An original use of Pearson's correlation to construct a unique assessment procedure from individual ones for dynamic hedonic tests of cars

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Context of assessment for hedonic tests

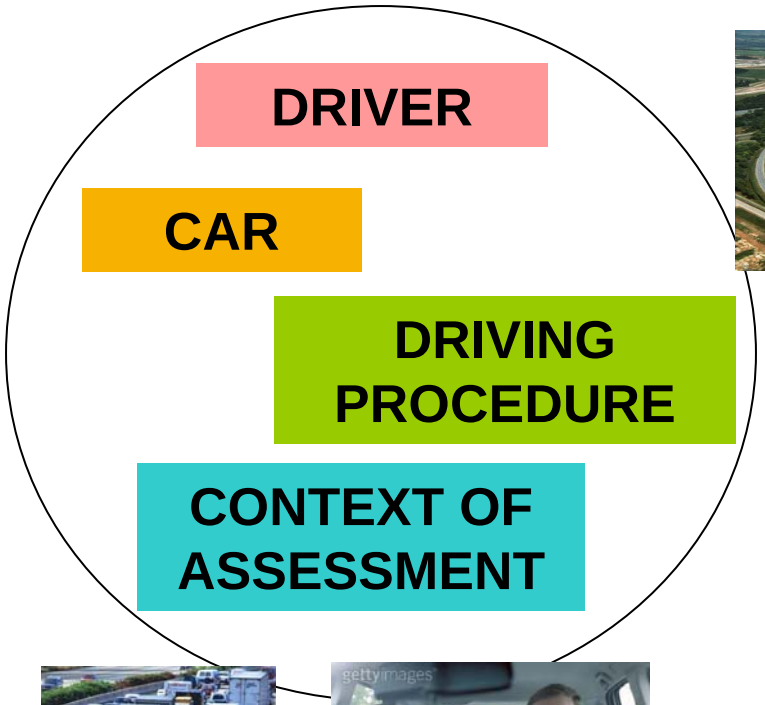
CONSUMER

FOOD

PROCEDURE

CONTEXT OF ASSESSMENT

Originality of the context of assessment for car under dynamic conditions



Private Renault tracks

Road in the campaign

- **Interactions exist between the driving situations and the car.**
  - **The perception of the car differs with the road experienced by the drivers.**
- **A driving procedure is composed of different types of road and road events.**
  - **The context changes during the assessment.**

Objective

To construct a unique driving procedure for hedonic tests.

- Close to real contexts of use.
- Identical for all the participants.

Means

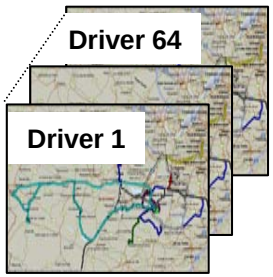
- **To observe the choice of the consumer under free driving conditions during the assessment of cars.**
- **To set up a tool for characterizing routes.**
- **To summarize several drivers' routes into a unique route.**

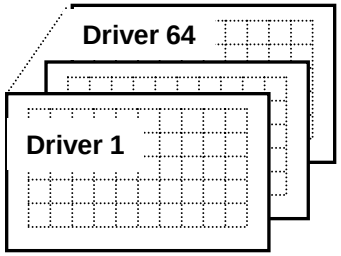
Strategy to build a unique route from drivers' routes

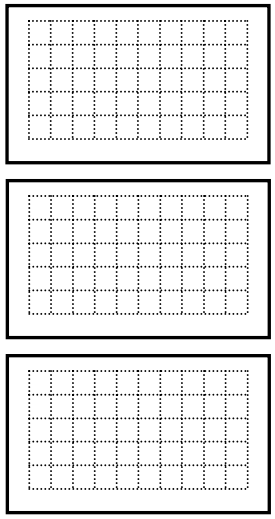
Route characterisation | **Construction of common routes** | **Choice of the unique virtual common route** | **Transfer to the real world**

1 | 2 | 3 | 4

64 ACTUAL individual routes → 64 VIRTUAL individual routes → Several VIRTUAL common routes → 1 VIRTUAL common route → 1 REAL common route







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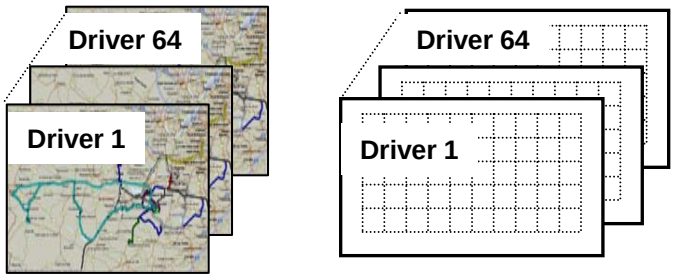
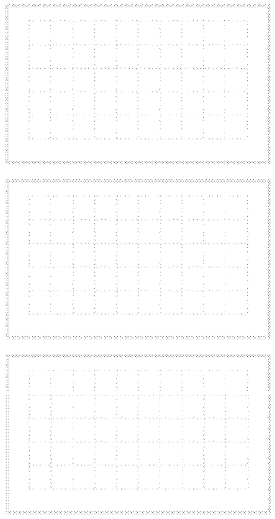
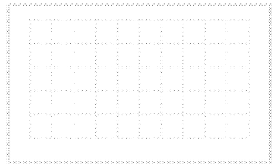
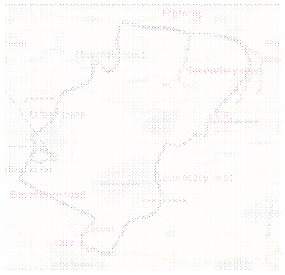








Individual route characterization

Class of road: residential road, city, urban road, mountain road, secondary road, freeway, highway, private road.

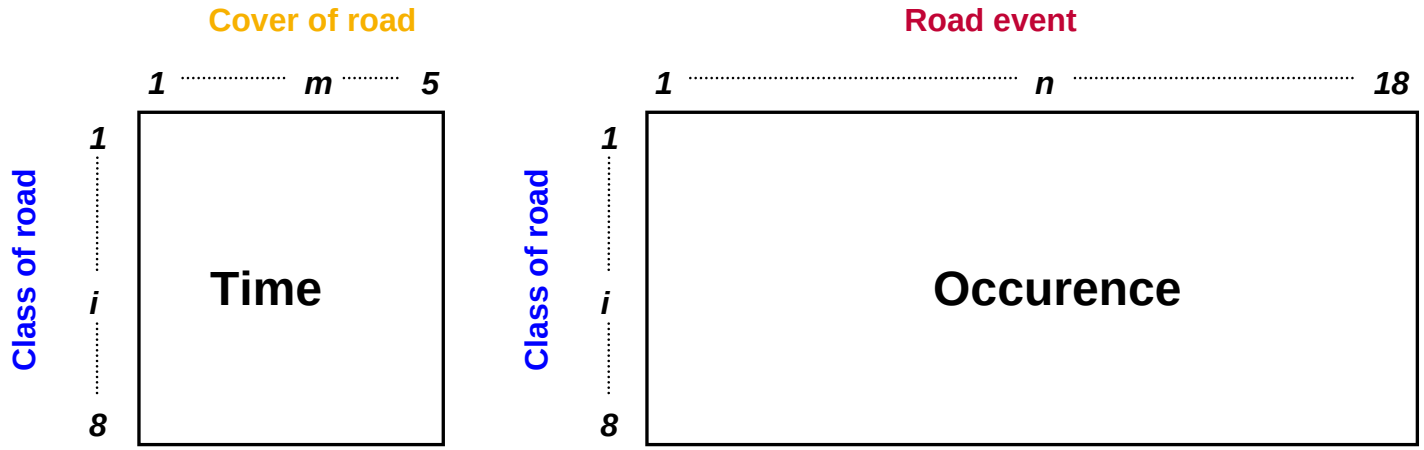
Cover of road: good cover, granular surface, road with bumps and hollows, cobbled surface, tiled surface.

} **Time**

Road event: roundabout, manhole, stop, overtaking, etc.

} **Occurence**

For one driver's route



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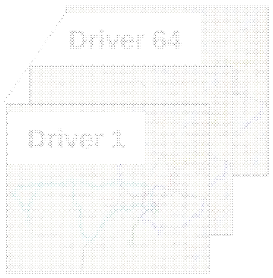
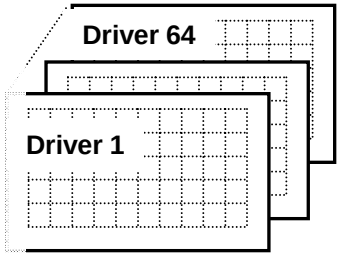
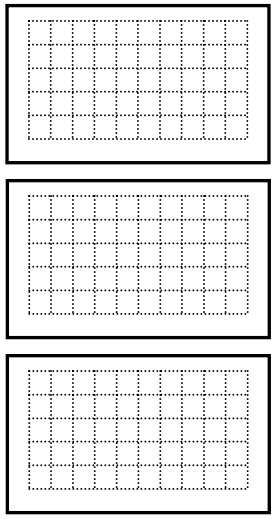
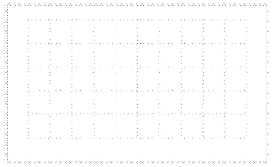
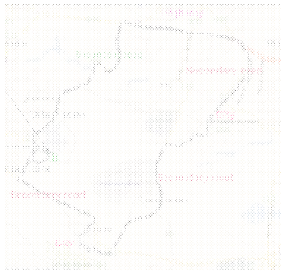








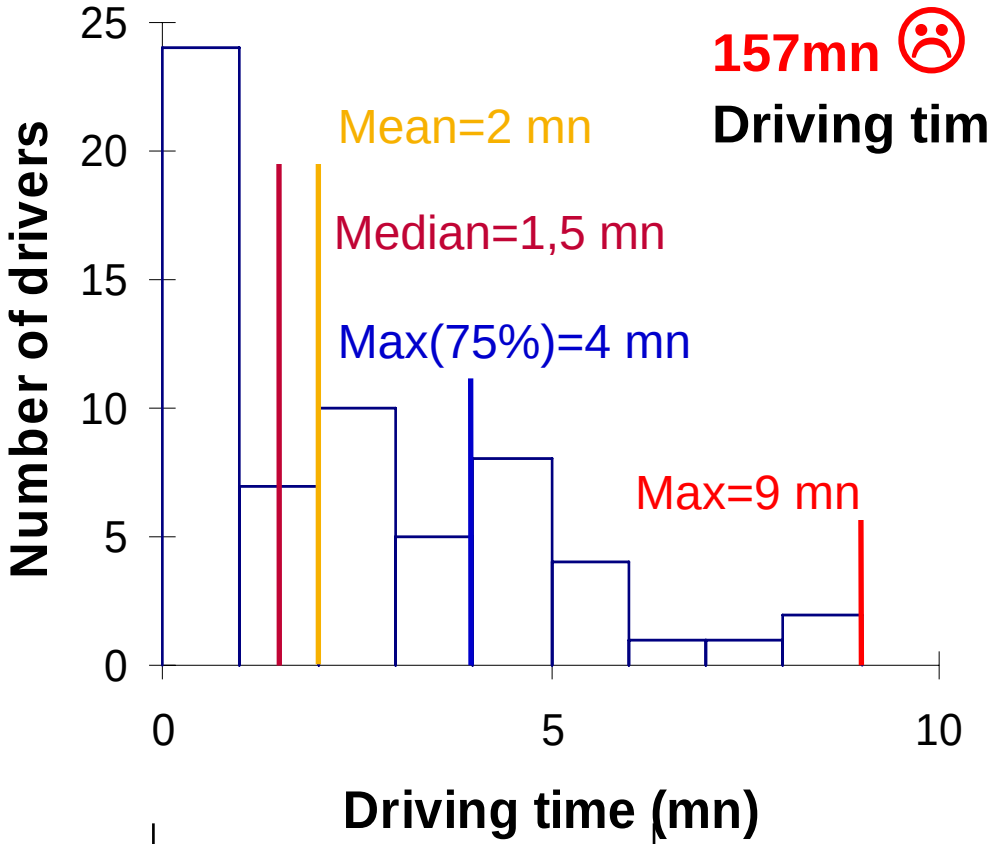


Construction of common routes

Consumer « satisfaction »:

- **The common route must include at least the same time the participant drove for each type of road.**
- **The common route may contain some types of road he did not choose to drive.**

City with granular cover



157mn ☹

Driving time constraint!

Mean common route

Median common route

Maximum common route under the time constraint

Strategy to build a unique route from drivers' routes

Route characterisation

Construction of common routes

Choice of the unique virtual common route

Transfer to the real world

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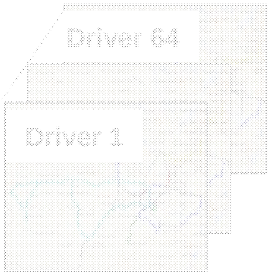
64 ACTUAL individual routes

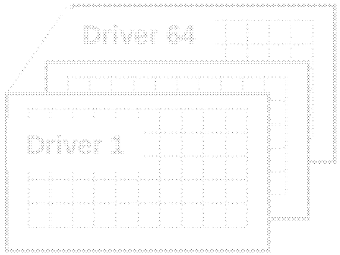
64 VIRTUAL individual routes

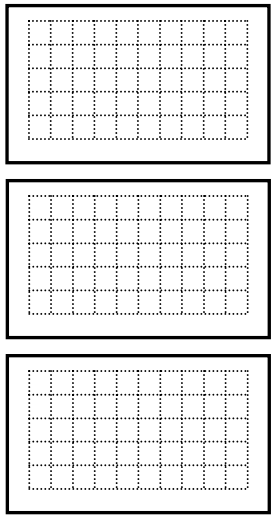
Several VIRTUAL common routes

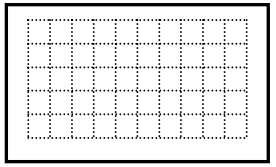
1 VIRTUAL common route

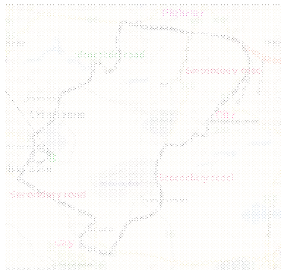
1 REAL common route











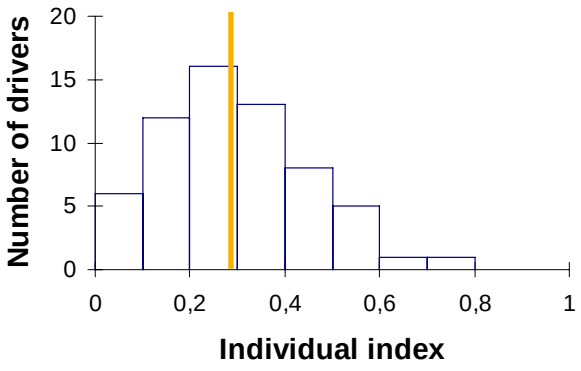
Choice of the unique virtual common route

Index to estimate the relevance of a common route for every individual route. Calculated only on the types of road chosen by the driver.

Index = N road elements chosen by the driver and included in the common route / N road elements chosen by the driver

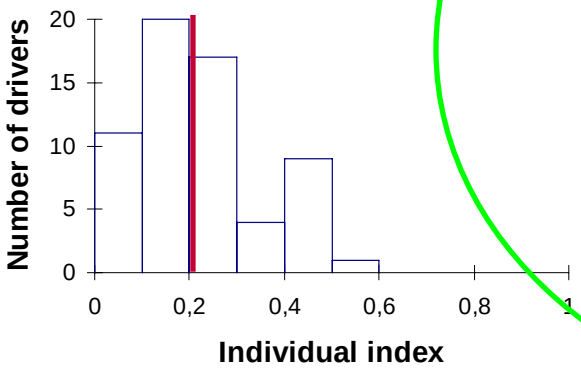
Mean common route

I_m=0.29



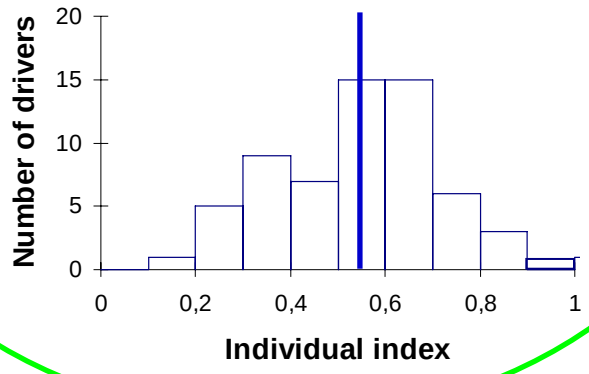
Median common route

I_m=0.21



Maximum common route under the global time constraint

I_m=0.54



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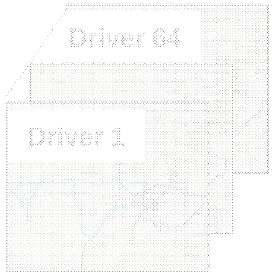
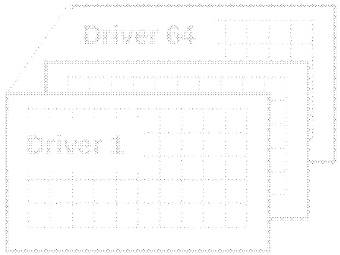
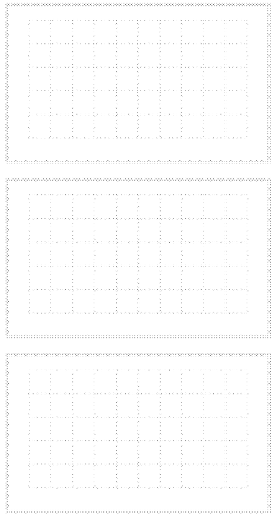


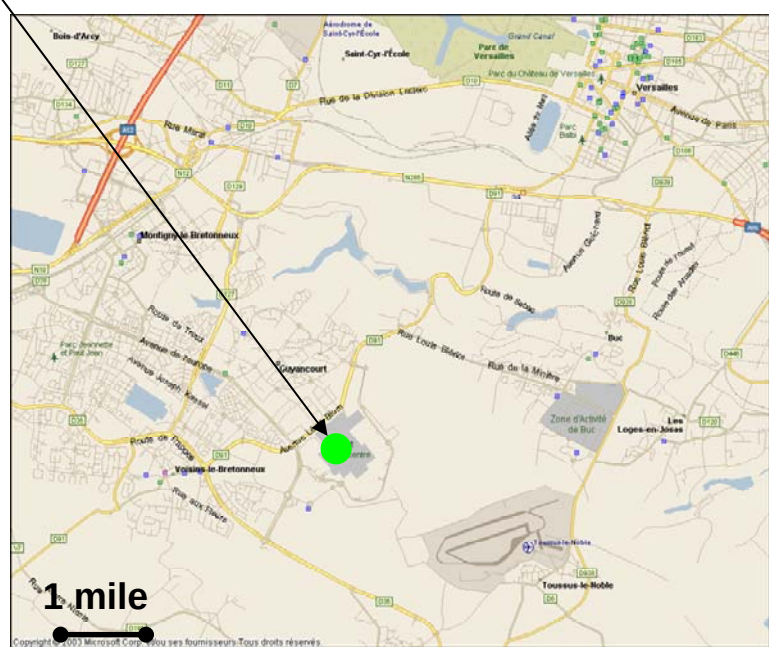




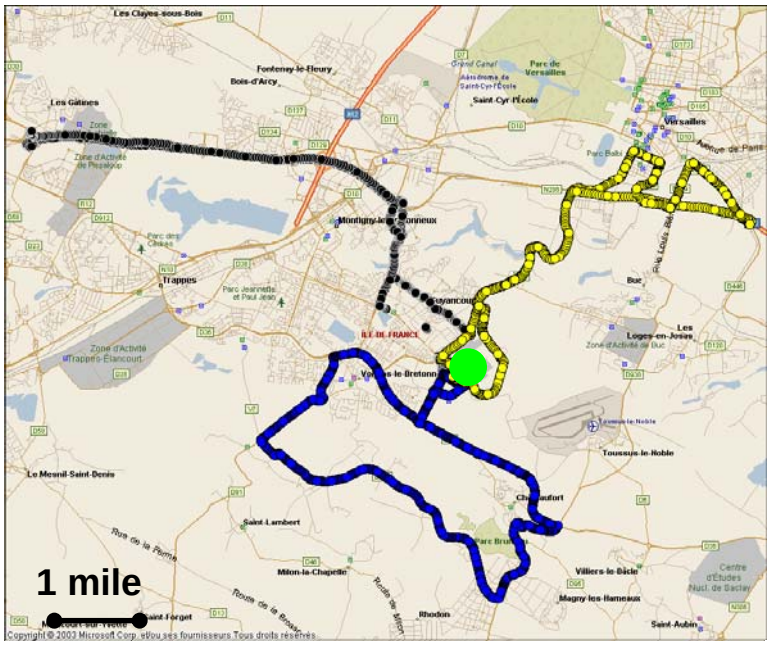
How to transfer the virtual common route into real driving conditions?

Type of road	T(mn)
Urban × cover1	6
Urban × cover 2	2
Urban × cover 3	4
Urban × cover 5	0
City × cover1	2,6
City × cover 2	1,6
City × cover 3	0
City × cover 4	0,4
Residential × cover1	0
Residential × cover 2	0
Residential × cover 3	0
Residential ×cover 4	0
Residential × cover 5	0
Secondary × cover1	7
Secondary × cover 2	2
Secondary × cover 3	1
Secondary × cover 4	0
Secondary × cover 5	0
Mountain × cover1	2
Mountain × cover 2	0
Mountain × cover 3	0
Mountain × cover 4	0
Freeway × cover1	1
Freeway × cover 2	0
Freeway × cover 3	0
Highway × cover1	0
Highway × cover 2	0
Highway × cover 3	0

Departure and arrival point of the route



How to find a real route close to the virtual route?



S13	S46	S71
5	6	8,5
2	0	0,5
2	4	0
0	0	0
1,4	4	6
1,5	0	5
1,5	0	0
0,6	0	0
0	0	0,8
0	0	1
0	0	1
0	0	0,2
0	0	0
4	7,8	13
1	0	0
2	0	0
0	0,2	0
0	0	0
0	3	1
0	0	0
0	0	0
0	0	0
2	0	1
1	0	0
1	0	0
1	0	0
1	0	0
2	0	0

Pearson's correlation between the characterization of the 64 individual routes and the characterization of the common route

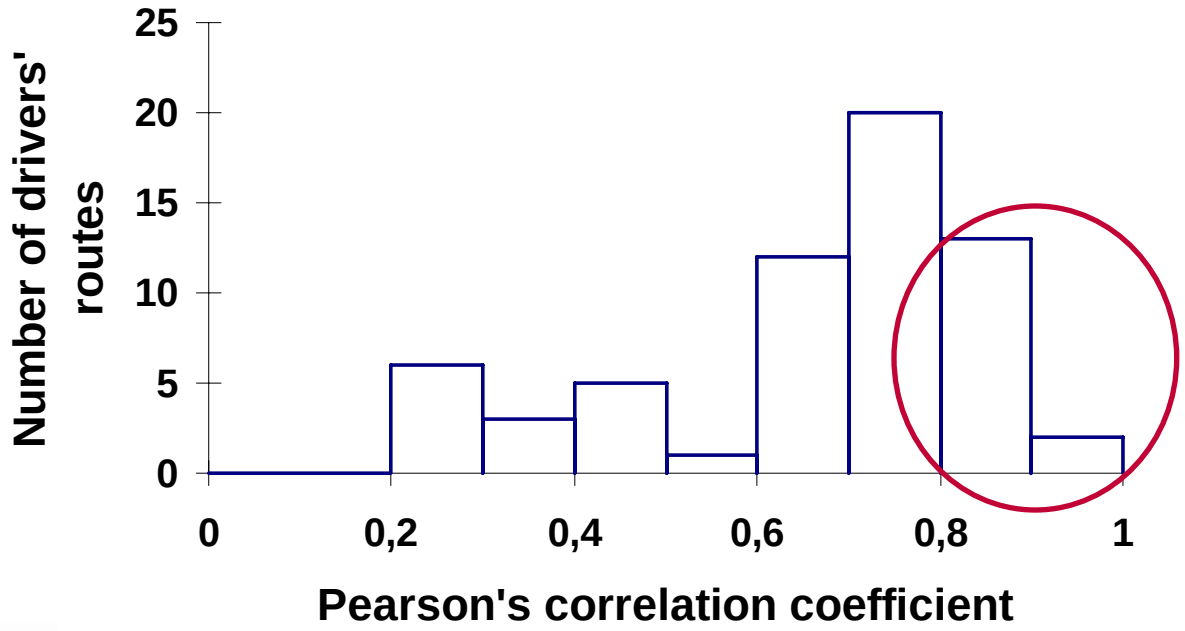
Virtual common route

Virtual common route
6
2
4
0
2,6
1,6
0
0,4
0
0
0
0
0
7
2
1
0
0
2
0
0
0
1
0
0
0
0
0

Pearson's correlation between the 64 individual routes and the virtual common route

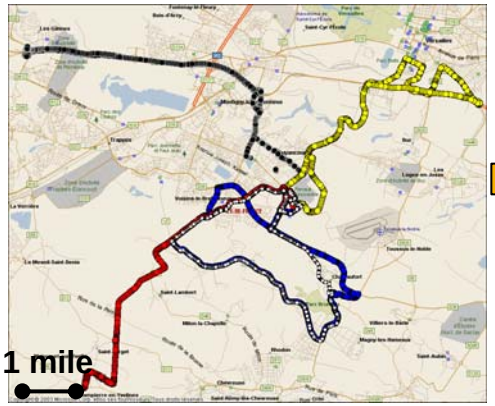
	ROUTE	S1	S2	S3	S4	S5	S8	S9	S10
ROUTE	1	< 0,0001	0,663	< 0,0001	< 0,0001	0,621	0,626	0,417	< 0,0001
S1	< 0,0001	1	0,666	< 0,0001	< 0,0001	0,504	0,523	0,371	< 0,0001
S2	< 0,0001	0,666	1	< 0,0001	< 0,0001	0,620	0,324	0,262	0,425
S3	0,006	0,642	0,456	1	< 0,0001	0,432	0,363	0,334	0,374
S4	< 0,0001	< 0,0001	< 0,0001	< 0,0001	1	0,462	0,393	0,337	0,505
S5	0,000	0,504	0,620	0,432	0,462	1	0,252	0,273	0,406
S8	0,000	0,523	0,324	0,363	0,393	0,252	1	0,402	0,407
S9	0,017	0,371	0,262	0,334	0,337	0,273	0,402	1	0,415
S10	< 0,0001	< 0,0001	0,425	0,374	0,505	0,406	0,407	0,415	1
S11	< 0,0001	< 0,0001	< 0,0001	0,259	0,501	< 0,0001	0,524	0,382	< 0,0001
S12	0,157	-0,103	-0,209	0,156	0,696	0,854	0,154	0,326	0,148
S13	< 0,0001	< 0,0001	< 0,0001	0,239	0,625	0,581	0,396	0,452	< 0,0001
S14	< 0,0001	< 0,0001	0,943	0,240	0,479	0,621	< 0,0001	0,375	0,610
S15	< 0,0001	0,671	0,250	0,429	0,640	0,262	0,415	0,316	0,542

Pearson's correlation coefficients between **15 drivers' routes** correlated with the virtual common route ($p<0,05$) and with a **P>0,8**

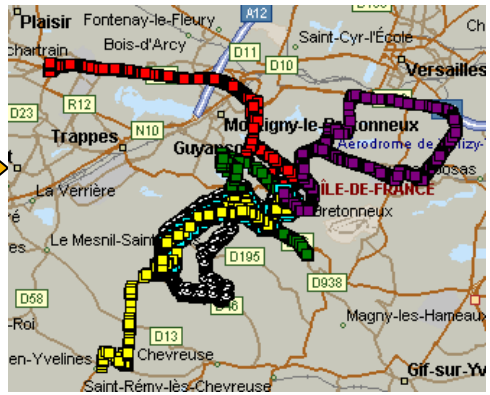


How to find the real route close to the virtual route?

15 drivers' routes selected



1. Combination of the drivers' routes to build **new routes**
2. Test of the new build routes under real conditions to characterize them


Plaisir
Fontenay-le-Fleury
Bois-d'Arcy
Saint-Cyr-l'École
Versailles
Trappes
Montigny-le-Bretonneux
La Verrière
Le Mesnil-Saint
Magny-les-Hameaux
Chevreuse
Saint-Rémy-lès-Chevreuse
ÎLE-DE-FRANCE
A12
D11
D10
R12
N10
D23
D195
D938
D58
D13

New routes

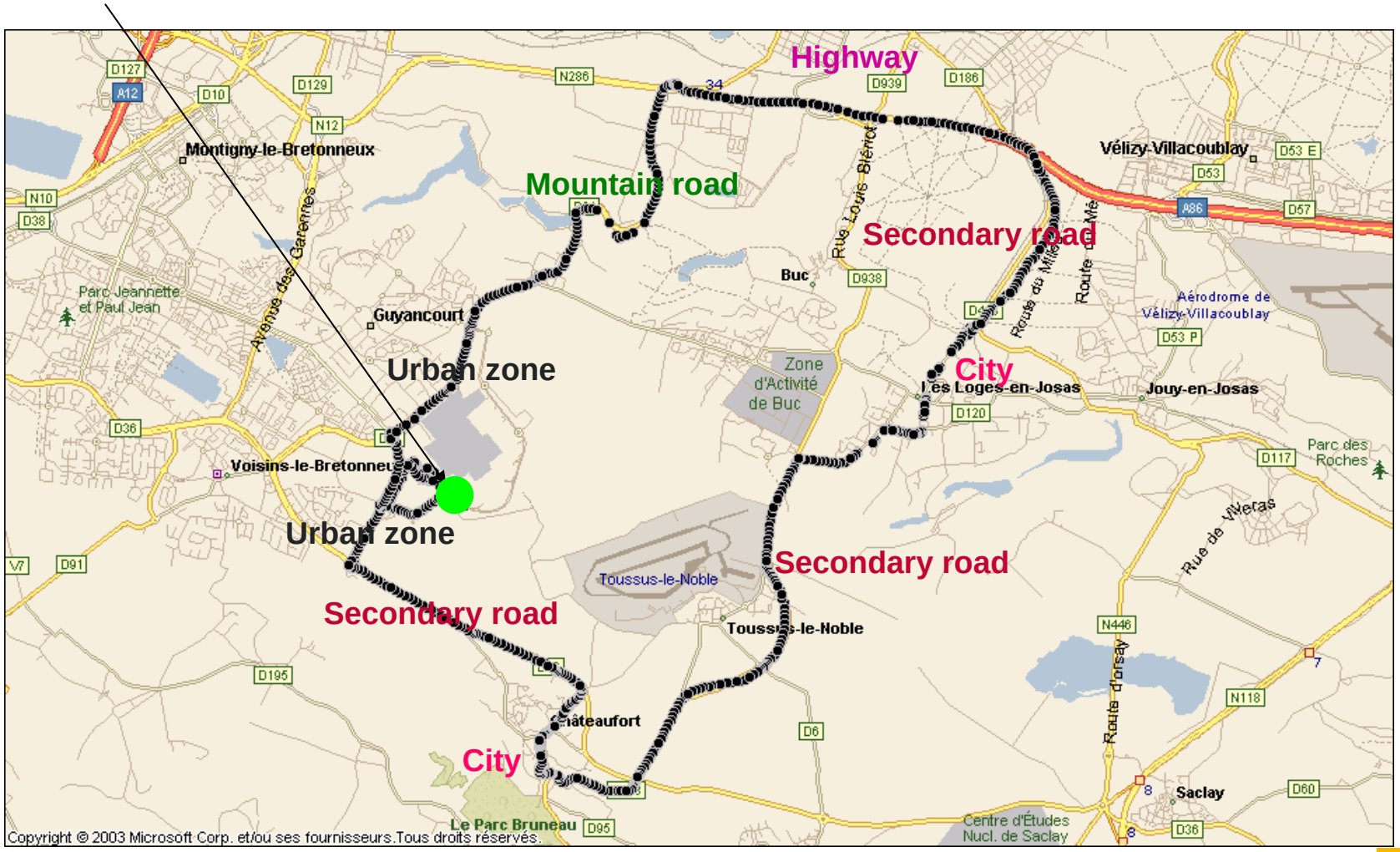
5	6	8,5	6
2	2	0,5	2
2	1	0	4
0	0	0	0
1,4	3	6	2,6
1,5	2	5	1,6
1,5	1	0	0
0,6	0	0	0,4
0	0	0,8	0
0	0	1	0
0	0	1	0
0	0	0,2	0
0	0	0	0
4	7	13	7
1	2	0	2
2	1	0	1
0	0	0	0
0	0	0	0
0	2	1	2
0	0	0	0
0	0	0	0
0	0	0	0
2	0	1	1
1	0	0	0
1	0	0	0
1	2	0	0
1	0	0	0
2	0	0	0

Pearson's correlation

Selection of the new route the most correlated to the virtual common one ($p<0,001$)

The real common route

Departure and arrival point of the route



Conclusion

A robust methodology to frame a driving procedure for hedonic tests taking account 2 difficulties:

- The compromise between the drivers 'satisfaction and the global driving time constraint
- The transfer of a virtual route into the real driving conditions

➢ **An operational result with the use of a simple technique**

Transposition to other fields.

- Behavioral study to observe the consumers' choices.
- Characterization of the contexts of use.
- Construction of a unique test procedure from the different contexts of use.

THANK YOU FOR YOUR ATTENTION!