shown that potential applications for gaze guidance are now becoming reality by the advances in SMI eye tracking technology..."

STUDY DESIGN

A driving route was set up in an enclosed part of a city. This route included sudden predefined events depending on the driver's location in the city.

The system used the drivers' eye tracking data to react with visual cues. Those cues were intended to shift the persons attention to objects of higher importance, e.g. a little boy crossing the street, in case the driver did not attend to them.

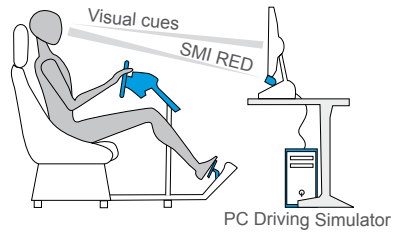


Driving simulator

18 participants drove two scenarios - one with and one without gaze guidance. Both scenarios included a predefined event where a diverting object (e.g. another car) and the object of interest (e.g. little boy) competed for the attention of the driver.

Methods used:

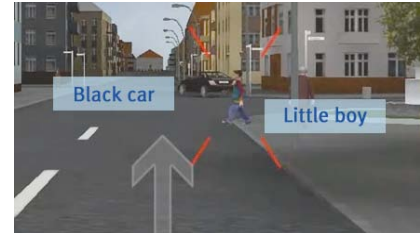
- Remote eye tracking
- Driving simulator
- Questionnaires



Set up

The gaze contingent display detects whether the driver looks at the little boy crossing the street or pays attention to a diverting object (black car).

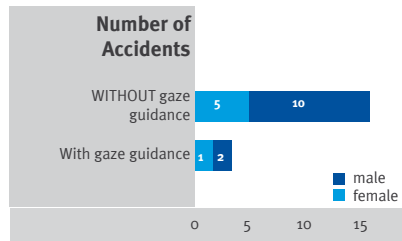
In case the driver doesn't look at the the little boy, the boy is marked with red cues to navigate the driver's attention. The cues disappear when the driver looks at the boy.



Little boy and gaze guidance

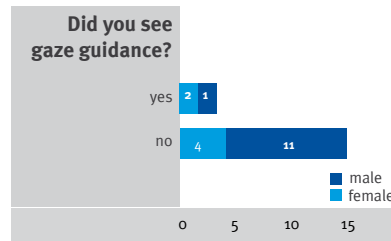
FINDINGS

1 Accidents are reduced!



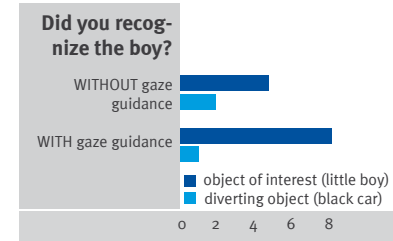
The number of accidents in the driving simulator was significantly lower with gaze guidance than without - regardless of age or experience of the driver.

2 Gaze guidance works subliminally!



83 % of the participants did not consciously notice the guiding visual cues though they obviously reacted to them.

3 Gaze guidance shifts attention!



Interviews after the study show that participants paid more attention to the object of interest with gaze guidance than without gaze guidance.

SMI EYE TRACKING

SMI's unobstrusive, high-speed (250 Hz) and low latency (8 ms) remote eye tracking technology has been integrated into display technology which detects where a persons' gaze is directed. The performance of the RED250 allows content modifications, which are so fast

that drivers do not consciously notice the cues and the guidance works subliminally. This new technology can be used to increase performance in teaching expert skills, in improving reading skills or in enhancing safety.



SMI RED250

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