



ROAD MARKINGS INCREASE DRIVER COMFORT AND SAFETY DURING NIGHT

RAINVISION

Results of WP2 – Driving Simulator

Pierre ANELLI



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ROAD MARKINGS INCREASE DRIVER COMFORT AND SAFETY DURING NIGHT

Purpose of the Study

To evaluate the **impact of the visibility** of **standard** and **enhanced** road markings in **night rain conditions**, also taking into account different **age groups**

Experiments

Static driving simulator

Simulated environment: 2-lane rural road

Driver's performance investigated in **night rain driving**

**Visibility
Class**

Condition 1: standard reflective road markings
preview time = 1.5 second (poor) RL 15 mcd/m²/lx

RW0

Condition 2: enhanced reflective road markings
preview time = 2.5 second (good) RL 50 mcd/m²/lx

RW3

Experiments

Coverage of the different ages of human vision

20-40

41-60

61+

120 male and female drivers

Class of age	Raw number of drivers	Exploitable number of drivers
20-40	47	45
41-60	41	40
+ 60	35	34
TOTAL	123	119

Gender	Raw number of drivers	Exploitable number of drivers
Male	69	68
Female	54	51
TOTAL	123	119

Selection of Participants

Systematic optical testing

Long-middle-short range vision

Customization to night time driving

- Binocular acuity
- Stereoscopic Vision
- Vision of colors
- *Vision of contrasts*
- Mesopic vision
- Glare recovery time



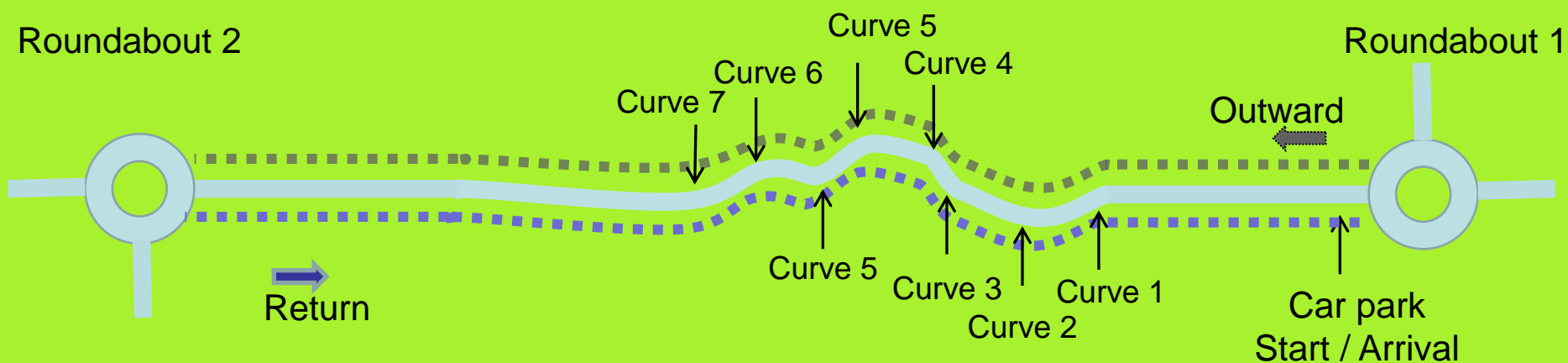
Support of ASNAV

FR Association for the Improvement of Vision

www.asnav.org

Simulated Itinerary Layout

2-lane rural road



Driving Simulator Test



Developer simulators

Triple screen for binocular perception

Realistic and adjustable
HMI: wheel, pedal box,
seat, seat belt

Ergonomically validated
with professional drivers



Condition 1 (standard RM)



edge line
distance of visibility = 30m
preview time = 1,4 sec (@80 kph)

center line
distance of visibility = 20m
preview time = 0,9 sec (@80 kph)

edge line
distance of visibility = 55m
preview time = 2,5 sec (@80 kph)

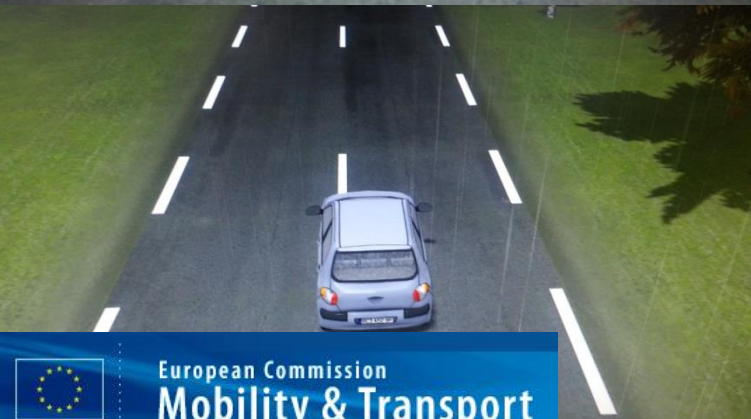
center line
distance of visibility = 35m
preview time = 1,6 sec (@80 kph)



Condition 2 (enhanced RM)

Measurement & Analysis of Driving Performance

Lane departures



Run off the road



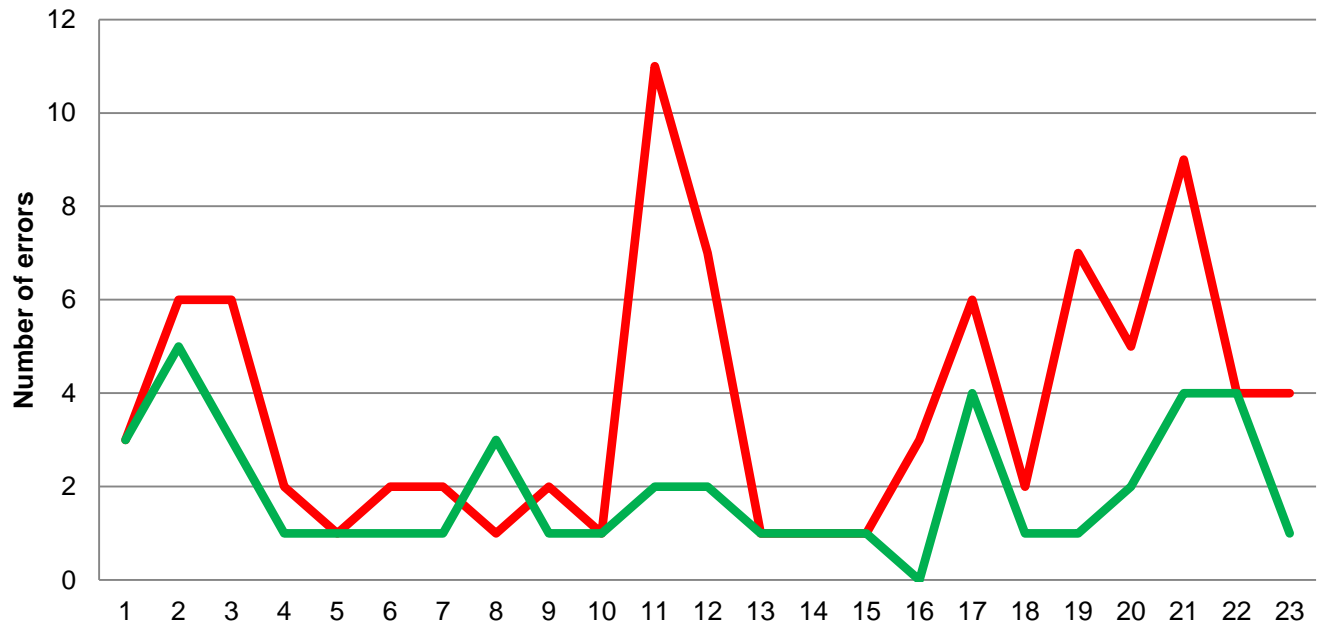


Results

Driving performance measured by drivers' errors

Age bracket 20-40

Standard vs. Enhanced road markings age 20-40



Condition	Lane Departures	Run off the road	Total
1. Enhanced RM	0.9	1.0	2.0
2. Standard RM	1.5	2.4	4.0

Errors for runs with more visible road markings are 50% less on average than for runs with standard RMs.

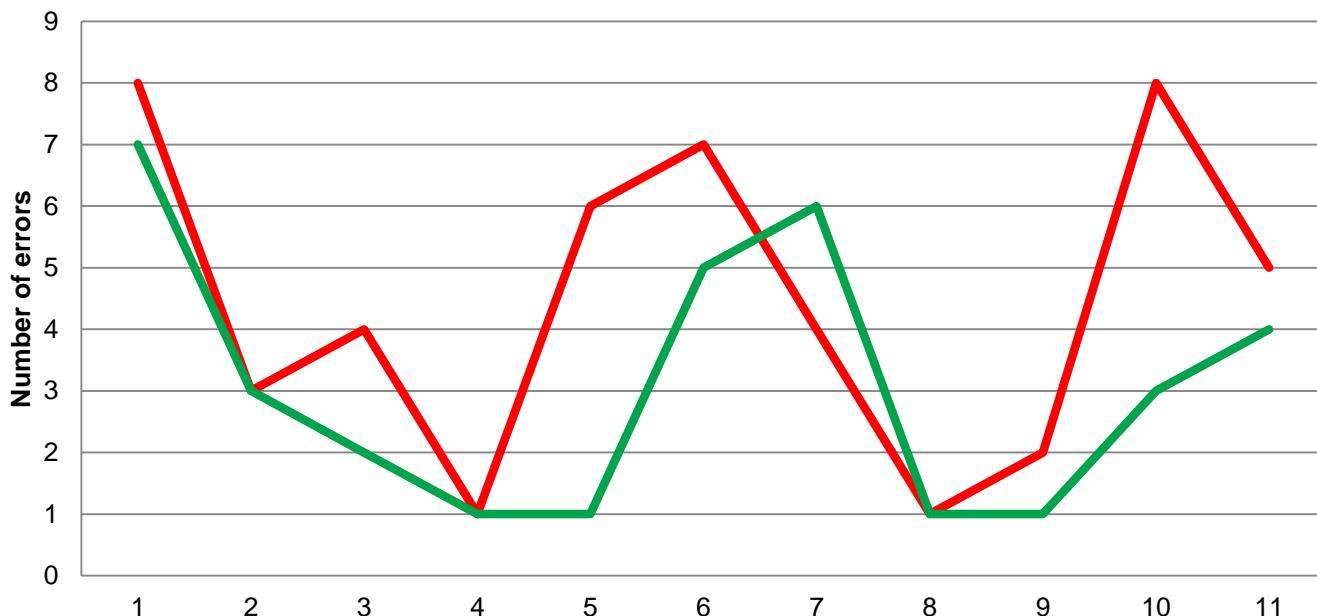


Results

Driving performance measured by drivers' errors

Age bracket 41-60

Standard vs. Enhanced road markings age 41-60



Condition	Lane Departures	Run off the road	Total
1. Enhanced RM	1.6	1.5	3.1
2. Standard RM	2.5	2.0	4.5

Errors for runs with **more visible road markings** are **33% less on average** than for runs with standard RMs.



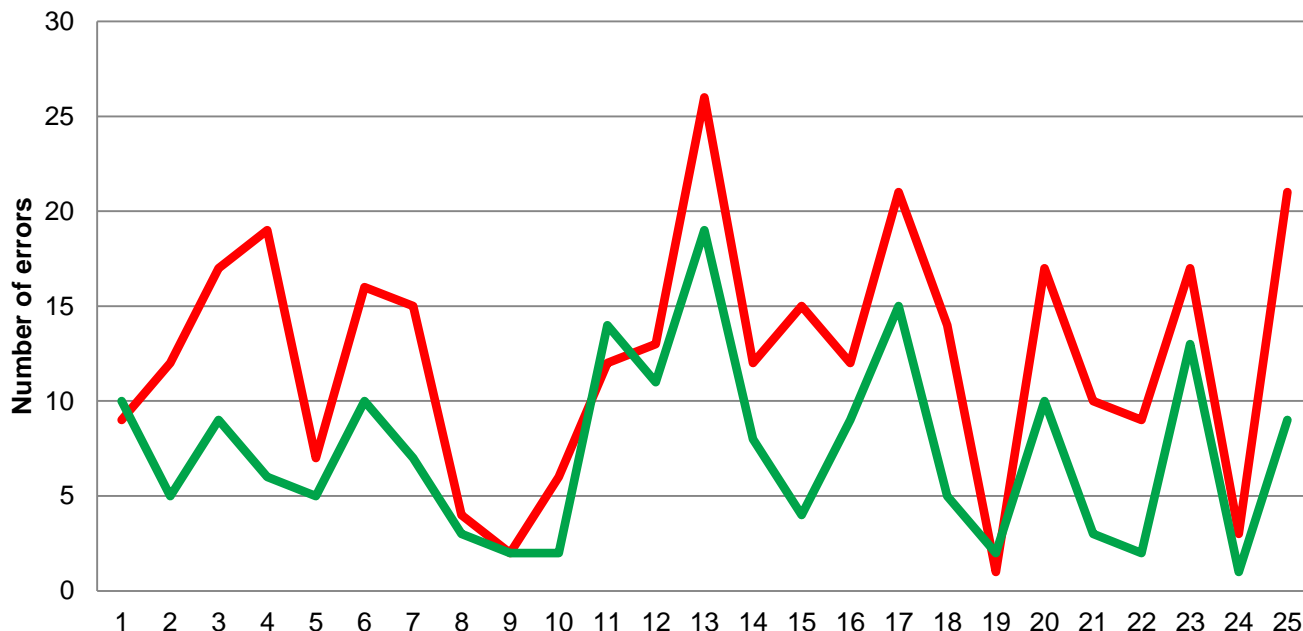


Results

Driving performance measured by drivers' errors

Age bracket 61+

Standard vs. Enhanced road markings age 61+



Condition	Lane Departures	Run off the road	Total
1. Enhanced RM	3.9	3.8	7.7
2. Standard RM	6.3	6.7	12.9

Errors for runs with more visible road markings are 40% less on average than for runs with standard RMs.

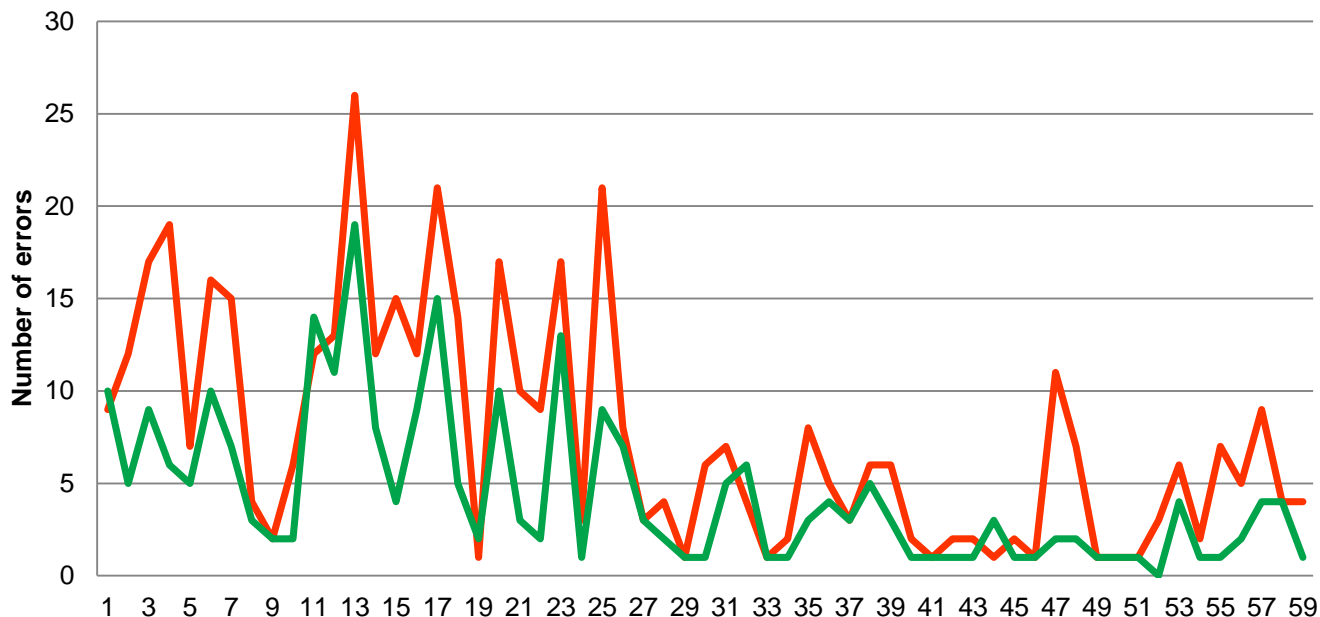


Standard vs. Enhanced road markings - all subjects

Results

Driving performance measured by drivers' errors

All drivers



Condition	Lane Departures	Run off the road	Total
1. Enhanced RM	2.2	2.2	4.4
2. Standard RM	3.6	4.0	7.6

Errors for runs with more visible road markings are 42% less on average than for runs with standard RMs.

Results: Conclusions

Improvement of road trajectory

Perception of the driving path

Greater impact for youngest and oldest drivers

Tested subjects slightly faster in visible RMs condition

Subjects generally failed to adopt an error-free drive in both conditions

Special attention to the legibility of the road (self-explaining)

THANK YOU!

Contact details:
Mr. Pierre ANELLI
anelli@aximum.fr
Phone: +33 620 876 093