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 et al., 2016)
- Has a greater efficiency for hot climates (Saeli et 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>
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<th>Input Variables</th>
<th>Symbol</th>
<th>Range</th>
<th>Unit</th>
<th>Probability</th>
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<td>°C</td>
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</table>

4096 simulations were performed

**Normalized Outputs**

**Energy Consumption Index (I_{ec}):**
- Sum of the final energy consumed in one year
- Cooling and artificial lighting

**Thermal Comfort Index (I_{th}):**
- % of time when the operative temperature is below 26°C

**Visual Comfort Index (I_{vis}):**
- % of time when the illuminance reference points are between 300 and 2000 lux

**Results**

**Distribution of Input Parameters**
- Filtering model outputs according to a criteria
- Sorting given inputs by glazing size (small, medium, large)
- Energy consumption: [0; 0.40]

**References**


