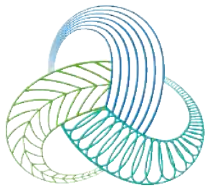
# *Tools and methods for the understanding of road users behaviours: the case of PTW riders*

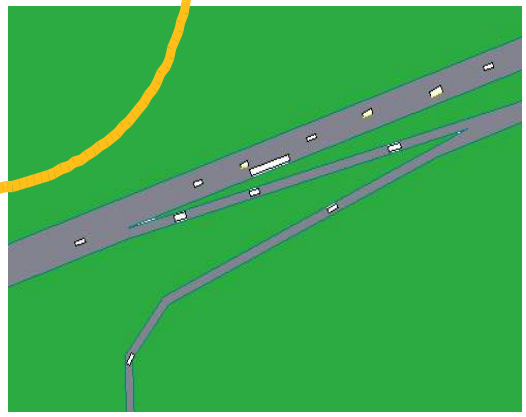
***ESPIÉ Stéphane***
***IFSTTAR (ex INRETS/LCPC)***



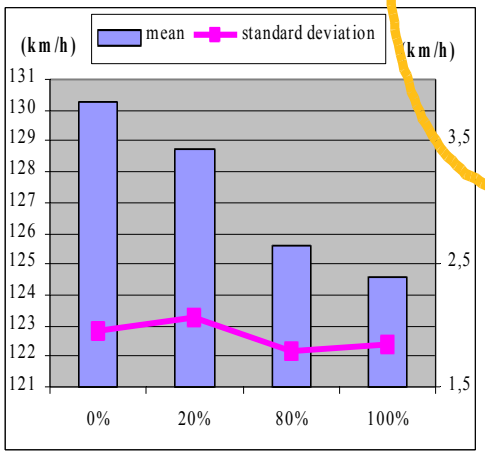
IFSTTAR

**A** - Identification of drivers' behaviours for the future situations (e.g. including ITS devices), in real situations or with a driving simulator.

**B** - Modelling of identified (step A) driver's behaviours (hypothesis). Implementation in the behavioural traffic simulation model. Implementation of the simulation of the the ITS (if any)



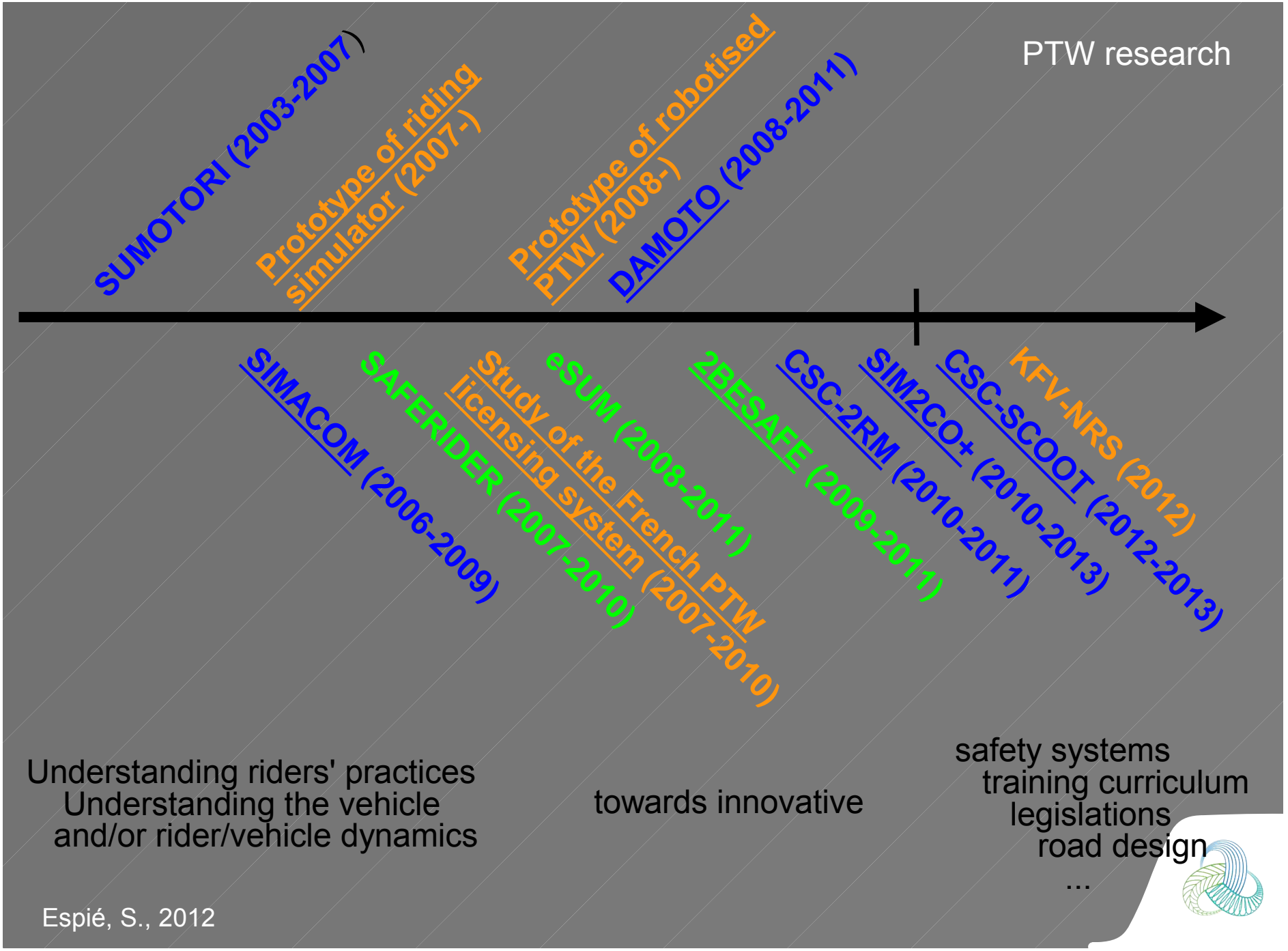
**C** - Simulation of the future traffic flow. Conducting trafic studies related to impact of changes, from capacity and safety standpoints (impact of penetration rate, sensitivity analysis of hypothesis)..




**D** - (optionnal step: for on-board systems) Identification of non-equipped driver's behaviour embedded in "equipped" virtual traffic:

# INTEGRATED APPROACH

Espié, S.


PTW research
SUMOTORI (2003-2007)
Prototype of riding simulator (2007-)
Prototype of robotised PTW (2008-)
DAMOTO (2008-2011)
SIMACOM (2006-2009)
SAFERIDER (2007-2010)
Study of the French PTW licensing system (2007-2010)
eSUM (2008-2011)
2BESAFE (2009-2011)
CSC-2RM (2010-2011)
SIM2CO+ (2010-2013)
CSC-SCOOT (2012-2013)
KFV-NRS (2012)
Understanding riders' practices
Understanding the vehicle
and/or rider/vehicle dynamics
towards innovative
safety systems
training curriculum
legislations
road design
...
Espié, S., 2012

# CSC-2RM project
# Study of the spontaneous riding behaviours in urban and peri-urban traffic

24 august 2010 – 23 august 2011

Samuel Aupetit
Stéphane Espié

*UEM,*
*Beograd, July 1st, 2012*

*CSC-2RM was sponsored by French DOT-DSCR*

# Introduction

CSC-2RM

Aim : better understanding of the MC riders in real traffic situations, in urban and peri-urban conditions

- After a preliminary study: focus on riders' activity in filtering manoeuvre
  - Widely and commonly used by riders in every day life

Aupetit, S., Espié, S., 2012

# 1. Team, method

- Team: IFSTTAR (INRETS) S.Espié, S. Aupetit, in collaboration with UPSud/IEF (partner of the SUMOTORI..DAMOTO project
- Method: self confrontation interview, based on video recorded in natural riding context (instrumented motorbikes)
  - Use of the data acquired within the DAMOTO and 2BESAFE projects

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# 2. Process and method

- **Preliminary study**
  - Period: September 2010, Paris
  - Population: 5 motorcyclists with various profile
  - Method : Self confrontation interview

  → filtering is systematic

- **State of the art**

  → Low implication of the filtering manoeuvre in accidentology at international level

- **In-depth study**
  - Period: October 2010 – August 2011, Paris
  - Population : 11 motorcyclists (10H/1F)
    - Average age 40 years / average experience 18 years
    - Constraints due to insurance and instrumented motorbikes

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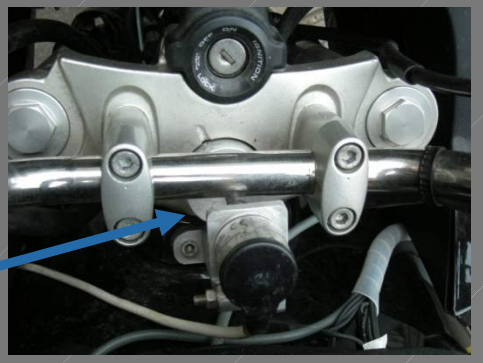
# 2. Process and method (2)

– Method: ➢ 2 instrumented motorbikes (sensors + GPS)
Honda 1000 CBF and 800 VFR

Recorders + GPS

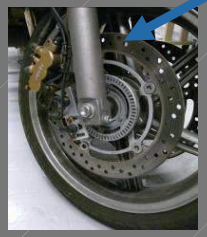
Acceleration/
rotation 3 axis



Handlebar position

Brakes contact

Throttle position



Rear/front wheels
displacements

Turn
signals

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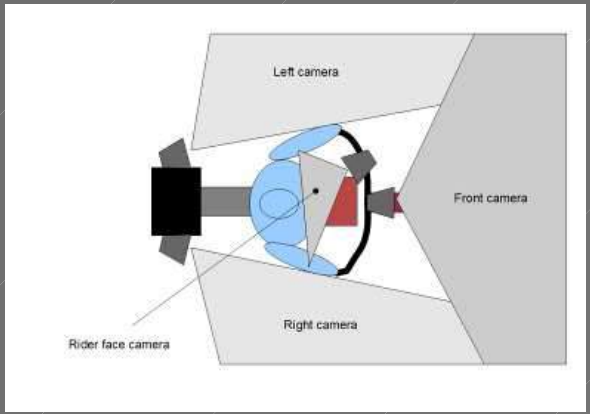
# 2. Process and méthod (3)

- 4 embeded vidéo caméras




Location and field of view

Video recorder located in the top case

Software to visualise the acquired videos

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# 2. Process and methods (4)

- Self confrontation interview, video based

The journeys of the interviewed riders

Researcher

Interviewed rider

Remote control shared by researcher and rider: stop/ backward

Face and gesture of the rider during the interview

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# 2. Process and methods (5)

- Two columns sheet
  - Coming from riding situations (on road recorded data)
  - Verbal data (from the interviews)

| Données d'observation (centrées sur les situations de remontée de files) | | | | | | | | | | Données d'entretien d'auto confrontation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temps | Type de route (A86, N118…) | Insfrascture/ configuration route (virage, rétrécissement, travaux…) | Comportement du conducteur de 2RM | | | | Etat du trafic 4R | | | Temps | Acteur | Verbalisations (retranscription verbatim) |
| | | | Actions (s'insère dans le trafic, suit un motard, freine, évite, insulte, quitte la "voie 2RM"…) | Vitesse instantanée du conducteur observé (acquisition GPS en km/h notée sur l'écran) | Emplacement de la voie "virtuelle" empruntée (entre files de gauche et du milieu, à gauche de l'unique file…) | Positionnement vis-à-vis des autres 2RM (remontée seul, à deux, "train") | Densité (fluide, dense) | Vitesse instantanée (estimation) | Largeur voie "virtuelle" (estimation en mètres) | | | |
| 14h08 | Ville | Ligne droite | Remonte une file de voitures à l'arrêt derrière un scooter. | 35 km/h | Sur la gauche de la file, sur la ligne blanche | Derrière un scooter. 15 m derrière | Dense. | Arrêt. | 2m | | | |
| | | | | | | | | | | 6'30 | B | Là c'est pas risqué ce que je fais. J'ai suffisament de place entre les voitures pour passer, il n'y a personne en face et je connais bien la route donc je sais où sont les points risqués. Par exemple, là je sais qu'il y a une voie à gauche que les gens prennent souvent donc je fais attention. C'est un cas d'accident ça en remontée de file lorsque des voitures coupent la voie pour aller sur la gauche. Mais bon je connais bien le trajet donc c'est pas risqué. |
| | | | | | | | | | | | S | **C'est pas risqué…** |
| | | | | | | | | | | | B | Oui je pense mais bon on n'est jamais à l'abris qu'un mec déboite. Mais bon là les voitures sont arrêtées et j'en vois pas une qui déboite ou qui a un comportement suspect… |
| | | | | | | | | | | | S | **Un comportement suspect ?** |
| | | | | | | | | | | | B | En fait j'essaye de voir si un conducteur a un comportement différent des autres dans la file : une voiture qui n'a pas la même trajectoire ni la même vitesse. Dans ces cas là, on ralenti parce qu'on ne sait pas ce qu'il va faire. Je guette donc la voiture qui n'est pas comme les autres. |
| | | | | | | | | | | | S | **Comment vous faites pour guetter ?** |
| | | | | | | | | | | | B | Avec le regard. |
| | | | | | | | | | | | S | **Il porte sur quoi là ?** |
| | | | | | | | | | | | B | Il porte vers l'horizon, au loin, et en même temps grâce à la vision périphérique je peux voir si un conducteur a un comportement anormal par rapport aux autres. |
| 14h09 | Ville | Ligne droite | S'arrête derrière un scooter qui n'a pas l'espace nécessaire pour remonter les files. | 0 km/h | Sur la gauche de la file, sur la ligne blanche | Derrière un scooter. | Dense. | Arrêt. | 2m | | | |
| | | | | | | | | | | 7'07 | B | Le scooter devant c'était un gros nerveux !! Il accélérait comme un malade et après il s'arrêtait, ça ne sert à rien. Regarde il prend plusieurs mètres et après on va s'arrêter. |

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# 3. Results : state of the art

- Relatively low figures at international level
  - MAIDS (2003) : 0.4% in Europe (injuries)
  - Clarke et al. (2004 ) : 5% in UK (injuries)
  - BAAC (2009) : 1% in France / 0% in Paris (fatalities)
- The literature do not take into account:
  - The accidents without injuries / fatalities
  - The “near misses »
- A lack of scientific knowledge on:
  - The behaviours in naturalistic context
  - The real **interactions** between road users
  - The difficulties of motorcyclists in the traffic

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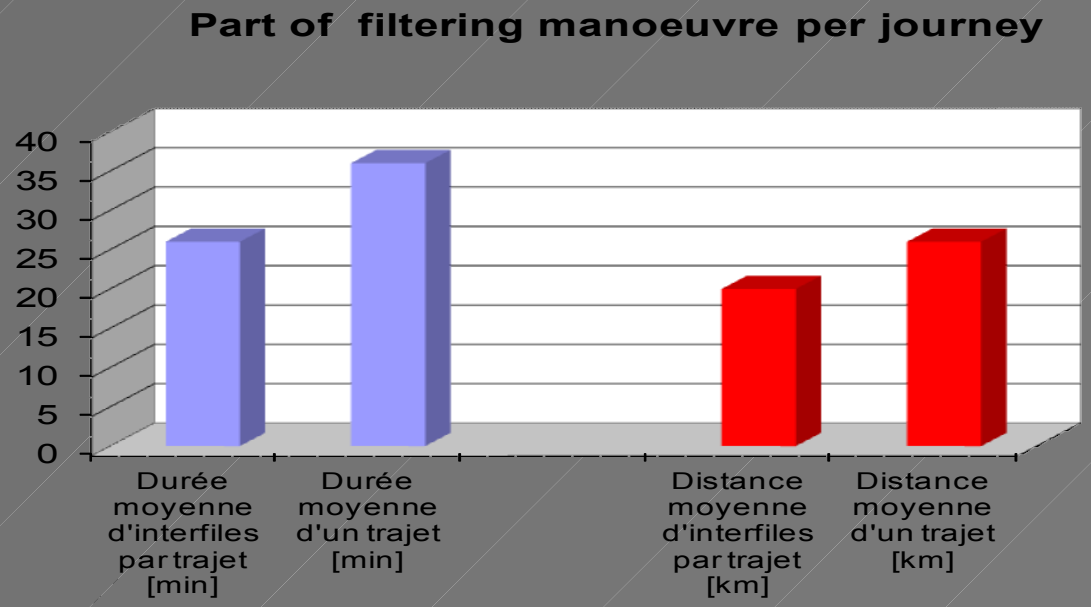
# 3. Results and analysis (2)

## 1. Filtering manoeuvre




- Systematic and long duration (from vidéos)
  - 72% of time, 77% of the distance by commuting journey
  - On all the Paris region roads
- A strong reduction of the travel time for the riders
  - Travel time divided by 2 up to 3

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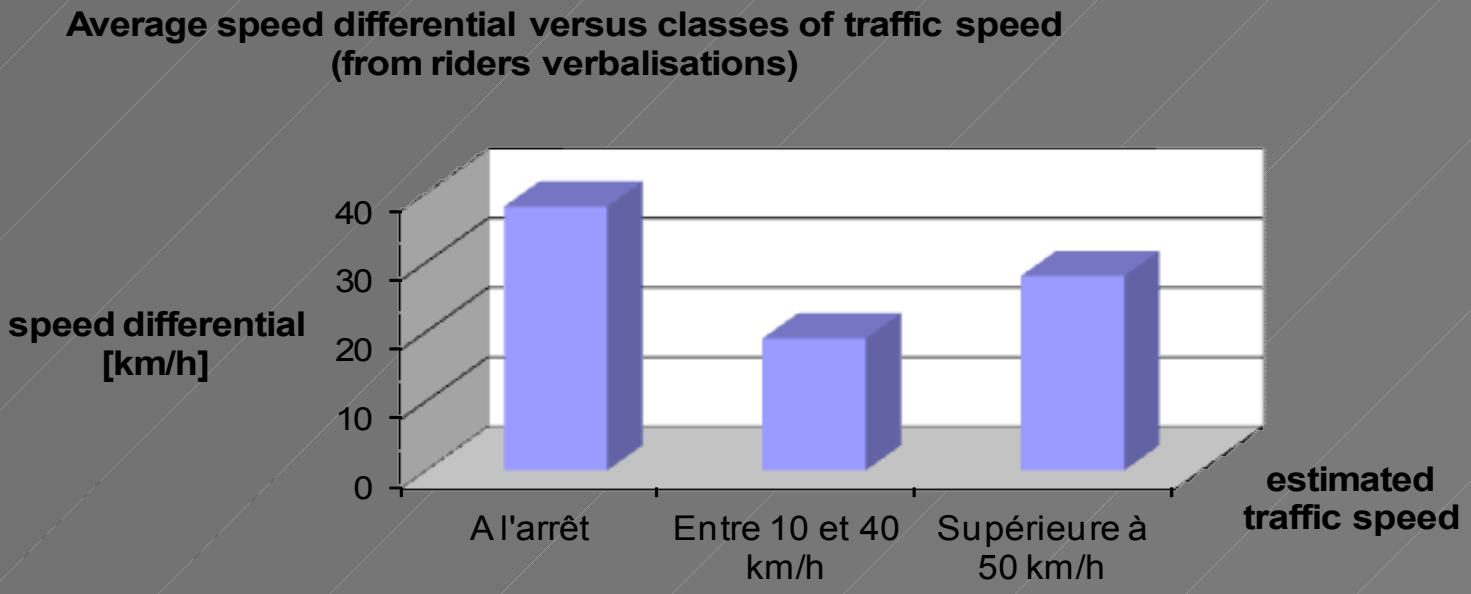
# 3. Results and analysis (3)

## 2. The speed used on the Parisian ring in filtering manoeuvres, based on interviews




- Traffic stopped: avg. Differential = 38 km/h («a safe situation»)
- Traffic > 50km/h: avg. differential = 28 km/h or manoeuvre stopped
- Between 10 and 40 km/h: avg. differential = 19 km/h (« the more risky situation for the filtering manoeuvre »)

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# 3. Results and analysis (4)

## 3. The perceptive strategies of the motorcyclists in filtering manoeuvres

- Several indicators, in the whole visual field
  - Linked to traffic
    - *Speed of the vehicles, inter vehicular distances of the vehicles on the adjacent lanes, width of the inter lanes...*
  - Linked to the infrastructure and the equipments
    - *Pavement quality, proximity of on/off ramps, radars...*
  - Linked to drivers' activity
    - *« luminous screens », gesture and head orientation, wheels orientation, region number on the vehicle id plates...*

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# 3. Results and analysis (5)

## 4. Typical situations of vulnerability

- Week end traffic
  - *Difficulties when interacting with non “Parisian” drivers*
- Filtering in narrow lanes situations
  - *Work zone*
- Situations where the PTW conspicuity is degraded
  - *When motorcyclists are isolated*
  - *In rainy conditions*
- In a traffic with lorries

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# 3. Results and analysis (6)

## 5. The riders' activity for improving their conspicuity

- Use of strategies to be detectable by drivers
  - Integration in a MC « train »
  - To move laterally in the back of the cars
- Efforts to ensure that thy are properly detected
  - When the car moves laterally or use its turn signal
  - When the eyes contact occurs thru the car rear mirror (< 50 km/h)

➢ Competencies acquired “on the field”, due to a lack of training for this (forbidden) manoeuvre (Aupetit, 2011)

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# 4. Summary of the main results

- The filtering manoeuvre as systematic and long-term
- Organised by the speed with the adjacent lanes
- By riders actives for the improvement of their visual conspicuity and for the double checking of their detection by drivers
- Salient difficulties of interaction between PTW's riders
- A quite large variety of “vulnerability” situations endured by riders in their every day journeys (without accidents)
- Motorcyclists which developed competencies to anticipate these situations

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# 5. Limits / Prospects for the study

- To study the acceptability of the MC filtering manoeuvre practice for the drivers
- To enlarge the geographic area and the studied population
  - PACA, scooterists, novices and returning, womans
- To precise the speed differentials with embedded instrumentation
  - Difficult as the speed of the adjacent lanes is not constant
- To study the interactions between PTW ( conflicts)
- To design tools to automatically  detect the risky situations
- ...

# Thanks for your attention

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