



4. Presentation of mesopic research work

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European Commission GROWTH Project: Mesopic Optimisation of Visual Efficiency -

MOVE

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European Commission GROWTH Project:
Mesopic Optimisation of Visual Efficiency
MOVE



OBJECTIVES

To define relevant spectral sensitivity functions for low light levels (mesopic range) and to set up working practices that are accepted throughout the European Community.



Starting point to develop performance based mesopic photometry

- Different visual tasks are relevant in different mesopic applications
- We need to be able to assess visibility of various subtasks
- Several experiments needed to generate data on mesopic visual performance

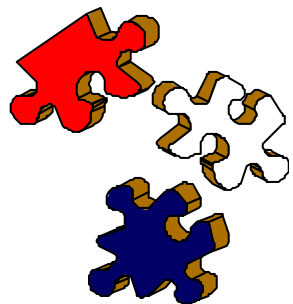
Objective to find out interaction between

Spectral sensitivity – Lighting conditions – Visual tasks in mesopic applications

New approach to develop performance based mesopic photometry

In MOVE we have adopted a multi-technique system

- use of different experimental techniques based on different visual criteria
- use of common parameter values
- combination of data from several test locations using different test methods and complementary equipment
- Multi-Mesopic-Model – MMM model





Multitechnique system of MOVE

Conduct vision experiments with complementary equipment of the partner laboratories

- Laboratory experiments, e.g. display unit, hemisphere
- Driving simulator experiments
- Field investigations, e.g. test car in traffic

Generate new data for mesopic visibility functions based on different visual criteria

Modelling the vision experiment data

- Combination and comparison of the generated data
- Experiments to validate the generated functions
- Test the new data with existing mesopic models

Document project results and the generated mesopic model for the basis of performance based mesopic photometry

Application: Night-time driving

In MOVE project visual performance of night-time driving is divided into three subtasks

1. Can it be seen ?

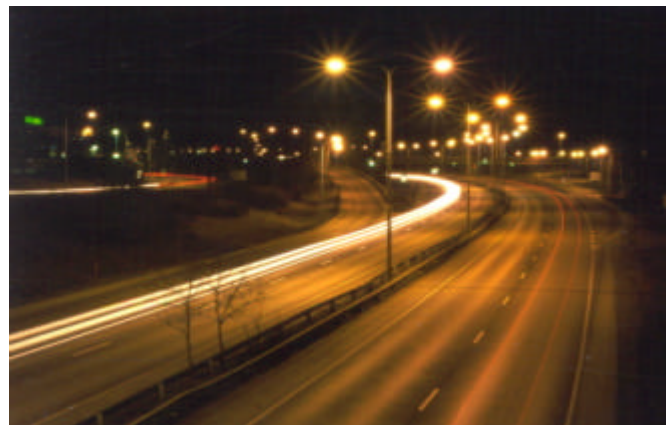
Detection threshold
(Metric: Contrast threshold)

2. How quickly ?

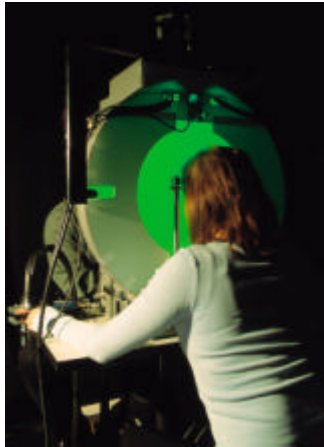
Speed of performance
(Metric: Reaction time)

3. What is it /
Can it be resolved ?

Recognition
(Metric: Visual acuity)



Multi-technique system to generate performance based model



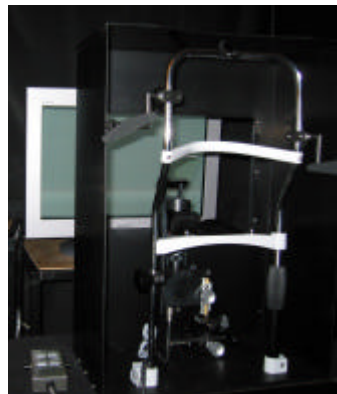
HUT Finland



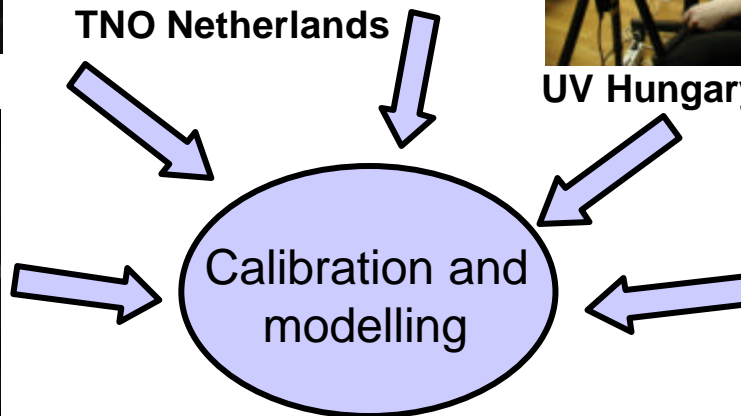
TNO Netherlands



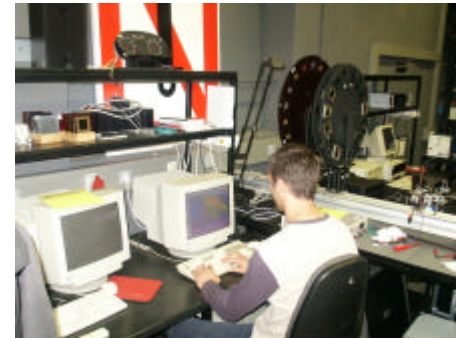
UV Hungary



CU UK



NPL UK



TUD Germany

Common values:

- $L=0.01, 0.1, 1, 10 \text{ cd/m}^2$
- eccentricity 0° and 10°
- target size $2^\circ/0.3^\circ$

Over 100 observers

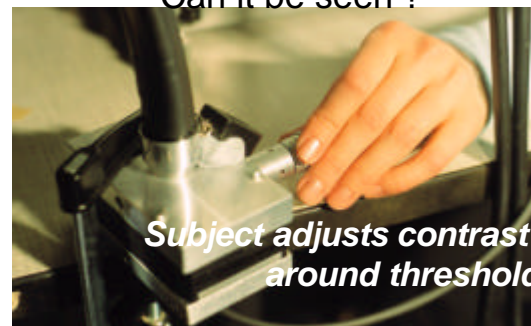
One example of building a mesopic model of threshold detection

Application:
Night-time driving



Sub-task:

Threshold detection
Can it be seen ?



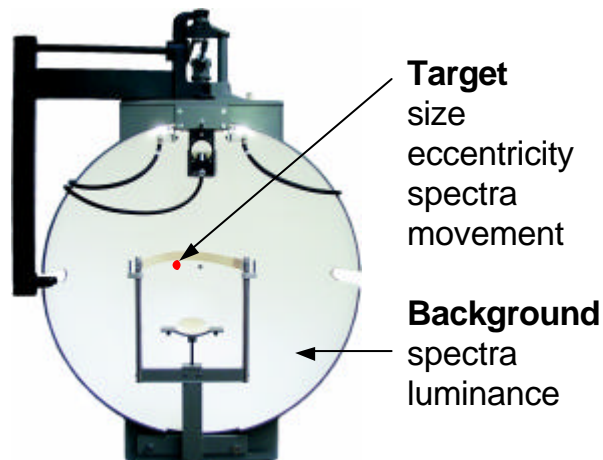
Parameters:

Metric:

Contrast threshold

"Minimum value of the contrast of luminance, which allows the target to be distinguished from its background"

$$C = \frac{L_b - L_t}{L_b}$$





MOVE Outcome:

1. **Mesopic spectral sensitivity function $V_{mes}(\lambda)$** or several $V_{mes}(\lambda)$ functions depending on
 - adaptation level and
 - visual task
2. **Mesopic model**, which is a way of combining the different functions

Example of the simplest model

$$V_{mes}(\lambda) = x V(\lambda) + (1-x) V'(\lambda)$$

$$L_{mes}(\lambda) = K_{mes} \{ (xL / K) + (1-x) L' / K' \}$$

Allows mesopic meter to be built from simple combination of photopic and scotopic detectors

3. **Mesopic system**, which is a way to use the model in practice