An IAQ and thermal comfort coach prototype to improve comfort and energy consumption thanks to adequate management of natural ventilation:

Genesis, development and first feedback results

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CONTEXT

- Natural ventilation through open Windows allows to exchange easily 5 - 10 ACH for free
- But might bring some additional energy consumption or discomfort if open at inappropriate time
Wind’ose genesis:
Monitoring of our Naturally ventilated Office Building in Summer period

Monitoring of Windows/Doors opening

Interface to collect User feedback

OPENINGS STATUS AND FAN MONITORING

Contact sensors on all openings on 2nd floor of west wing.

Power meters for fans.
+ Z-wave repetitor
Initial behavior campaigns: First results (1/2)

Window louvers to Outdoor and corridor

Windows to outdoor

Desk Fan

% of opening time

ON

OFF

Initial behavior campaigns: First results (2/2)

Number of answers for each user

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Interface to collect user feedback

Clothing

Thermal Comfort: sensation, preference, satisfaction, acceptation

Potential annoyance

Office Status: Windows, fans, ...

Air movement acceptability and preference

Global Comfort

Automatic air temperature acquisition

7 summers campaign

51 different users

51 different users
**WIND'OSE OBJECTIVE**

- Coaching tool developed to help occupants to know whether it is a good option to open or close their windows.

- Coach objective is to consider the three components:
  - thermal comfort,
  - indoor air quality (IAQ)
  - energy consumption

\[\text{Based on Patent EP3971490 on “Method and system for advising on the opportunity of activating a door in order to improve the thermal comfort and/or the quality of the air”}\]
WIND’ose an e-fAIR prototype

SPECIFICATIONS AND PROTOTYPE V1

- 2 Indoor Sensors:
  - Indoor air temperature
  - CO₂ concentration
- 1 Outdoor sensor
  - Outdoor air temperature

Autonomous (Energy & embedded algorithm)
and easy to set up

Intuitive message communicate to users

WIND’OSE ALGORITHM

1. Separate evaluation of each criteria
2. Check consistency between the 2 separate evaluations
3. If necessary – Arbitrate between criterias
4. Advice push to user

Thermal criteria

Potential depending on Tint-Text

Opportunity based on adaptive comfort

IAQ criteria

Indoor CO₂ concentration compared to a lower threshold

Advice push to user

Free mode

Open

Close

CO₂

|ΔT|
EXPERIMENTAL CAMPAIGN
SET UP ON A REAL BUILDING.

FIRST RESULTS

Measured Data

CO₂ > CO₂_lowthreshold
& T_int > T_conf_sup

Thermal criteria

Intermediate indicators

Final Advice

Exploring window opening behaviour for optimal cooling and thermal comfort
INIVE Webinar – 26 March 2024
CONCLUSION AND PERSPECTIVE

• Wind’ose prototype answer our 1st requirements and specifications

• What’s next:
  • Increase period and number of user feedback
  • Improve algorithm, and integrate specificity for
    • Mid-season
    • Winter
  • Enhance battery autonomy or integrate PV cells to get it fully autonomous.
  • Integrate other pollutants sensors.
  • Integrate shutter advice for solar control
  • ...

Thank You for your attention

Next presentation:

Coupling methodology of windows and ceiling fan occupant behaviour models with building energy models: a tropical case study

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