THE INFLUENCE OF THERMOCHROMIC GLAZING PARAMETERS ON ENERGY SAVING AND COMFORT CRITERIA USING MOMENT-INDEPENDENT MEASURE

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AIM OF THE STUDY

Identify the influence of thermochromic glazing parameters for office buildings in hot climates using dynamic building simulations and sensitivity analysis techniques.

BACKGROUND

Thermochromic glazing (TC):
- Has the capability to modulate its thermo-optical properties dynamically and reversibly when a change in its temperature occurs.

TC glazing for building application:
- Has to be doped with other metals to improve its properties:
  - Transition temperature
  - Visible Transmittance
  - Solar modulation
- Has a potential to:
  - Reduce energy consumption (Hoffmann et al., 2014)
  - Improve thermal and visual comfort (Costanzo and al., 2016)
- Has a greater efficiency for hot climates (Saeli and al., 2010)

METHODOLOGY

- Thermal and daylighting simulations with EnergyPlus
- Sensitivity analysis method with a Python code with the SAlib
- Analysis on several indexes and on 4 locations (hot tropical climates)

SENSITIVITY ANALYSIS

Moment-Independent Measure (Borgonovo, 2007):
The assessment of “the influence of the entire input distribution on the entire output distribution without reference to a particular moment of the output”

<table>
<thead>
<tr>
<th>INPUT VARIABLES</th>
<th>SYMBOL</th>
<th>RANGE</th>
<th>UNIT</th>
<th>PROBABILITY</th>
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<tr>
<td>Building Orientation</td>
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<td>°</td>
<td>Continuous/Uniform</td>
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<td>Window to Wall Ratio</td>
<td>WWR</td>
<td>5-99</td>
<td>%</td>
<td>Continuous/Uniform</td>
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<tr>
<td>Insulation Thickness</td>
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<td>m</td>
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<tr>
<td>Weather File</td>
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<td>-</td>
<td>Discrete/Uniform</td>
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<tr>
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<td>5-70</td>
<td>°C</td>
<td>Continuous/Uniform</td>
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<tr>
<td>Switching Temperature range</td>
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<td>Solar Transmittance range</td>
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<tr>
<td>Visible Transmittance Max</td>
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<td>-</td>
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</table>

4096 simulations were performed

REFERENCES