

Perception of Multisensory Wind Representation in Virtual Reality

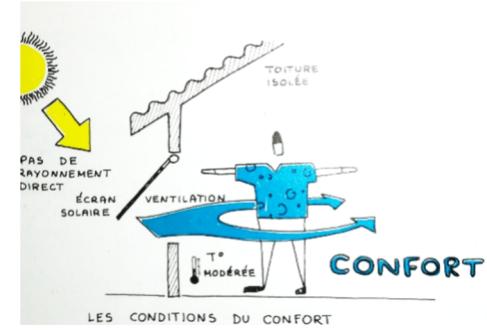
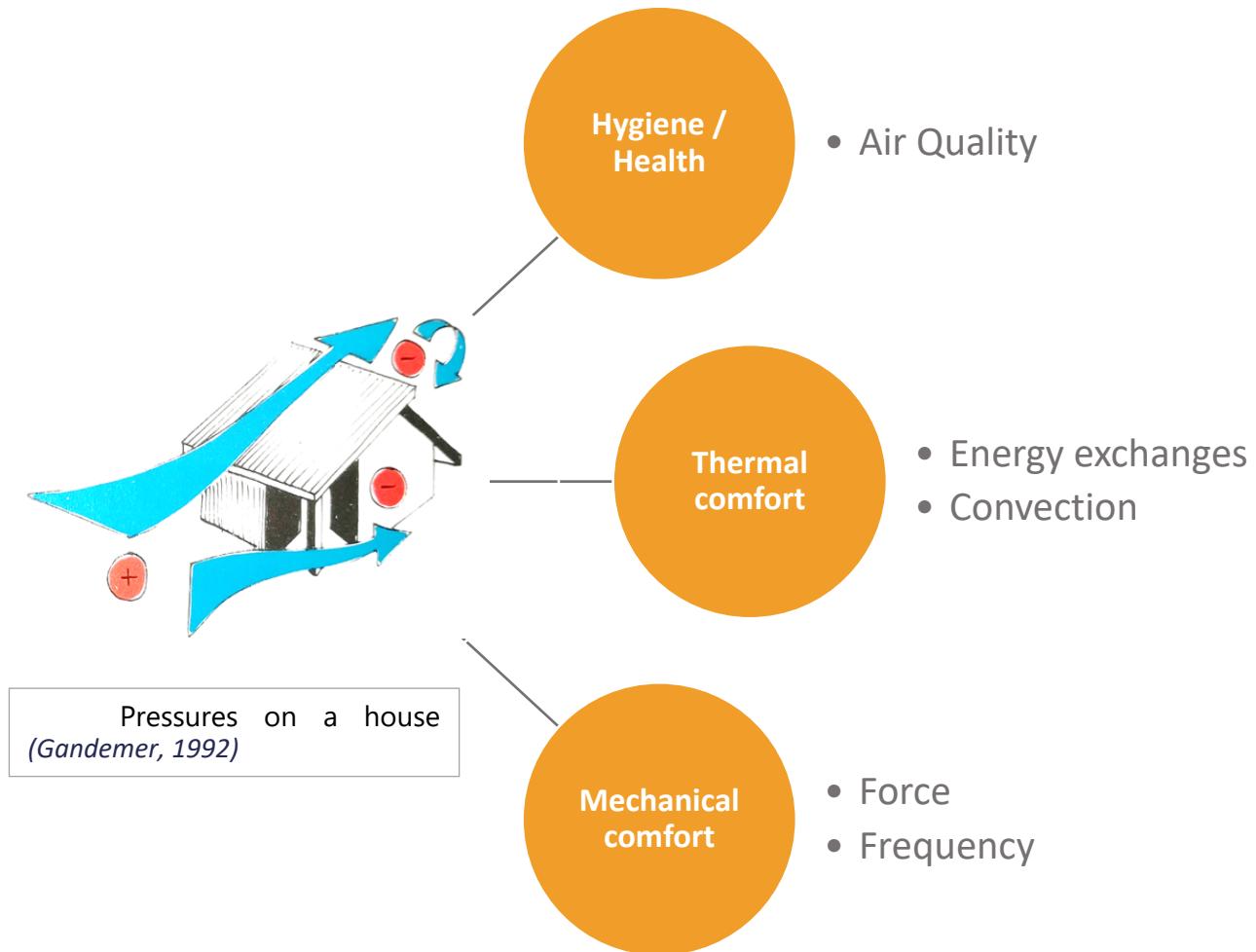
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Ecole Centrale de Nantes



MAGIS 07/01/2021

Wind Issues

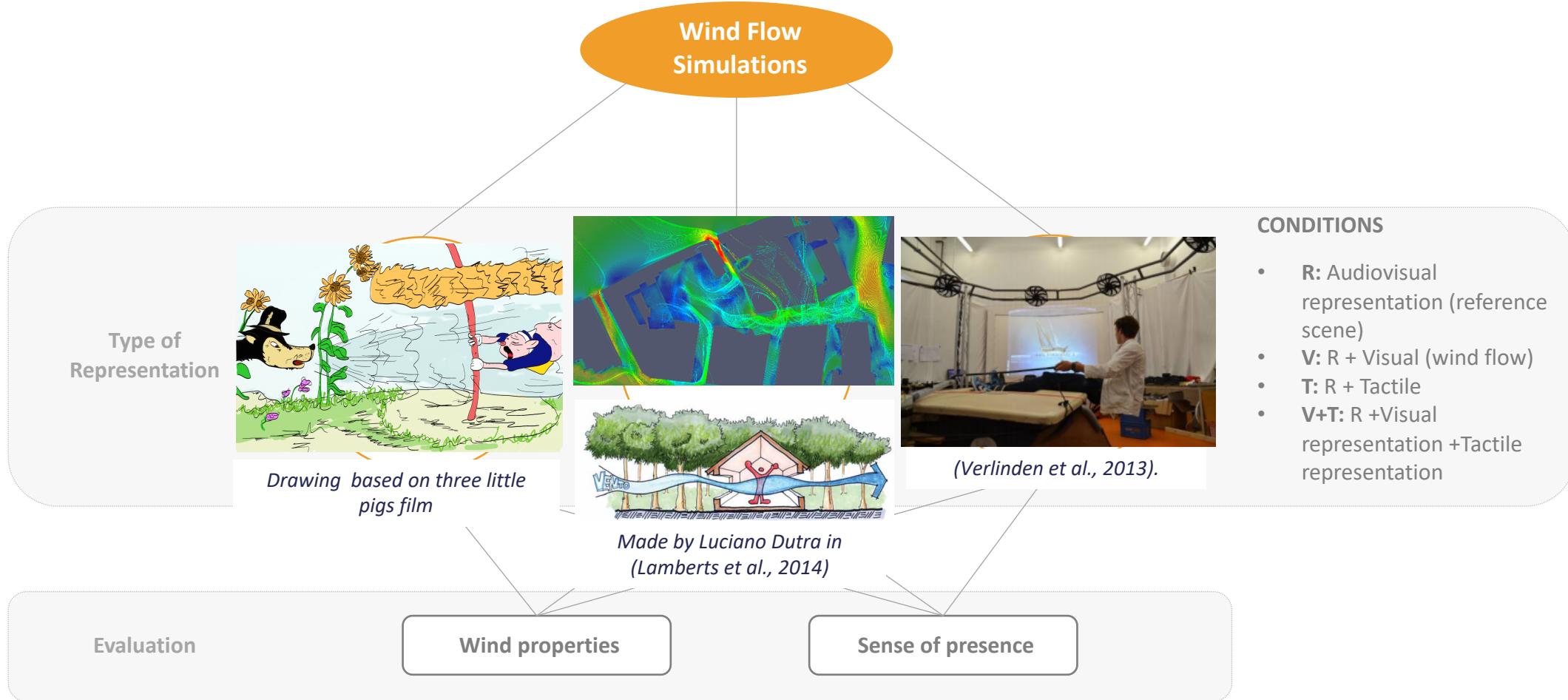


Comfort control in humid tropical climate (Gandemer, 1992)

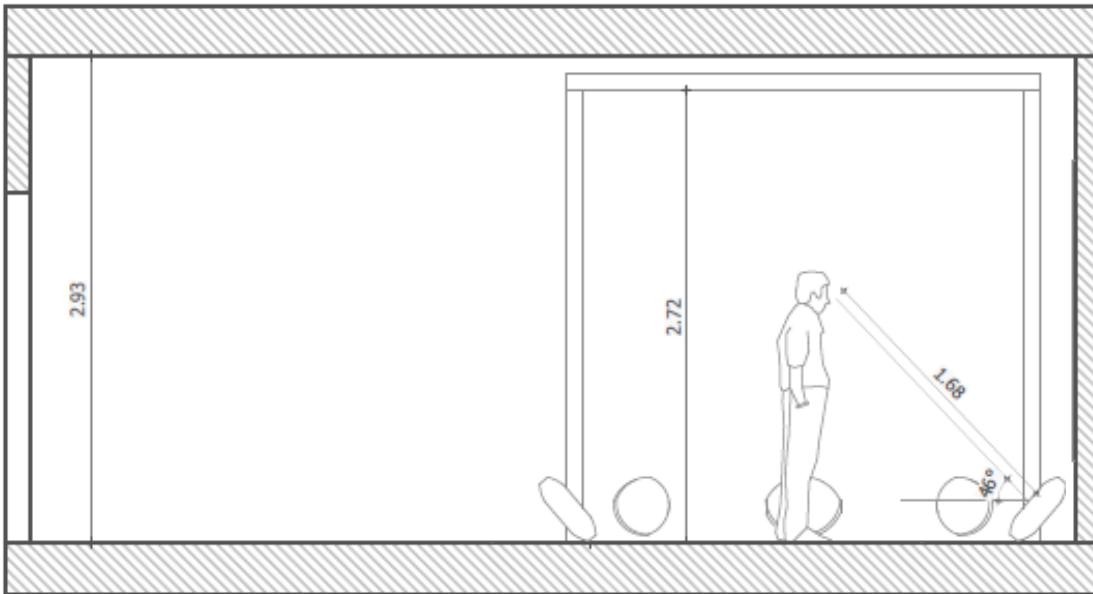
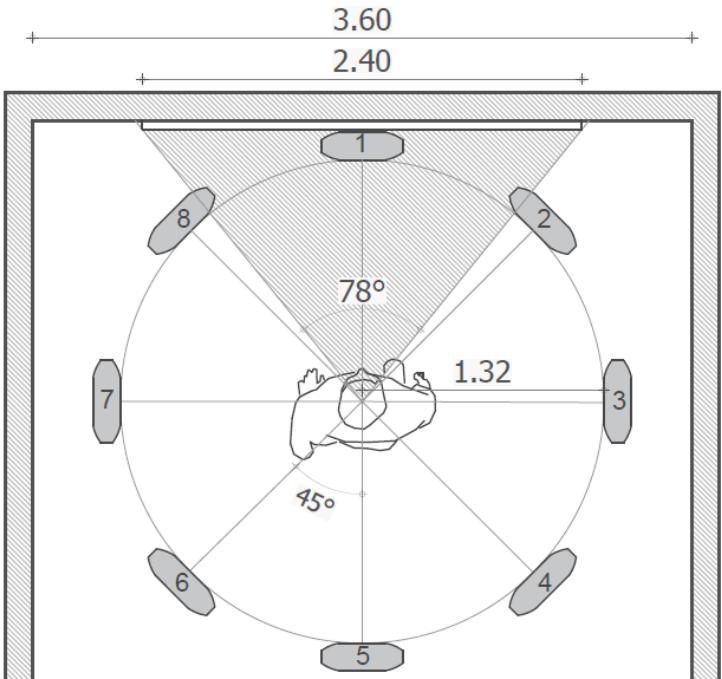


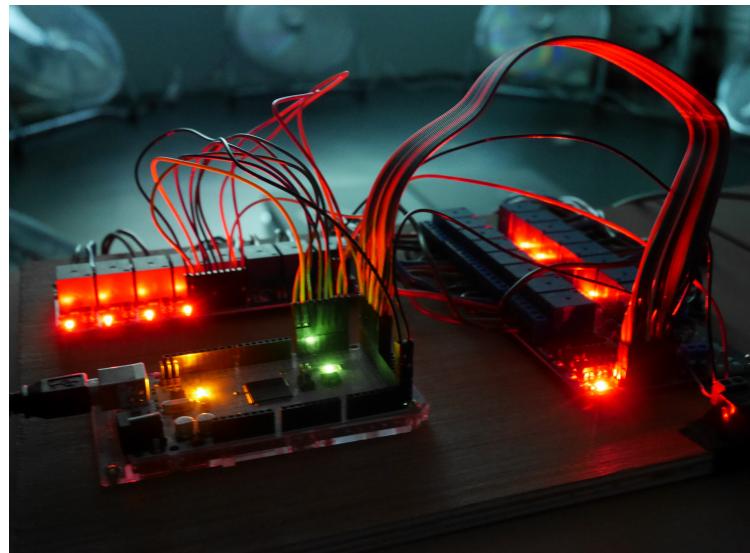
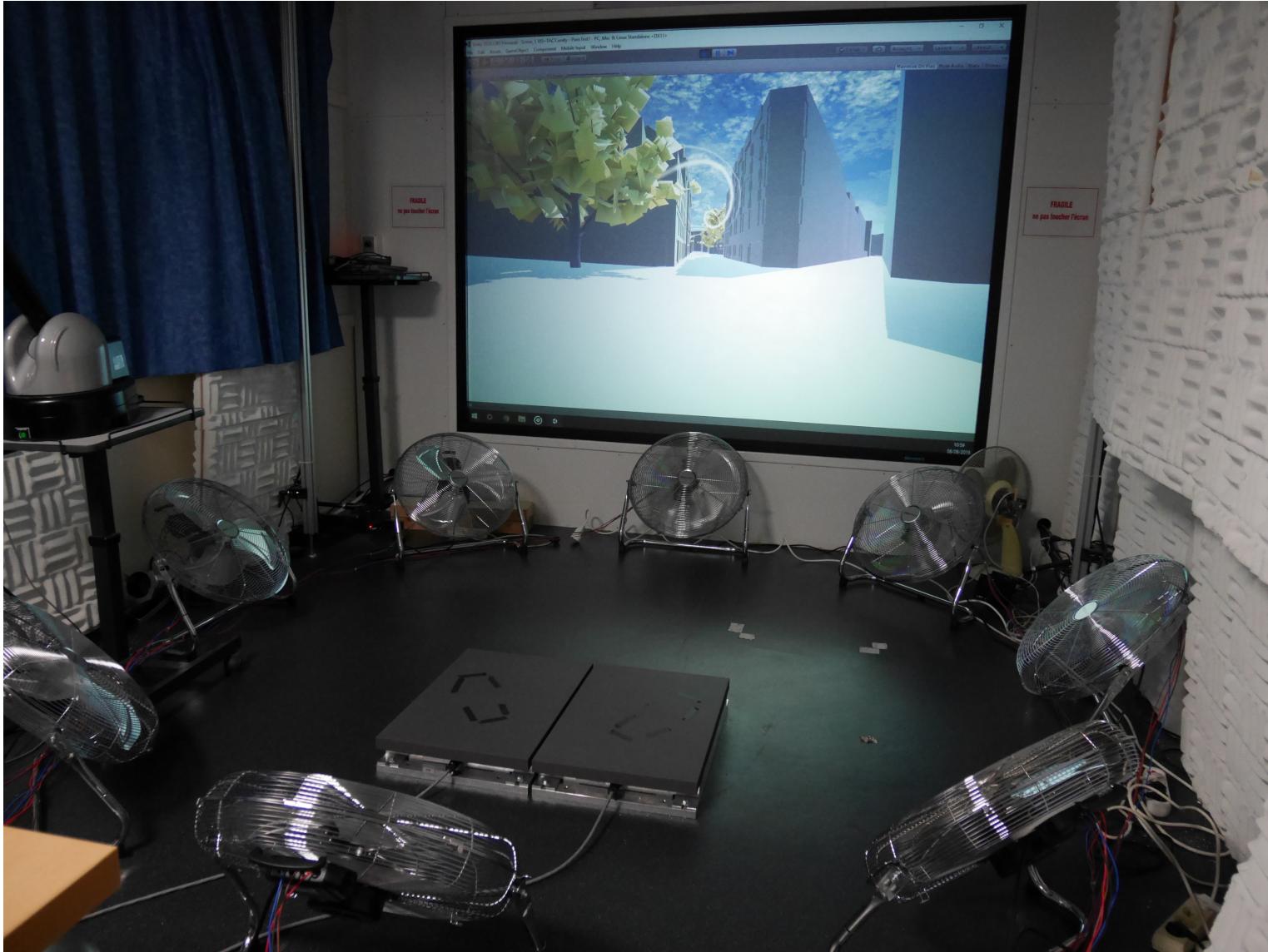
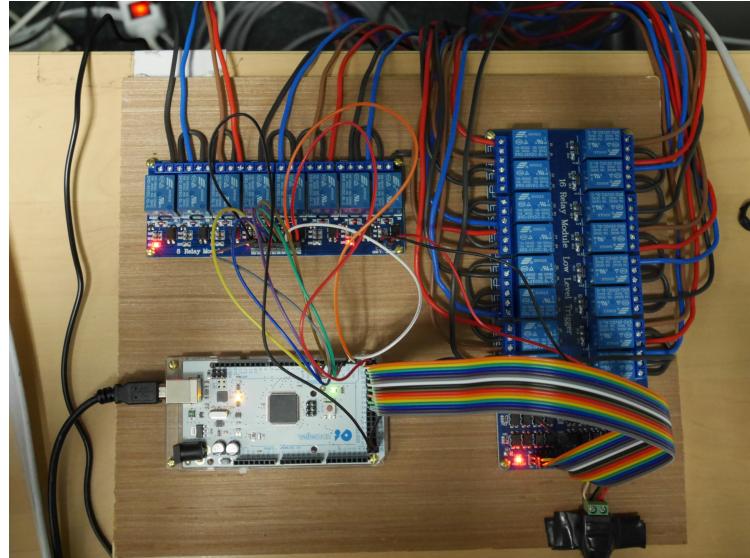
Difficulty walking due to the mechanical effects of the wind (Sacré & Gandemer, 1993)

Context



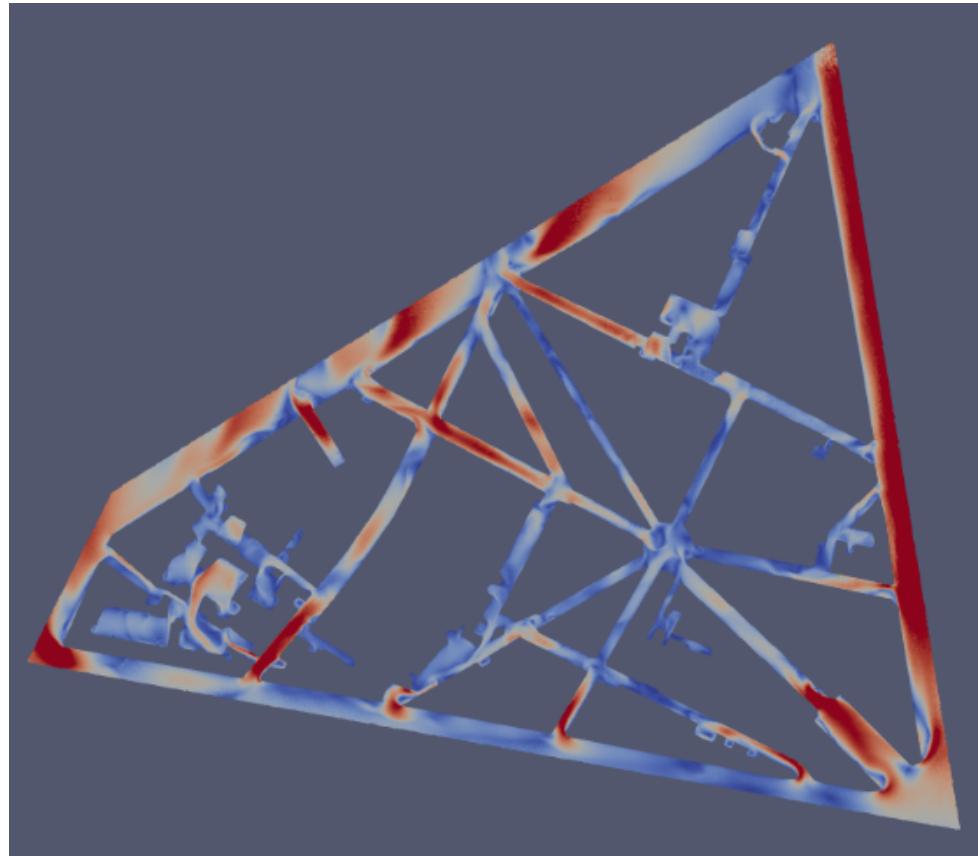
Apparatus



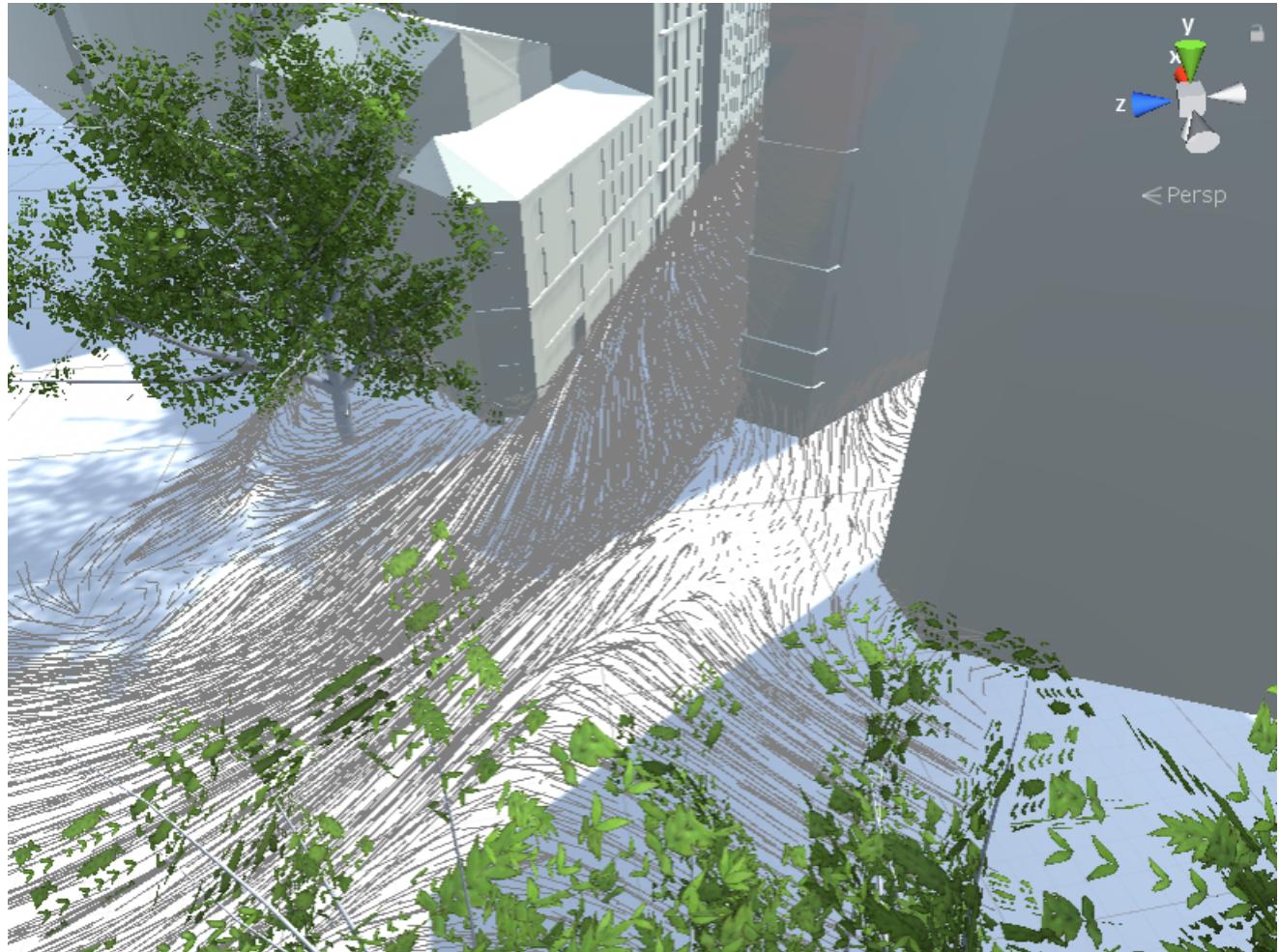


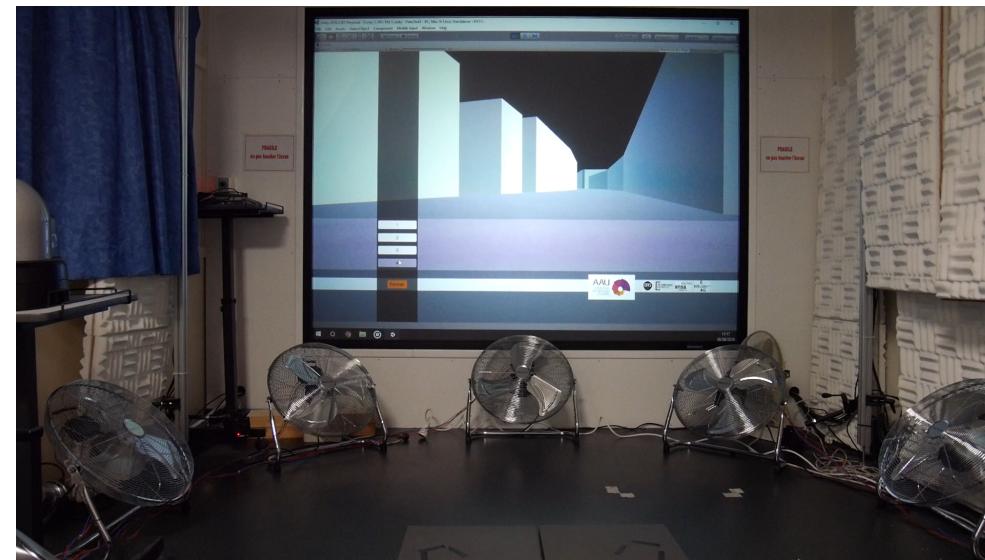
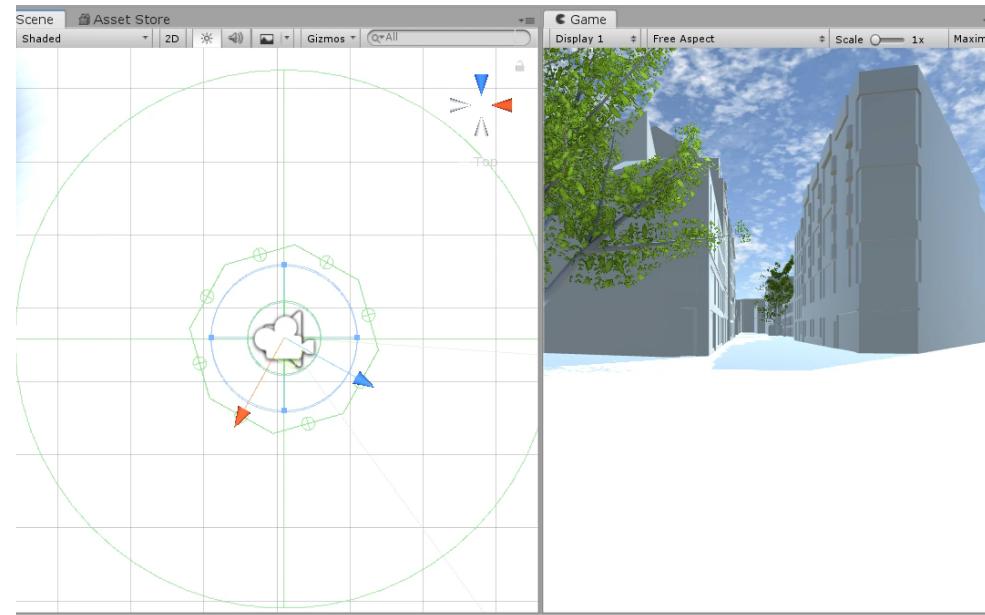
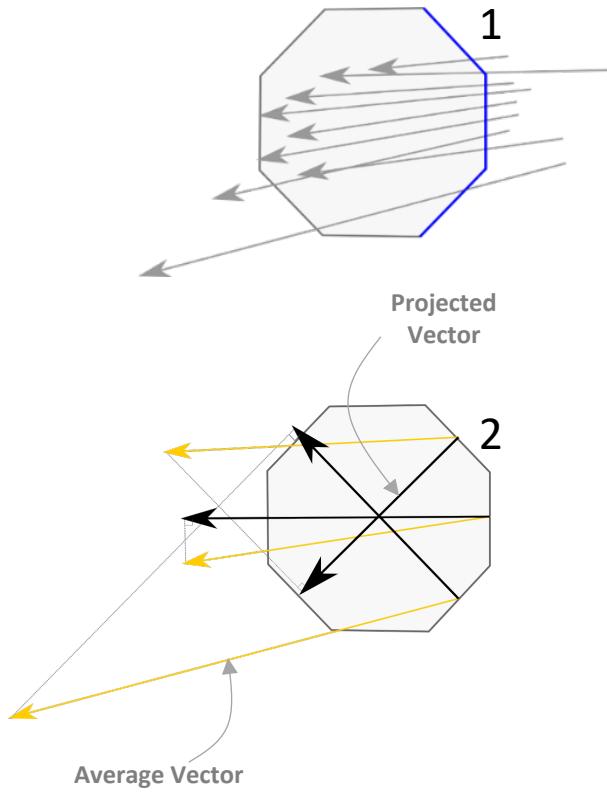
VR Scene

1- Tactile Representation/sound

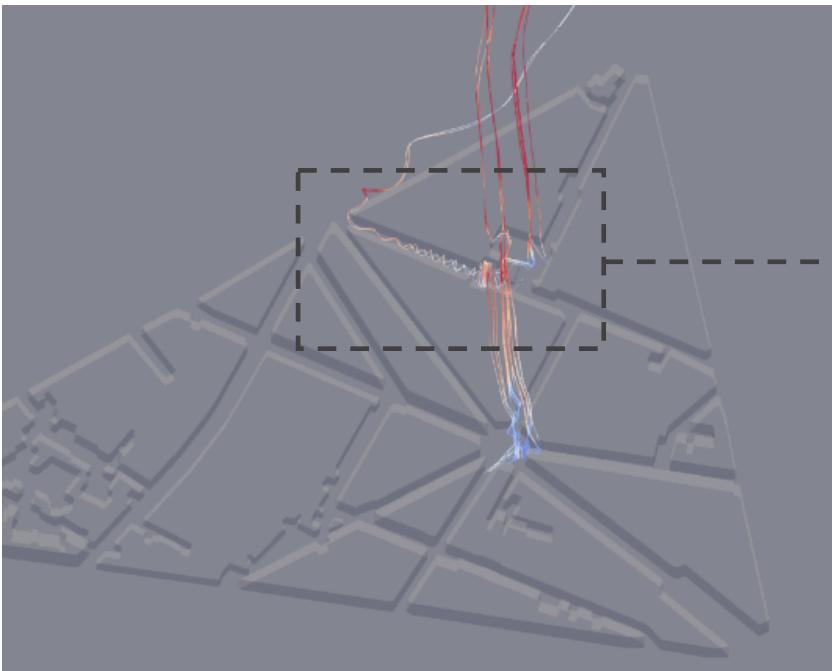


CFD results, horizontal cut of wind speed visualization.(Left).
Vector field representation in Unity3D (Right).

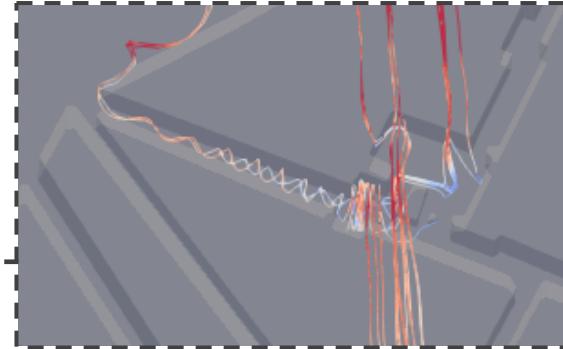




2- Wind flow Visualization



Streamlines of wind velocity visualization in the 3D model of the street of interest. .



Procedure

- 37 Participants (17 women and 20 men)
- 4 Conditions:
 - R
 - V
 - T
 - V+T
- 4 paths : P1-P4 (3 Zones of evaluation)
- 12 Stop points (evaluation)
- 4 Groups of participants:

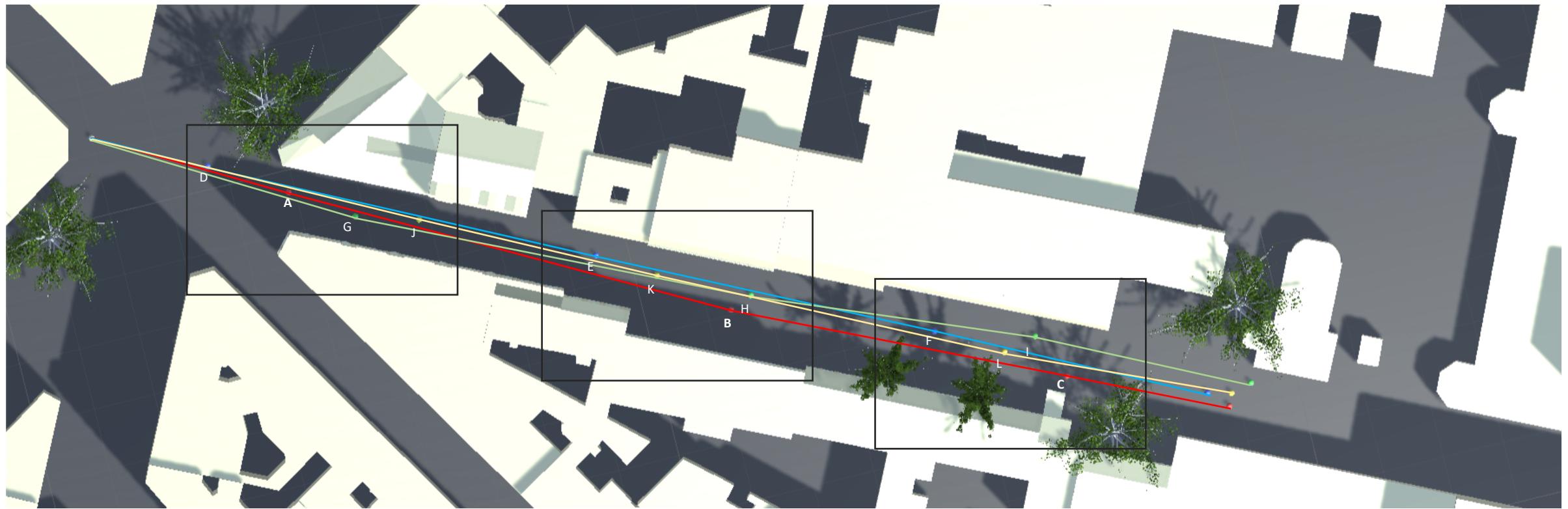


R condition



V condition

	Group 1	Group 2	Group 3	Group 4
R	P1	P4	P3	P2
V	P2	P1	P4	P3
T	P3	P2	P1	P4
V+T	P4	P3	P2	P1

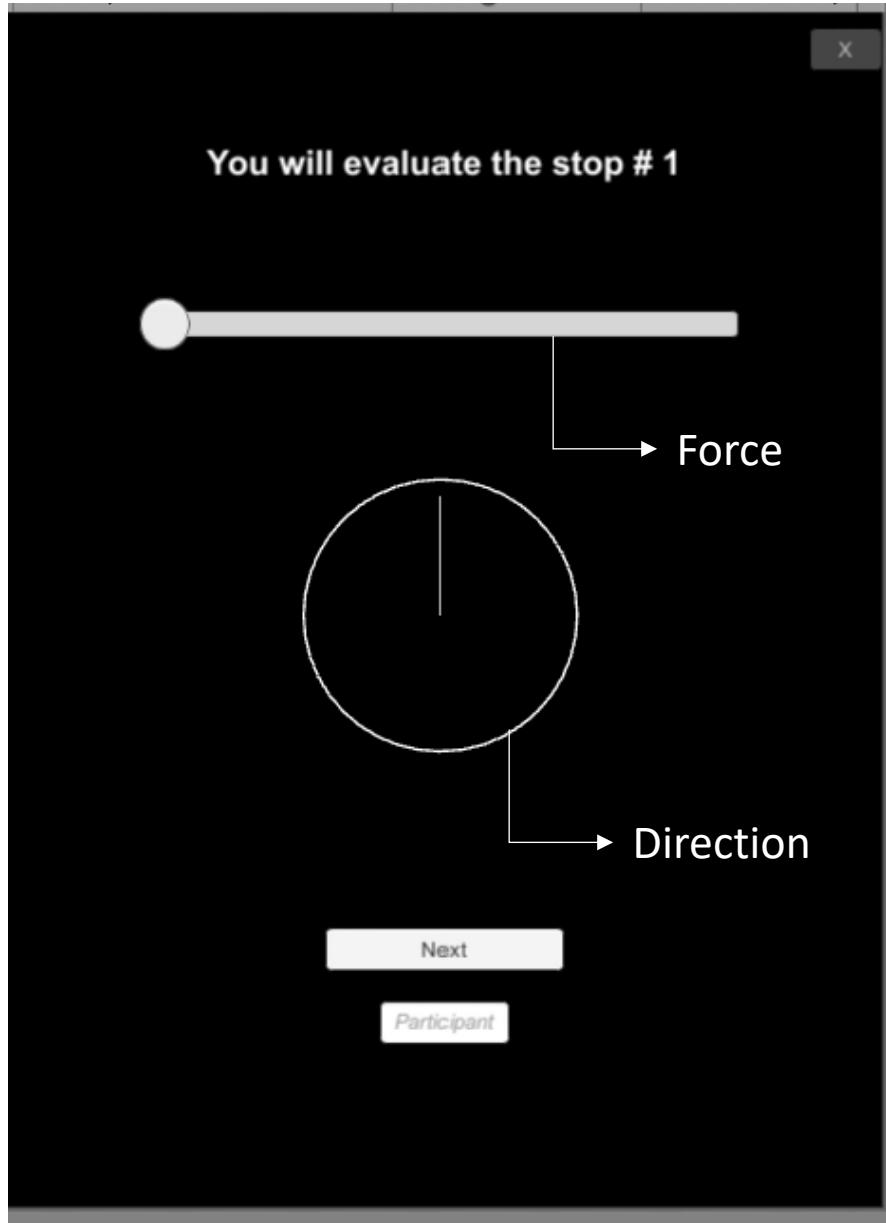


Route 1

Route 2

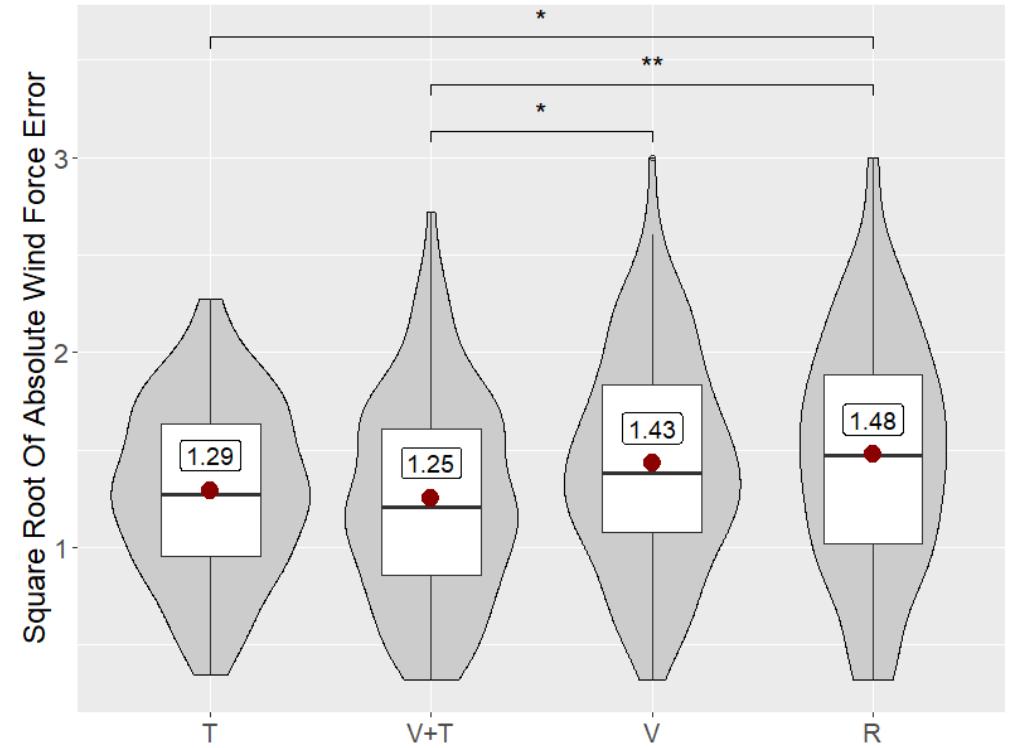
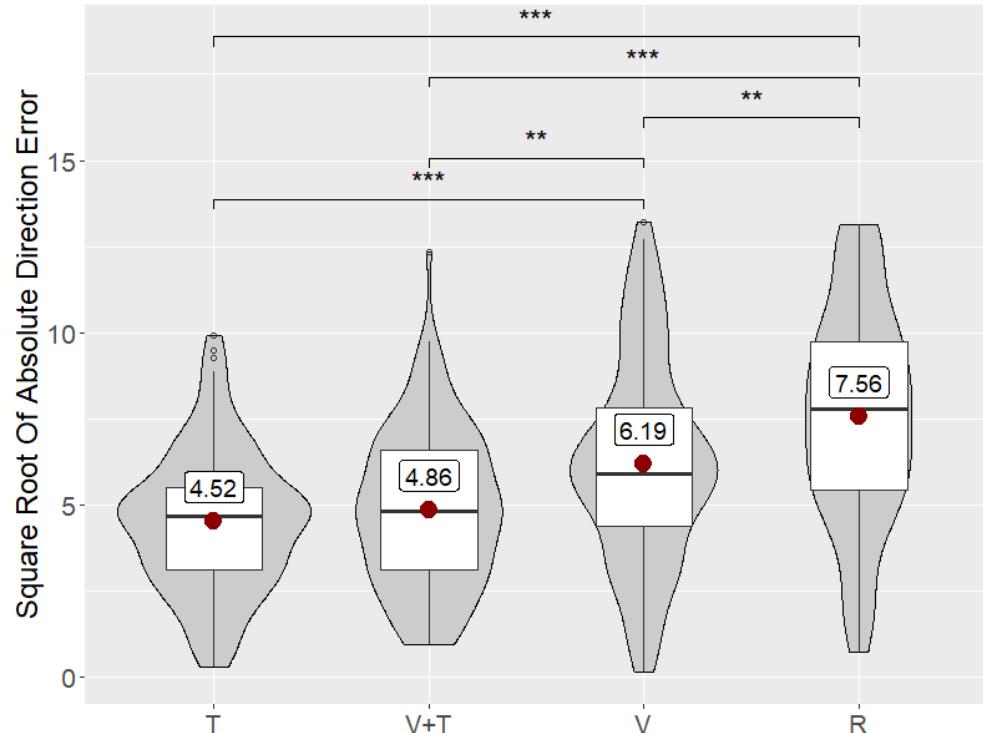
Route 3

Route 4



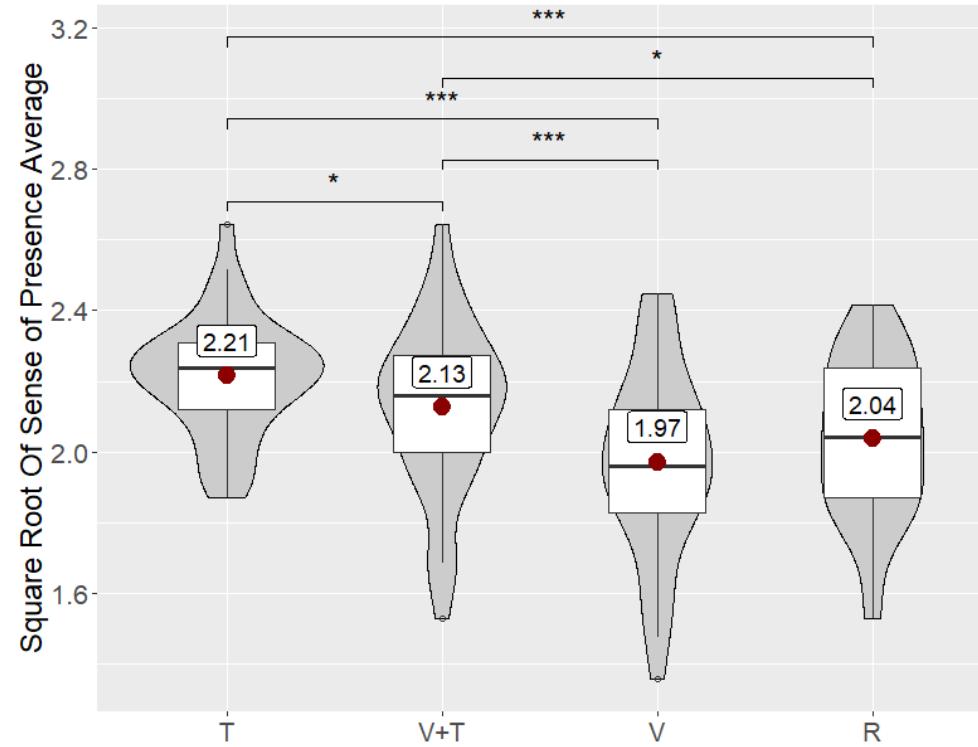
+ **Questionnaire of presence (SUS)**

Results : Wind Properties



- T condition was the most accurate in order to identify the wind direction
- VT present the most accurate result in order to identify the wind force

Results : Sense of Presence



- T condition was the one that increased the most the sense of presence

CONCLUSION

- Better understanding of wind properties and sense of presence including tactile restitution.
- Interest in the architecture and urban design fields to exploit other types of representation beyond visual effects.
- Tactile wind restitution could help to simulate or reproduce a possible wind behavior from an urban space.

Thank you for your attention

Paper link:

[Perception of Multisensory Wind Representation in Virtual Reality \(archives-ouvertes.fr\)](#)