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Validation of a visual attention model in a driving field test: difficulties and benefits.

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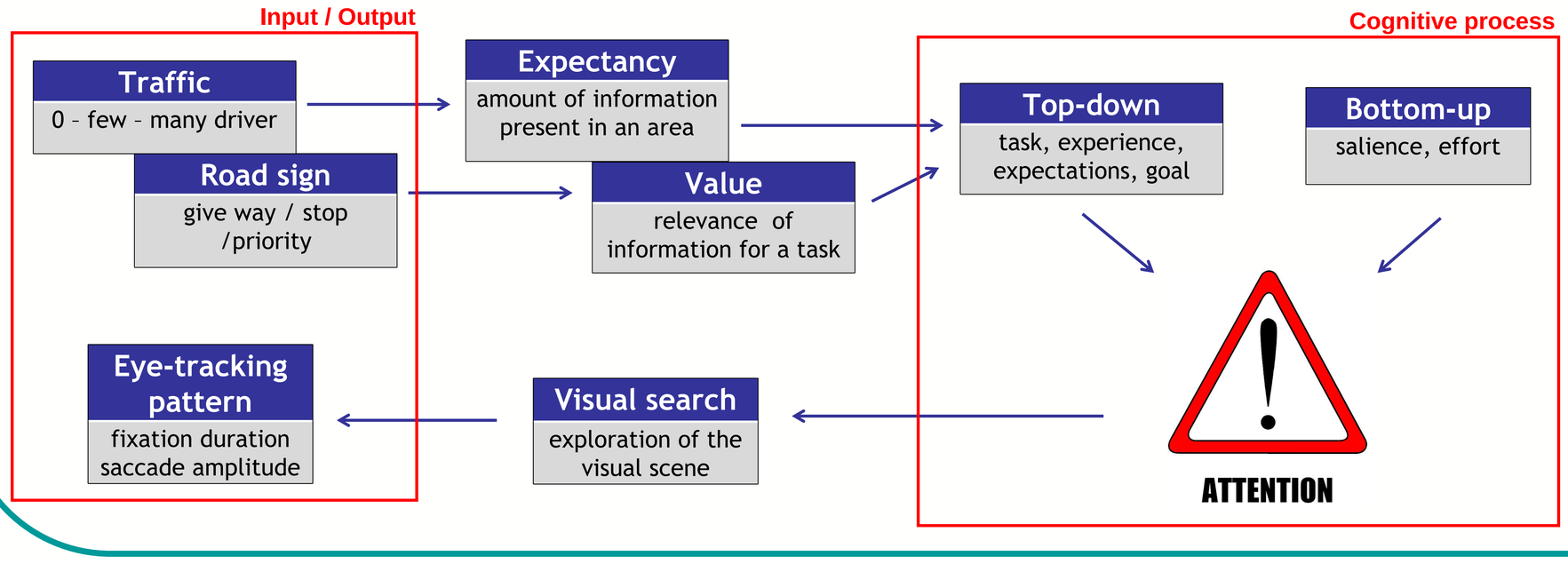
Background

Visual attention = Bottom-up (*i.e.* saliency) and Top-down processes (*i.e.* goal, task, expectancy; +++ in the literature).
The more complex the processes under study, the more necessary it is to have an ecological experimental setting.
→ Driving is an interesting task to study top-down models of visual attention (Tatler *et al.*, 2011).
Wickens *et al.* (2003) proposed a model of visual attention predicting in which areas of interest people gets information. Visual attention depends on two TD parameters: expectancy and value of information. We are currently testing this model with driving field test.

Model



Method

Material: a vehicle mounted eye-tracking system (SmartEye).

Driving situation: anticipation of a crossroads.

Intermediates variables = road sign [value] + traffic Density [expectancy].

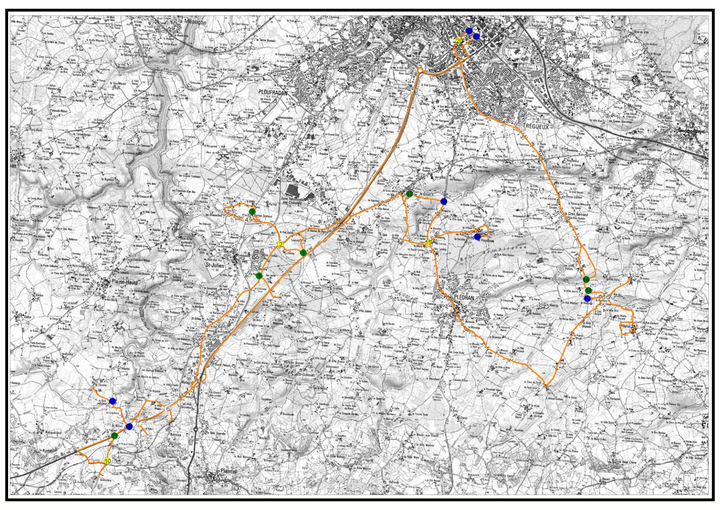
Results: data analysis in progress.

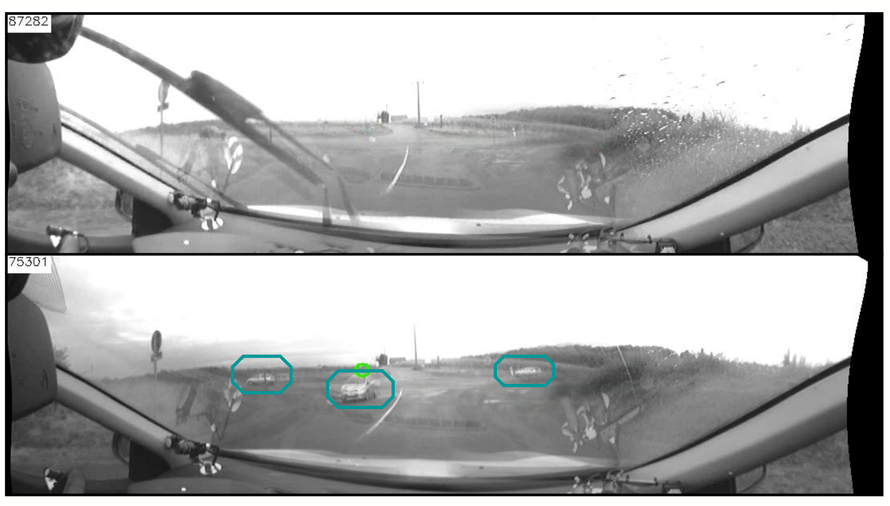
Variability intra- and inter- of participants and situations

Each step of the experiment protocol leads to some difficulties, but each difficulty introduces variability in the data, and thus enlarges the field of potential applications.

Itinerary

includes 5 crossroads per road sign (*i.e.* give way, stop, priority). Some detours were necessary because of the constraints of the road network, which resulted in a 2 hours trip per participant. A benefit of this long trip is the fact that the participants cannot guess the hypothesis under study.



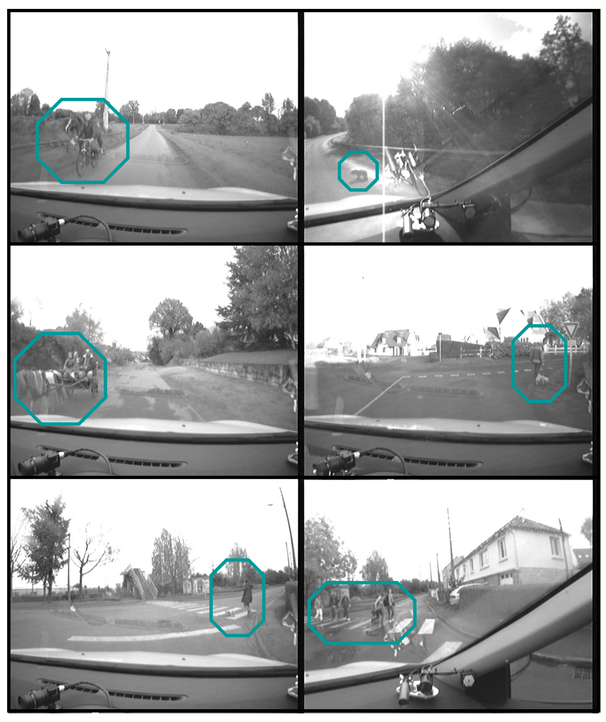


Traffic density

can only be controlled *a posteriori*, with some intra-modality variability (*i.e.* no, low, dense traffic).

Eye-tracking calibration

is complicated, including variable duration, with expected consequences in terms of the participants' state of mind.



Surprising events

But also:
the weather, the familiarity of the trip, interactions with other drivers, and more

… all these factors contribute to the variability of the encountered situations.

These differences in terms of participants and crossroads environments help to generalize our results to many driving situations. (Smilek *et al.*, 2006)

Discussion

Although test field experiments are costly, some advantages emerge. Among the benefits of generalizing a visual attention model to true driving situations, its applications to road safety, road design, driving assistance systems and traffic simulation become easier. In addition, such an experiment on the road produces a large database of behavioral data, ready for future analysis.

References

Smilek, D., Birmingham, E.,Cameron, D., Bischof, W.F., & Kingstone, A., 2006. Cognitive ethology and exploring attention in real world scenes. *Brain Research, 1080*, 101-119.
Tatler, B., Hayhoe, M., Land, M. F., Ballard, D., 2011. Eye guidance in natural vision : Reinterpreting salience. Journal of Vision 11 (5), 1–23.
Wickens, C. D., Goh, J., Helleberg, J., Horrey, W. J., Talleur, D. A., 2003. Attentional models of multitask pilot performance using advanced display technology. *Human factors, 45 (3)*, 360-380.

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